

**Authentic Learning in the Kitchen and Garden:
Synthesising planning, practice and pedagogy**

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Abstract

This study identifies and articulates the interrelationships between six key components essential for authentic learning to maximise the student-centred learning opportunities in kitchen and garden-based learning projects. Interpretative case study methodology using multiple qualitative methods for data analysis were used to direct three layers of inquiry around kitchen and garden-based learning: the context, content and characteristics of kitchen and the garden-based learning, the student learning, and the teachers' work.

Review of the literature indicated significant gaps in understanding how teachers can foster children's interest in nature, and plan for effective authentic learning experiences in the garden. Through analysis of the literature, together with the perspectives of the Grades 4, 5 and 6 children, and their teachers, key components for authentic, contextualised learning were identified. These included: a real-world context, the opportunity for working as professionals, within a collaborative learning community, work requiring higher-order thinking, ownership of learning and authentic integrated assessment.

Teachers' pedagogy and practices are often hidden but were nevertheless significant factors affecting student outcomes. Teachers made the learning experiences more meaningful by ensuring student reflection was embedded in learning tasks. Planning and providing arenas or "safe platforms" for discursive reflection was an essential step in transforming tacit understandings to explicit knowledge enabling children to connect their personal experiences with the experiences of others. From this discourse deeper understanding of ecoliteracy emerged with one cohort, and understandings about the intricacies of collaborative teamwork with another. The focus group discussions about common experiential learning experiences had wider implications for teaching; they were a key step in making the children's tacit understandings explicit. Examination of the staff and students' immersive experiences within a kitchen garden learning environment, led to the development of a model of learning that provides educators with a comprehensive approach to scaffold authentic learning opportunities.

Candidate declaration

I, Heather D Wallace, declare that the PhD thesis entitled Authentic Learning in the Kitchen and Garden: Synthesising planning, practice and pedagogy, is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

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Terms used in this document

Acronyms

ACARA	Australian Curriculum, Assessment and Reporting Authority
AP	Assistant Principal
AusVELS	Australian Curriculum Victorian Essential Learning Standards. AusVELS incorporates the Australian Curriculum F-10 for English, mathematics, history and science within the curriculum framework first developed for the Victorian Essential Learning Standards (VELS).
AuSSI Vic	Australian Sustainable Schools Initiative Victoria
COAG	Council of Australian Governments
DE&T	Department of Education and Training (Victoria)
DEECD	Department of Education and Early Childhood Development (Victoria)
EfS	Education for Sustainability
HOT	Higher-order thinking
HOTS	Higher-order thinking skills
KGBL	Kitchen- and garden-based learning
MCEETYA	Ministerial Council on Education, Employment, Training and Youth Affairs
MKO	More Knowledgeable Other (Vygotski)
NAPLAN	National Assessment Program Literacy And Numeracy
OGSE	Office for Government School Education
PD	Professional development
PLT	Professional learning team
PoLT	Principles of Learning and Teaching
UNESCO	United Nations Educational, Scientific and Cultural Organization
RDA	Recommended daily allowance
RDI	Recommended daily intake
SAKGO	Stephanie Alexander Kitchen Garden Organisation
SAKGP	Stephanie Alexander Kitchen Garden Program
SMART	Specific measurable attainable realistic timely (goal setting)
VELS	Victorian Essential Learning Standards
ZDP	Zone of proximal development (Vygotski)

Definitions

Authentic learning —an approach that promotes student exploration and inquiry in contexts that involve real-world problems and projects relevant to the learner.

Biophilia —love of life or living systems. According to a theory of the biologist E. O. Wilson (1984), it is an innate and genetically determined affinity of human beings with the natural world.

Biophobia —aversion or fear of the natural world, Biophobia is the antonym to biophilia. In *Earth in Mind* by David W. Orr biophobia is defined as “the culturally acquired urge to affiliate with technology, human artifacts, and solely with human interests regarding the natural world.” “Biophobia ranges from discomfort in natural places to contempt for whatever is not man-made, managed or air-conditioned. Biophobia is also manifest in regarding nature as nothing more than a disposable resource” (White 2004).

Ecoliteracy (Ecological literacy) —is the ability to understand the natural systems that make life on Earth possible. The term was created by environmentalist and educator David W. Orr and physicist Fritjof Capra in the 1990s and refers to the “wellbeing of the Earth”. Systems thinking (recognition of the world as an integrated whole) and ecology are combined requiring recognition of the complex interdependence of ecological systems and an appreciation of nature and our role in it.

Ill-defined problem —may be used to develop critical-thinking and problem solving skills. As the ill-defined problem is generally complex and has multiple possible outcomes, collaborators must discuss, define and/or restructure the problem, carry out research and analysis, and negotiate and prioritise, in order to be able to decide on the parameters of the problem and the best approach.

Lifeworld (German: *Lebenswelt*) —may be conceived as a universe of what is self-evident or given, a world that subjects may experience together. The concept emphasises a state of affairs in which the world is experienced; the world is lived (German *erlebt*).

Professional Learning Team—a collaborative group of teachers that work together on shared goals to improve the efficacy of their teaching and address the learning needs of the children in their classes.

Chapter 1: Context of the research

Introduction

Educators worldwide are being challenged to provide the best possible education for their students in a world where it is impossible to predict the positions they will be required to fill in society. Academic success is regarded as a basic necessity for being prepared to take advantage of new opportunities. Teachers want to ensure students develop the skills and knowledge they will find useful in a changing world (Stokes 2012; Trilling & Fadel 2009). Australia is in the process of changing to a new national curriculum where the “core knowledge, understanding, skills and general capabilities” have been outlined for foundation to Year 10 to bring a common core curriculum and levels that align across state boundaries (ACARA 2012). Education departments are in the process of adjusting their curriculum to reflect national priorities.

Educational authorities in each state and territory have the responsibility for implementation of the Australian Curriculum and for supporting schools and teachers (ACARA 2012).

Although overused, the term “crowded curriculum,” describes a real concern and complaint from teachers as education departments and governments try to detail the essential learning, and refine educational policies, programs and tests to standardise and measure student achievements.

Education in Australia generally begins with between one and two years of non-compulsory kindergarten or preschool leading into primary education. Primary schools in Australia teach Foundation level to Grade 6 (ages generally ranging between five and 13 years). Secondary schooling follows, offering schooling from Year 7 to Year 12. From 2010 schooling in Victoria became mandatory to Year 10. Students are required to remain in (or undertake a combination of) education, training or employment until seventeen years of age (ACARA 2010). Society is increasingly expecting that students will have completed Year 12 as a minimum education level. This is reflected in the Council of Australian Governments’ (COAG) goal to have 90 per cent of Australian

students achieve Year 12 or equivalent by 2015 (COAG, National Education Agreement 2012 p. 5).

AusVELS is Victoria's answer to these requirements, and incorporates the Australian Curriculum into the Victorian Essential Learning Standards (VELS) framework. In Victoria the curriculum is divided into the domains of physical, personal and social learning, interdisciplinary learning and disciplines-based subjects. In this period of change the Australian Curriculum is used to describe the content and achievement standards for English, Mathematics, Science and History in the discipline-based learning domain. The *Victorian Essential Learning Standards* (VELS) are used to inform the other domains of AusVELS (Appendix A: AusVELS — Strands, Domains and Dimensions).

While implementing the changes to the national curriculum, Teachers are expected to develop curricula that are engaging, build on prior knowledge and cater for differing learning styles and abilities. Simultaneously, they must create scaffolded learning opportunities with integrated assessment, which enable the reporting of achievement standards referenced to AusVELS. In this demanding education climate, and despite the increased standardisation of the curriculum, there has been an increase in popularity of experiential gardening projects (Blair 2009; Bucklin-Sporer & Pringle 2010; Williams & Brown 2013).

Historical context of kitchen- and garden-based learning

Getting children outdoors to participate in gardening is not a recent concept. Historically, kitchen gardens have been associated with schools (Jurenka & Blass 1996; Moore 1995; Trelstad 1997). Friedrich Froebel established the first “kindergarten” to teach young children through gardening in 1837. He pointed out that children needed to see things in context and to achieve “the clearest insight” they should study the things that are “in closest and most constant connection to him” (Froebel 1826, cited in Desmond et al. 2004 p. 27). Using the example of “the garden, the farm, the meadow, the field, the forest and the plain... Instruction should proceed from the nearest and known to the less near and less known” (Froebel 1826). Dewey also recognised the value of gardens for teaching children. He argued that gardens offered opportunities for reproducing situations of life, acquiring and applying information and ideas, and carrying forward of progressive experiences (Dewey 1916). Using children's gardens to help encourage an appreciation

for nature and the development of interpersonal skills, kitchen gardens were also promoted in the early 1900s by Marie Montessori. She described how looking after and nurturing seedlings gave children a mission and responsibility in life (Montessori 1964).

During the first and second world wars there was both an increased interest and necessity for school kitchen gardens. They were used for food production and vocational instruction. The first American school garden was created in 1891 in Boston, Massachusetts, at Putnam School. School gardens quickly spread, and by 1919 hundreds of thousands of children were involved in producing food for the war effort, under the umbrella of the United States School Garden Army (Trelstad 1997). This initial commitment to school gardens as a site for food production gradually lapsed, as the necessity for food supplementation decreased and the focus shifted to the new emerging computer technologies.

The “Information Age” demanded that the contained space of the classroom engage with the new technologies. Information and communication technology was heralded as the new thing. Concern about being left behind or being “stragglers in a world of technology” (National Science Board Commission 1983) is still a common driver today. “The world is changing fast. Technological know-how is spreading throughout the world — along with the knowledge that such skills and sophistication are the basic capital of tomorrow’s society” (1983 p. v). The report goes on to recommend, “States should establish regional computer centers for teacher education and encourage the use of computers in the classroom for both teaching and administration” (1983 p. xi). The Victorian Department of Education in 1998 identified “innovative information technology and multimedia”, together with “improved participation and performance in science and technology education”, as two priority objectives (MCEETYA 1999 p. 167). Teachers took delivery of notebook computers and were exhorted to attend professional development to assist with this new focus. The move from the natural environment outdoors to indoors with a technology focus was privileged. Asphalt playgrounds and manicured sporting fields replaced the food gardens (Subramaniam 2002).

While technology continues to play an important part in modern classrooms, there are calls from educators and environmental activists to reconnect children and education to the natural world (Bucklin-Sporer & Pringle 2010; Gill 2005; Hicks 2002; Kellert 1997;

Louv 2008; Smith 2002). The increase in popularity of garden-based learning in primary schools is one response of educators to this concern. In Australia, primary schools are participating in programs such as the Stephanie Alexander Kitchen Garden and the Gould League's Multicultural Schools Gardens (Gould Group 2011). The Australian Government committed over \$18.2 million to the rollout of the Stephanie Alexander Kitchen Garden National Program, and according to 2013 figures, had supported the involvement of more than 456 schools in the program.

The revival of interest in school kitchen gardens means that it is crucial to examine the learning opportunities and benefits of garden-based learning. The time and commitment required for implementing cooking and garden programs needs to be assessed. Is it time well spent? With the increased budget and resources allocated to providing kitchen gardens in primary schools, it is critical to examine the nature and quality of learning that takes place.

As educators we are challenged to provide integrated curriculum that is engaging, builds on prior knowledge, caters for differing learning styles and abilities, is authentic and also provides learning opportunities that cross the domains of personal, interpersonal, cross-curricula and subject disciplines. Professional development has also undergone a shift in emphasis. Professional learning communities are being established within schools with the aims of creating a shared vision, a common language and to encourage a culture of collaboration. These goals also need to be achieved in an educational climate where there is increased curriculum standardisation and emphasis on evidence-based outcomes. Is the kitchen garden the magic formula enabling the resolution of these apparently contradictory goals?

Research focus

The overarching objective of this research was to analyse the learning of primary school children that occurred through participation in the kitchen garden program and evaluate whether kitchen- and garden-based learning programs are worthwhile additions to the curriculum. Two case studies were compared. The case studies were based on different units of work and year levels: the Grade 4 "Kitchen Garden" project and the Grade 5 and 6 "Pantry Plunder" nutritional unit. Examining the learning and growth children

underwent when participating in these units will assist in evaluating whether kitchen- and garden-based learning programs are worth including in the curriculum.

The first layer of research analysed the type of learning, including the content, context and characteristics of the learning that occurs through participating in the Kitchen Garden Project and Pantry Plunder Unit. The second layer of research examined the children's learning and evaluated whether it can be thought of as "authentic learning"¹. It explored the attitudes of the children in a Grade 4 class towards the project, and documented their reflective discourse and stories of the kitchen garden as evidence of their learning.

Reflections from the Grade 5 and 6 children on their learning in the Pantry Plunder Unit were also explored. The third layer of research examines the pedagogy and the planning of the teachers based around the kitchen garden and the development of the nutritional unit "Pantry Plunder". This provided the opportunity to compare the Grade 5 and 6 students learning focused on health and nutrition, with the Grade 4 unit, which included cooking, health science and gardening components.

Structure of the thesis

Three interrelated layers of research were employed to structure and provide a framework for this thesis, enabling comparison of the two case studies. A core research question directed the inquiry within each of these three layers.

Layer 1: The kitchen- and garden-based learning: context, content and characteristics

1. Do the kitchen garden activities engage the children, generate stories of learning and growth and promote an appreciation of nature?

Layer 2: Student learning

1. Do the Kitchen Garden Unit and the Pantry Plunder Unit provide the opportunity to participate in authentic learning?

¹ Authentic learning definition on page xiii

Layer 3: Teachers' work

3. Does the e5 Instructional Model² support the pedagogy, planning and practices, required for implementation of student-centred, authentic learning?

In discussing the findings in relation to each of these research questions, the significance of the kitchen and garden in promoting authentic learning at the school is clarified.

Overview of the thesis chapters

Chapter 2: The literature review examined the reported benefits of kitchen- and garden-based learning and provided a context for this research. The initial discussion addressed the consequences and changes brought about in the lives of young people in a more “technology-driven” world. This part emphasised the significance of providing opportunities for reconnecting children to nature, and lead to an examination of the reasons for establishing school gardens. The reported benefits and barriers of using these outdoor spaces for teaching and learning were explored.

Pedagogical approaches currently used to inform kitchen garden learning were outlined. Theories of learning underlying the way teachers use the kitchen- and garden-based activities to promote learning were examined. Elements of authentic learning regarded as essential were synthesised from the literature and grouped under broad headings to clarify the key characteristics of authentic learning.

The current educational climate, where there is an increased call for accountability and standardisation of curriculum, was contrasted with the demands of educating children for skills necessary in the 21st century. How professional learning communities could develop a common focus, equip teachers with new skills, promote opportunities for collaboration and reflection with the aim of supporting students learning was explored. Chapter 2 is concluded with a discussion on the demands of reporting against the curriculum standards in schools.

² e5 The e5 Instructional Model is a framework that promotes a common language for description of classroom practice; ‘a framework to inform conversations and guide the critique and reflection of classroom practice’ (DEECD, 2009b).

Chapter 3: The theoretical framework provided an outline of the social research paradigms informing the research, and put forward arguments for selecting the qualitative research paradigm used in this study. Constructivist epistemology aligned most closely with the overarching research goals of understanding the significance of the kitchen garden to the children and evaluation of whether kitchen and garden programs are worthwhile additions to the school curriculum. Naturalistic inquiry was identified as the overarching research paradigm, because the research was centred on the school and required the phenomena of the kitchen garden to be examined in context. The value of using a hermeneutic approach to interrogate the data from the two case studies was explained, together with trustworthy validation criteria.

Chapter 4: Research approaches outlined the rationale for the approach to participant selection, data sources and collection, and data analysis techniques. Background information on the school and the participants was provided to enable comparison with similar schools and groups of children. The SECI model, used to explain knowledge creation in business organisations, was proposed as an appropriate tool for interpreting knowledge construction within the school setting. Ethical considerations were discussed (it was important to ensure no harm came from participation in this study). Chapter 4 concluded with a discussion on the limitations of this research.

Chapter 5: Case study 1 — The Grade 4 Kitchen Garden Unit was examined from the perspective of the Grade 4 children talking and writing about *their garden*. Analysing the learning from the point of view of the children highlighted the significance of kitchen- and garden-based experiential learning to them. Four key themes: relationships, life skills, health and nutrition, and the environment, emerge convincingly from the data collected from the children's interviews and written work. A summary of characteristics exhibited in the Grade 4 Kitchen Garden Unit was placed into an authentic learning framework.

Chapter 6: Case study 2 — The Grade 5 and 6 Pantry Plunder Unit analyses the learning of the Grade 5 and 6 children through their verbal and written reflective discourse. The children highlight three main themes of collaborative learning, life skills and health and nutrition, which illustrated their learning in the nutritional unit. A summary of characteristics exhibited in the Grade 5 and 6 Pantry Plunder Unit was placed into an authentic learning framework.

Chapter 7: The e5 inquiry was centred on the collaborative planning for the unit of work “Pantry Plunder” as part of a Professional Learning Team’s (PLT) inquiry into the e5 Instructional Model. The inquiry provided the opportunity to examine the teachers’ approach to planning for the unit, as well as document the development of their learning community. The different approaches to planning for kitchen- and garden-based learning in the two case studies were compared.

Chapter 8: The context, content and characteristics of kitchen- and garden-based learning explored the nature of the learning kitchen and garden contexts can provide. The elements of real-world contextualised learning that assist with creating experiences connecting to the children’s lifeworlds were discussed. The curriculum content covered in the context of the kitchen garden and the nutritional unit was examined. The essentially social nature of the learning experiences demonstrates the way knowledge was created in the context of the kitchen or garden. Discussion of the first research question concludes this part:

1. Do the kitchen garden activities engage the children, generate stories of learning and growth and promote an appreciation of nature?

Chapter 9: The children’s learning explored the reported learning in the two case studies (Chapters 5 and 6). Core characteristics were placed into the authentic learning framework to enable a comparison between the two cases. A new student-centred learning model, *Planning for authentic learning* (Figure 9.5) outlined the key considerations for authentic learning. The second research question was answered:

2. Do the Kitchen Garden Unit and the Pantry Plunder Units provide the opportunity to participate in authentic learning?

Chapter 10: The teachers’ work in setting up the learning experiences in the two case studies was examined. Evaluation of the teachers’ role in organising these learning experiences responded to the third research question:

3. Does the e5 Instructional Model support the pedagogy, planning and practices, required for implementation of student-centred, authentic learning?

A new model incorporating the findings from Chapter 8 on the importance of contextualising learning was combined with the understandings developed in Chapter 9 on the characteristics of authentic learning. How teacher's planning, practices and pedagogies, which inform kitchen- and garden-based learning, can facilitate authentic learning using discursive reflection and scaffolding of the learning was addressed in this section. The synthesis of planning, practice and pedagogy culminated in the 'Authentic learning knowledge construction model' (Figure 10.3).

Questions prompted by this research are suggested as possible areas for further research.

Chapter 11: Authentic learning in the kitchen and garden: synthesising planning, practice and pedagogy concluded with the findings from this case study, and the essential elements for maximising authentic learning in the kitchen and garden contexts.

Chapter 2: Literature review

Introduction

The literature review is divided into three sections that relate to 3 layers of inquiry that flow through the thesis, as described in Chapter 1. Section 1, Kitchen- and garden-based learning, examines the reasons that kitchen- and garden-based learning contexts have been established, and the barriers that work against their utilisation. Section 2 analyses the range of educational theories that inform the pedagogical approaches used in kitchen- and garden-based learning. The key characteristics of authentic learning are analysed. Section 3 examines kitchen- and garden-based learning in the context of the current educational climate.

Section 1: Kitchen- and garden-based learning

Relationship between health and natural environment

There is growing concern that children are becoming detached from the natural world (Bucklin-Sporer and Pringle 2010; Gill 2005; Hicks 2002; Kellert 1997; Louv 2008; Smith 2002). Richard Louv in his book *Last Child in the Woods* (Louv 2008) uses the evocative term “*nature-deficit disorder*” to capture the essence of the predicament (p. 36). These researchers and environmental educators are seriously concerned that the modern lifestyle of many children is making the natural world irrelevant, unfamiliar or even scary (Gill 2005; Kong 1999; Louv 2008). Children are brought up in a consumer-oriented, technological and generally urban world. Appreciation and connections to the natural world that comes from exposure to nature are not developing (Gill 2005; Louv 2008). Gill expresses his alarm:

[C]hildren are disappearing from the outdoors at a rate that would make the top of any conservationist’s list of endangered species if they were any other member of the animal kingdom... (Gill 2005 para. 6).

Research has promoted the benefits and value of outdoor play and nature experiences for children (Bredekamp & Copple 1997; Cobb 1977/1993; Louv 2007; Mitchell & Popham 2007; Moore & Wong 1997; Rivkin 2000; Suzuki 1997; Wilson 1996; Wyver et al. 2010).

There is a growing body of evidence of the relationship between human emotional, psychological, physiological and spiritual health and the natural environment (Barton & Pretty 2010; Florez et al. 2007; Maller et al. 2006 Reser 2008; Ulrich et al. 1991; Wells 2000). As defined by the World Health Organization (2003), health is “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. The Australian Psychological Society published a position statement in 2008 stating, “It is clear that the well being and integrity of natural ecosystems and the biophysical environment are integral to human health and well being” (Reser 2008 p. 4). Research has found that significant modern-day mental health problems, such as attention deficit hyperactivity disorder and depression can be helped by contact with nature and by being in the natural world (Barton & Pretty 2010; Bell & Dymment 2008; Canaris 1995; Dymment & Reid 2005; Maller et al. 2006; White 2004). When people are in a natural outdoor setting, levels of stress decrease, and at the same time reports of feeling positive increase. These natural settings range from wilderness areas (Kaplan 1995; Maller et al. 2008; Talbot & Kaplan 1986), national parks (Runte 2010), community parks, (Cimprich 1993; Maller et al. 2008) to areas grouped under the term green space (MacKay & Neill 2010; Pretty et al. 2007). This positive effect on mental health extends to the garden; fewer mental health issues affect people that spend time in a garden (MacKay & Neill 2010; Pretty et al. 2007; Ulrich 1999).

Viewing natural landscapes can have a soothing affect when individuals are stressed (Kaplan 1993; Ulrich et al. 1991). Wells (2000) reports on the cognitive and psychological benefits of natural environmental experiences: even being able to see trees and plants through the window can produce this positive effect in children (Wells 2000; Wells & Evans 2003). The Learning Through Landscapes Trust in the United Kingdom reports that the main factor inspiring positive feelings in children’s about their school environment was the presence of nature. A study investigating levels of anxiety and the effects of physical activity found that the more “green” a place was perceived as being, the greater the reduction in anxiety (MacKay & Neill 2010). Being in a natural environment has been associated with a reduction in stress and anxiety, and may be linked to the improvement in the behaviour of children (Han 2009). Brymer et al. (2010) explain that “Exposure to nature provides a refuge from the need for focused attention... being in nature provides an opportunity for being away from the everyday, for opening up

feelings of fascination, for providing a sense of extent [a sense of something larger] as well as a deep realization of a special compatibility” (p. 13). The “special compatibility” described by Brymer has been expressed by others as a feeling of being at peace or at one with the world (Kaplan & Kaplan 1989).

In contrast with reports that children have become alienated from nature (Kong 1999), most research has found that children seem to have an innate attraction to nature and prefer natural spaces as places for play (Maxey 1999; Sobel 2002; Tandy 1999). The variance between these apparently conflicting views can be resolved if the key to the difference is the *timing* of nature experiences. There appears to be a critical time in childhood for these bonds with nature to occur (Louv 2008; Shepard 1982). Biophobia, the fear or dislike of nature, may occur if children are not given the opportunity to become familiar with nature in their early formative years (Louv 2008; Orr 1992; White 2004).

Edward Wilson constructed the word *Biophilia* from the Greek terms for life and love to describe “the tendency to focus on life and life-like tendencies”, which he explains led to humans developing an “emotional affiliation” to other living things and the need to be in nature (Wilson 1984). Kellert also advances the idea that nature is essential to our wellbeing, and is more than just a source of material goods. “Intellectual capacity, emotional bonding, aesthetic attractions, creativity and imagination, even the recognition of a just and purposeful existence” are dependent on our relationship with the natural world (Kellert 1997 p. 6).

The natural world and nature provide in situ contact and a sense of “health” and wellness by definition. It is in the natural world that food and sustenance is grown. Unsurprisingly, many children growing up in city environments are reported as being ignorant of where their food comes from (Berry 1990; McGee 2007; Pollan 2006), and do not have an understanding of being part of nature (Desmond 1998; Louv 2008; Moore 1997). They have lost the sense of what it is to grow food naturally and how resources are there to be grown, tendered, harvested and ultimately utilised for the benefit of humanity and in harmony with nature. The notion that humans are the “managers” of the world has given a false sense of control. We have lost our place in the natural web of life. The economic call to get rich so we can buy more consumer goods is held up as the ideal and as an

indicator of success (Suzuki 1997). Suzuki (1997) argues the need to change our thinking, enabling action on a personal level:

Instead of trying and failing to manage the life-support systems of the planet, we — each one of us — can manage the effect we have on those systems (p. 208).

The school playground, an environment with which children become intimately acquainted during playtime, may actually serve to add to the alienation from nature. Many schoolyards have been designed based on ideas put forward by Herbert Spencer, a psychologist from the nineteenth century: that the playground should enable children to burn off “surplus energy” (Malone & Tranter 2003; White 2004). In many schools the playground has been “up-graded” with artificial manufactured climbing and play structures. Instead of shade trees there are canvas shade “sails” ostensibly to protect the children from the hot summer sun. Nature has been replaced by hard surface areas such as concrete, asphalt and synthetic grass, suitable for vigorous running and chasing, or ball games (Moore & Wong 1997). Playgrounds are designed for ease of maintenance and supervision, rather than providing a natural stimulating environment rich in opportunities for children to engage with nature (Cheskey 2001; White 2004).

The need for children to be environmentally literate

Getting children outdoors and providing opportunities for garden-based learning has been promoted as one way of connecting children to nature (Bell & Dymont 2008; Green 2007; Martin 2006; Moore 1995; Thorp 2005). Kitchen gardens provide a link to nature. A relationship between human health and the natural environment has been reported. This relates to school grounds and children’s physical, social, mental and spiritual health (Bell & Dymont 2008; Canaris 1995; Dymont & Reid 2005; White 2004). Skelly and Zajicek (1998) found that there was a positive correlation between the number of outdoor activities elementary school children experienced and their positive environmental attitude, although they also found that gardening alone was not enough to cause this influence. The kitchen garden makes the crossover between the learning that occurs at school and the learning experience that comes from life, bridging the void that both Dewey and Gruenewald identify. Environment, culture, education and place, all interconnect in a complex dynamic. Simultaneous with this general divorce from nature there is an ever-increasing awareness of our world and its resources as being finite. Kellert (2002) warns that our society has become “so estranged from its natural origins, it

has failed to recognise our species' basic dependence on *nature* as a condition of growth and development" (p. 118). The warning about our divorce from nature is timely, with most of our children growing up in urban environments (Kellert 2002). In the early 1980s the founder of the Worldwatch Institute, Lester Brown, defined a sustainable society as one that can fulfil the needs of the present without compromising the ability of future generations to meet their needs (Capra 2007). The idea of obligation to the next generation is important, but as Capra (2007) points out, we need to know how to create a sustainable society. In order to build sustainable communities we need to "cooperate with nature's ability to sustain life" (p. 10).

The scientific literature defines sustainability in different ways. One is the ability of an ecosystem to regenerate or recover after an adverse impact; to restore the cycling of matter and the energy flows within the ecosystem. Some take a resource management approach; others focus on species diversity; and yet others regard a sustainable ecosystem in terms of communities of functional groups. There is no simple definition that encompasses all the different ways of viewing sustainability and species diversity. In the following quote, Pimm outlines some of the variables that make the definition problematic:

Controversy arises because of the many different meanings of complexity (in term of species richness, connectance, interaction strength, etc.) and stability (in term of resilience, persistence, resistance, variability, etc.) and the different levels of functional *organization* (individual species abundance, species composition, trophic level abundance, etc.) at which the notion of complexity and stability can be tested. The diversity of interpretations and issues maintains confusion (Pimm 1984, cited in De Leo & Levin 1997).

To achieve a sustainable society there needs to be a complete change in thinking. Rather than the fragmented view, where the emphasis is on the individual, the short term or a single variable such as profit, there needs to be a new way of understanding the complex relationships between variables that make up the whole (Bateson 2000; Sterling 2003).

The understanding that we are part of nature and inextricably interdependent on the natural systems and cycles of nature is essential for ecoliteracy. Ecoliteracy is a term used by David Orr and is used to promote an educational paradigm integrating ecosystems and sustainability and the belief in the web of inter-connectedness in all things (Orr 2004). Capra uses a very similar term: he labels the type of understanding that is required to do

this “ecological literacy”. He explains that ecological literacy requires us to see the world in terms of “relationships, connectedness, and context” or systems thinking. Systems thinking emphasises relationships and connections. Separate disciplines or subject areas are seen as artificial and unable to cope with the complexity of relationships and connections; relationships and connections do not stay neatly within discipline areas. This has implications for the way knowledge is taught in schools. Integrated curricula, where things are explained in terms of their context and connection to other things in their environment, is essential for developing ecoliteracy (Capra 2007).

Sterling (2003) calls for a complete epistemological change, resulting in the development of “a relational or ecological world view, wherein our Seeing, Knowing and Doing are more whole”. This is in the tradition of the hermeneutic circle, where the “parts” cannot be fully understood unless in the context of the whole.

In the past, particularly in rural areas, schools were often surrounded by remnants of native habitats. The natural buffer zone provided by the remnant vegetation framed the school environment and provided a biodiversity “reservoir”. Trees, flowers, grasses, rocks and dirt provided natural play areas and also acted as a bridge into nature, bringing bugs, birds and wildlife into the realm of the school playground. It is noteworthy that some schools are reversing the trend of asphalt schoolyards and plastic play equipment; they are actively encouraging biodiversity, creating lizard lounges, multicultural school gardens, frog bogs, kitchen gardens and diverse native plant habitats (Cutter-Mackenzie 2008; ResourceSmart AuSSI Vic³). The habitats that evolve through the reversal of the synthetic habitats are the natural world in which children can redress alienation from nature.

This is an affirmative move to a more enriched environment, and as research suggests, leads to developing a caring relationship with the natural environment (Kellert 2002; Skelly & Bradley 2007). Being immersed in nature is a positive, formative experience for the child (Chawla 1998; 1999; Chawla & Flanders Cushing 2007; Wells & Lekies 2006; White 2004). The frequency of these childhood visits to green spaces have been found to

³ ResourceSmart AuSSI Vic is a Victorian Government initiative that helps schools embed sustainability
<http://www.sustainability.vic.gov.au/services-and-advice/schools/resourcesmart-aussi-vic-online-system>

be significant, and can be used to predict attachment to and use of green places as an adult (Chawla 2007; Thompson et al. 2008; Wells & Lekies 2006). Investigations into the type of experiences that encourage environmental empathy or environmental action found that over 80 per cent of participants acknowledged outdoor experiences such as fishing, hiking, camping and unstructured play in childhood as being important in developing their attitude to the environment (Wells & Lekies 2006). Chawla found that in order to develop a positive affinity with nature, outdoor experiences should be combined with social experiences. The social component assisted the interpretation of the “nature experiences” in meaningful ways (Chawla 1998). Having an influential role model, such as another family member or teacher, was a significant factor contributing to the development of environmental empathy (Chawla 2006; Chawla & Flanders Cushing 2007). These findings support the line of reasoning Rachel Carson promoted in 1956 in her essay “Help Your Child to Wonder”.

If a child is to keep alive his inborn sense of wonder without any such gifts from the fairies, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in (Rachel Carson 1956 p. 46).

The conclusion from these investigations is that nature, and being in nature, is beneficial to children. Children’s development is stimulated by natural settings, and is stimulated in ways not provided by other experiences (Chawla 1988; Louv 2008; Moore 1995; 1997). Health benefits occur through exposure to nature; however, the mechanisms or interactive factors that produce these health benefits are unclear, and require further research to explicitly detail these relationships (Brymer et al. 2010). If one of our goals is to develop ecoliterate, environmentally aware global citizens, experiences that include the combination of frequent exposure to nature, the social interpretation of nature experiences and the sharing of the joy and wonder of nature with an influential “teacher” appear to be essential components of education. Children need to play and be in green, outdoor spaces, to observe and to get to know nature for an affinity to nature to develop. We need passionate, environmentally aware teachers willing to be collaborators, assisting in the inquiry while being careful not to destroy the magic, the appreciation and wonder of the world we live in.

Healthy choice

The physical health of school children is a highly topical issue, with rising obesity rates reported across many countries (recently the matter of overweight children in Australia has been critiqued)⁴. Schools are being called on to support healthy eating choices in both the school canteen and by means of new programs promoting better nutrition through the production of fresh herbs, fruit and vegetables in school-based kitchen gardens and cooking programs. The garden becomes the vehicle for knowing the principles of healthy dietary practices, while also being the source of knowledge around food growth and harvesting. By planting, tending, harvesting and eating a variety of vegetables and fruits, children can gain hands-on knowledge about nutritious food and its production (Bell & Dymment 2006).

Studies on how the dietary intake of young children changes after participating in garden-based programs indicate an increased willingness to taste fruits and vegetables (Canaris 1995; Gibbs et al. 2013; Libman 2007; Morris et al. 2001; Ratcliffe 2007). This has been attributed to becoming familiar with the produce that they had grown as “gardeners”. As well as planting, tending and observing the growth of their vegetables as botanists, the consumption of vegetables in a school gardening program is generally a central social activity. Having friends sampling the different vegetables is likely to add to the normalising effect of knowing the origin of the food the children consume as well as its life path (Libman 2007; Ozer 2007; Ratcliffe et al. 2011).

Getting children to taste these foods is obviously the first step in including more fresh foods in their diet. Significantly, children were found to have an increased liking for vegetables after involvement in a kitchen garden program (Lineberger & Zajicek 2000; Meinen et al. 2012; Radcliff et al. 2011). In contrast to these programs, a study comparing two out-of-school nutritional programs, one with a gardening component, the other without, found that neither of the programs improved nutritional knowledge, fruit and vegetable preference or consumption. The researchers acknowledged the results might have been influenced by the small sample size, attendance and the selection

⁴ The Australian 2007–08 National Health Survey found 24.5% of children aged 5–17 years were overweight or obese, in the 2011–12 survey, 25.3% were overweight or obese (Australian Bureau of Statistics).

process (Poston et al. 2005). The reduced opportunities for making interdisciplinary connections may have been another factor.

One of the benefits of incorporating a kitchen garden into the school curriculum is the interdisciplinary or multidisciplinary nature of a kitchen garden (Miller 2007; Moore 1995; Thorp 2005). The garden provides frequent occasions for the healthy food message to be reinforced and opportunities to sample the snow peas or carrots while measuring plant growth or constructing a garden food web. Keeping a garden journal or writing about what happens in the garden also establishes interdisciplinary connections. This interdisciplinary approach would be difficult to replicate in an out-of-school program due to the parameters of the program and limited time available. Healthy eating and altering children's preference for particular foods is also going to be significantly influenced by the dietary habits in the home.

Benefits of school gardens

Numerous studies have reported the benefits of developing gardens and the greening of school grounds (Alexander et al. 1995; Canaris 1995; Dirks & Orvis 2005; Moore 1995; Thorp 2005; Wake 2008). The United States has an expanding "leave no child indoors" movement. Programs such as the Junior Master Gardener Program and The Edible Schoolyard in California have been developed to enrich education and reconnect children to nature. The state of California aims to have a working garden in every school, and other states have greening school grounds policies. The Learning Landscapes Program in Denver aims to provide green spaces, "offering children a place to wander and experience nature", to improve participatory learning and increase community connection (Brink & Yost 2004). In the United Kingdom the Learning through Landscapes organisation is encouraging and promoting the incorporation of gardens into schools. There is renewed interest in kitchen or school gardens in Victoria, partly through the Stephanie Alexander Kitchen Garden Program and the Gould League's Multicultural School Gardens (Alexander 2004; Block et al. 2012; Gould Group 2011). The increased numbers of schools in Victoria that are incorporating kitchen gardening or garden-based-learning into the school curriculum are part of a world trend (Dyment 2005).

Garden-based learning is simply defined as "an instructional strategy that utilises a garden as a teaching tool" (Desmond et al. 2004). While school gardens have been

reported as being instrumental in developing a positive environmental attitude in students, it has not been established whether this was due to providing the context in which to teach about the environment, or due to immersing the children in nature and giving them a chance to interact with nature, or a combination of both (Skelly & Bradley 2007). Reasons for developing a kitchen garden, and also the way the garden is utilised, vary. One study comparing gardening projects in schools across three continents (Kenya, India and England) found that although there were many similarities in the way the children regarded their gardens, there were also perceptual differences of the purpose of the school garden which were influenced by their environment and culture (Bowker & Tearle 2007). The “philosophy” of the garden, and the purpose and functionality of the garden, varied from country to country. What was common was that the garden provided a natural experience of being in a social collective context.

Working in the kitchen garden presents opportunities to develop on a social level (Alexander et al. 1995; Block et al. 2011; Montessorri 1964). Alexander et al. (1995) found that a classroom garden project provided the children with an “experiential way of learning about horticulture, gardening, themselves and their relationships with their peers”. The opportunity to relate to a wider group of children than those included in their groupings within class or friendship groups is valued by children. Thomas and Thomas found that the nature of the outdoors caused a “coming together” with their peers (2004). The multicultural aspect of a school garden also provides a space where newly arrived immigrants can share their culture and develop a sense of belonging (Cutter-Mackenzie 2009; Gould Group 2011; Harris 2009). “It is as if the act of planting and harvesting allows the children literally and metaphorically to plant roots in their new home” (Gould Group 2011). Schools can use the kitchen garden to celebrate diversity and demonstrate inclusivity (Cutter-Mackenzie 2009). Increased parental involvement and strengthened connection between the school and their community was also reported as being an important outcome of school kitchen gardens, particularly when volunteers are invited to help with cooking and gardening programs (Brunotts 1998; Cutter-Mackenzie 2009; Thorp & Townsend 2001).

The benefits of a gardening program are both intrapersonal and interpersonal in nature. Social gains include an increased sense of belonging, self-esteem and compassion (Corson 2003). In the garden, students work cooperatively together in groups of differing

abilities. Children that struggle in the classroom may have skills that are appreciated in the garden, improving peer integration (Marr 1997; Ozer 2007). Janet Dymont and Alan Reid (2005) identify that “student learning, environmental awareness, teacher motivation, social behaviour and relationships, safety and health” are core benefits of gardening programs.

A study on the socioeconomic impacts of community gardening in New Jersey states that, “Gardening cut across social, economic, and racial barriers and brought together people of all ages and backgrounds”. The participants in the interviews identified economic benefits, but also that the socialising, helping others and sharing produce involved improved their feeling of community and of being able to cope. Cultural and social barriers between neighbours were broken down by the common focus and the opportunity to socialise informally in the garden (Patel 1991). Glover (2004) goes as far to assert that, rather than the actual gardening, community gardens are about social interaction and community building; that the act of socialising and building connections while gardening, fosters norms of reciprocity and trust, the “conventional forms of social capital” (p. 143).

Barriers to garden-based learning

Researchers commonly report on some of the barriers to outdoors learning (Barker et al. 2003; Dymont 2005; Rickinson et al. 2004). Rickinson et al. (2004), in their review on research on outdoor learning, found five key barriers to outdoor learning:

1. fear and concern about young people’s health and safety;
2. teachers’ confidence and expertise in teaching and learning outdoors;
3. the requirements of school curricula;
4. shortages of time, resources and support; and
5. wider changes within the education sector and beyond.

Dymont (2005) used the barriers identified by Rickinson and associates (2004) to explore whether programs aiming to “green” or increase biodiversity around the school grounds experienced these same barriers. She reports that fear and concern about young people’s safety was not a major concern or barrier, and that most teachers felt that allergies,

injuries and safety “issues” could be managed. However, she did find that teachers’ lack of confidence and expertise in teaching outdoors was a major barrier to using the outdoors. This was partly explained by the fear of loss of control. Teachers were worried about the potential for losing control of the students in the open. Loss of control over the subject matter and “of not having all of the answers” contributed to their concern. The requirements of school curricula were also seen as a major barrier. Emphases on standards, on teaching literacy and numeracy and the lack of explicit links to outdoor teaching in the curriculum were seen as issues that limited teachers taking their classes outside. The comparative ease of taking children outside, where you don’t need to organise a bus, money, support and excursion forms was regarded as a positive.

Dyment reports that there were other barriers that acted against teachers utilising the outdoors. In some cases utilising the outdoors for learning was regarded as just another whim or fad of the time. In contrast, other teachers regarded it as more legitimate work, but a responsibility, as an “add-on” or extra. Competition from other subjects (the crowded curriculum), lack of suitable places, poor weather and no encouragement from school leaders (so it wasn’t seen as a priority) were some of the additional reasons or barriers to adopting outdoors teaching as an authentic pedagogical space. On a more optimistic note, Dyment reports that some schools had successfully eliminated these barriers resulting in positive outcomes for their students (Dyment 2005). Thus, the barriers to garden-based learning can be overcome if the school decides outdoor learning is desirable.

Section 2: Children’s learning

Learning in the kitchen garden is not an isolated occasion of play, or a simple transference of standard teaching practices to an outdoor learning space. A range of educational theories informs the pedagogical approaches used in the kitchen garden. Constructivist, experiential, social constructionism and place-based theories are some of the major learning theories that intersect and inform learning in authentic contexts such as the kitchen and garden.

Constructivist theory of learning

Theories of learning are divided into two main theoretical traditions (Creswell 1994; Denzin & Lincoln 2003; Neuman 2006; Polkinghorne 2010). The objectivist tradition believes that knowledge exists independently and is there to be discovered and learned; that understanding requires learning about this body of knowledge. The teacher is responsible for transferring this “knowledge” to the learner. This theory has links with the positivist paradigm. The other major tradition believes that meaning is created by the learner and is closely aligned with an interpretivist, qualitative paradigm, and has the central argument that meaning is constructed or created by the learner, rather than transmitted by the teacher (Biggs 1996).

The constructivist philosophy of learning involves reflecting on our experiences and trying to make sense of them (Schon 1983). An individual constructs their own meaning to explain phenomena. They adjust their mental model of the world they engage in to make sense of every new experience. The implications of this philosophy are that educators and teachers, in particular, must focus on helping children make connections between the facts and new experiences so that the new understanding is promoted and new knowledge is constructed (Bruner 1996).

Teachers build in choice and decision making opportunities to encourage ownership of learning. Children investigate problems, propose solutions and construct and modify their own world model or schema, rather than regurgitating facts. When a learner experiences something that doesn't fit into their schema, the resultant “puzzlement” provides the stimulus for further learning (Savery & Duffy 2001). Vygotsky's social constructivism theory overlaps with this theory as he emphasised the social context of cognitive development. He also introduced the zone of proximal development [ZPD] where a more knowledgeable other can assist students to master concepts or skills they could not master on their own (Vygotsky 1978). The curriculum must be tailored to the needs and prior knowledge of the children and encourage new experiential learning, to build up layers of experience and understanding.

Experiential learning cycle

Kolb's experiential learning theory also comes under the constructivist paradigm. In his seminal and influential work on experiential pedagogy, Kolb (1984) theorises that in order to be an effective learner, you needed to go through four stages of learning: "Learning is the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (1984 p. 41). The principle of knowledge generation being transformative is still relevant thirty years on. The initial concrete experiences need to be reflected on then abstract conceptions made from these reflections and observations, resulting in the formation of concepts. The abstract conceptions or theories that evolve should be tested. This may involve testing the model or theory. Trialling it in decision making, problem solving or experimenting, results in another revolution of the cycle. This cycle of experiential learning applies to all learners, and although they may enter at any stage, ideally, they would touch all bases in a learning cycle. Kolb's model is based on two intersecting continuums, the processing continuum (how we approach a task for example preferring to learn by watching or doing) and the perception continuum (our emotional response for example preferring to learn through feeling or thinking). These intersecting axes form the basis for the four prevalent learning styles shown in the following experiential learning cycle, Figure 2.1 (Kolb 1984 p. 38).

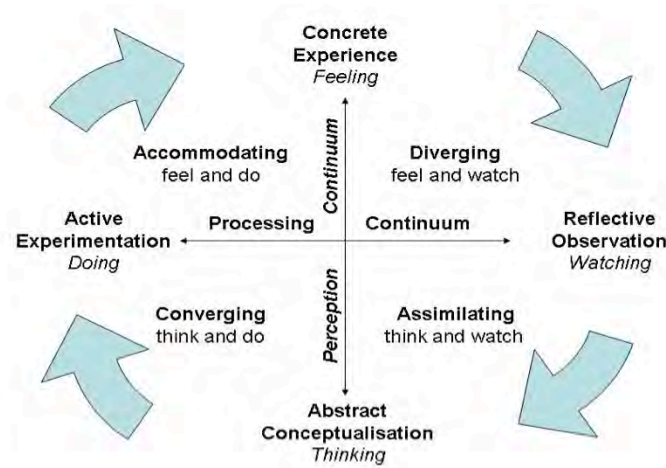


Figure 2.1: Kolb's experiential learning cycle

Kolb's four learning styles are still being proposed as ways of experiencing learning (Sullivan et al. 2013). These correlate to stages and highlight the preferred learning conditions for these learners to optimise their learning. These styles are:

Assimilators, who learn better when presented with sound logical theories to consider. They like to reason inductively. They are the watchers and thinkers and are good at organizing ideas into logical formats and create theories and models.

Convergers, who learn better when provided with practical applications of concepts and theories. They are the doers and the thinkers and specialize in putting theories to practical use.

Accommodators, who learn better when provided with "hands-on" experiences. They prefer a 'hands on' trial and error approach, and tend to be more intuitive than logical.

Divergers, who learn better when allowed to observe and collect a wide range of information. They prefer to watch and observe, they use their imagination and generate ideas

(Adapted from McLeod 2010, Learning styles section)

Kolb's theory of experiential learning can be applied to the kitchen garden. When creating a garden, it is necessary for children to be involved in the active practical work of digging, weeding, planting and watering. These are just some of the basic gardening tasks that are aligned with the "active experimentation", an essential phase in Kolb's experiential learning cycle.

It would be hard to deny that they need to be "hands on" in terms of concrete experiences, but what do children learn through participating in these activities? They are deepening their "abstract conceptualisation" through reflection and metacognition. Kolb's "experiential learning cycle" may begin with any of stages from the reflective observation, where they are watching someone else "doing", from the active experimentation where they can just jump in and have a go, from the concrete experience where they might receive advice on how to do it, to the abstract conceptualisation, where they are thinking about (or creating) a theory about what is going on. At the core of the learning quest is the belief that these four stages and ways of learning are inextricably interrelated, and present opportunities and ways of knowing that are maximised in a kitchen garden, allowing all children to learn irrespective of preferred learning style.

The very definition of the garden emphasises the "experience" of gardening. Specifically, school kitchen gardens have been created as a way to engage children in hands-on or

experiential learning. Jane McGeehan's definition of experiential learning emphasises the practical component and describes experiential learning as "hands on" — learning by doing. They are "First-hand experiences... that evoke rich sensory input to the brain", and include immersion, investigating real objects or manipulating models (McGeehan 2005). Experiential learning is learning by experiencing, sometimes involving deliberate, planned experiences engineered for learning, but often, as Jarvis et al. point out, learning is incidental (2003).

While some educational psychologists have criticised learning style models as being too simplistic to explain human learning, and criticise the lack of scientific evidence to support the theories (Massa & Mayer 2006; Pashler et al. 2008), this paradigm of practice is one model that impacts on the description of the activity in the garden. Rather than the solitary work of an individual gardener however, most tasks and activities in a school garden involve groups of students working together.

Social construction of meaning

The social constructionism theory holds to the notion that rather than the individual constructing their understanding in isolation; the *social aspects* of the experience serve to deepen and broaden knowledge construction. Schwandt (1994) explains that the constructivist paradigm promoted by Guba and Lincoln (1994) and principles of "social constructionism" move away from a focus on the individual meaning making argued by Kolb, and emphasise the shared, social constructions of meaning and knowledge (Schwandt 1994). Social interaction and negotiation of meaning is important in the construction of knowledge. The viability of our knowledge or understandings is tested, and either absorbed into our schema because it explains our world and experience, or rejected because it does not.

Bruner (2006) emphasises that knowledge needs to have an application. Isolated facts and formulae do not take on meaning and relevance until learners discover what these tools can *do* for them. Bruner explains that three almost concurrent processes occur when learning about a subject: *acquisition* of new information, *transformation* or manipulation of knowledge, to make it fit new tasks and *evaluation* or checking the plausibility of "whether the way we have manipulated the information is adequate to the task" (Bruner 2006 p. 41). In the garden these processes involve collaboration and discussion between

the learners, the discourse adding an important social dimension to Kolb's experiential learning cycle.

School gardening programs are based on shared social collaborative learning principles, where children are encouraged to discuss what they believe. They provide the opportunity to further develop understanding by taking into account what others believe as a "community" of gardeners. Again drawing on philosopher Lev Vygotsky, the learning theory and social development principle shows the kitchen garden facilitates teacher guidance and collaboration with the learner. The teacher employing Vygotsky's theory of "More Knowledgeable Other" (MKO) supports this model, because the learner in the kitchen garden is making sense of their experiences with the support of the teacher (Vygotsky 1978).

The garden is immersive, a socially connected place, real in the way young gardeners collaborate and work together. Zins et al. (2004) argue that because learning key social and emotional skills and strategies are essential components of education "for children to be successful not only in school but also in life", education programs addressing these needs should be "holistic". Working cooperatively together in the supportive, dynamic environments of the kitchen and garden presents many opportunities for children to practise and become competent in social skills as they work together on common tasks. The garden becomes a familiar place and the fruits of the children's labours are appreciated all the more as they are imbued with their care and the experience of tending them. As learning situated in the kitchen garden is learning in a context relevant to the children's world, it also fits into place-based education, a term that has become popular in the last twenty years.

Place-based education

Proponents of place-based education argue that the physical environment and context of the learning are critical components of authentic learning. A "place" is more complex than mere physical space. As this thesis will illustrate places are socially constructed. Spaces evolve into places because they are "imbued with meaning through lived experience" (Tuan 1977). Familiarity and attachment assist in building the understanding of the fragility and vulnerability of places, and serve to remind us that we are part of

nature and of our responsibility for looking after nature (Fettes & Judson 2011). David Sobel (2004) defines place-based education:

Place-based education is the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science, and other subjects across the curriculum. Emphasizing hands-on, real-world learning experiences, this approach to education increases academic achievement, helps students develop stronger ties to their community, enhances students' appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens. Community vitality and environmental quality are improved through the active engagement of local citizens, community organizations, and environmental resources in the life of the school (p. 7).

Place-based education demands that the knowledge and context is relevant to the children. It provides both the stimulus for the learning and the authentic setting for learning (Morgan 2012; Smith 2002; Sobel 2004). This approach promotes engagement, because the learning is directly relevant to the children's social reality. Place-based education is contrasted with and offered as an alternative to "narrowly conceived schooling with heavy reliance on tests" (Sobel 2004). Place-based education contextualises learning and goes against the current trend for a standardised curriculum.

The disconnect between what children learn at school and what is relevant in their lives, has been a recurring theme over the years. John Dewey's words, though written in 1956, are still pertinent and significant:

From the standpoint of the child, the great waste in the school comes from his inability to utilize the experiences he gets outside the school in any complete and free way within the school itself; while, on the other hand, he is unable to apply in daily life what he is learning at school. That is the isolation of the school, its isolation from life (1956 pp. 75–76).

Place-based education is a form of authentic curriculum, and can serve to bridge these two seemingly disparate learning environments by providing a relevant context and a real purpose for learning. A natural consequence of a place-based inquiry is the *integration* of school subject and discipline areas. The kitchen garden teaches about, and connects to, place. The geology that has made the soil, the climate and microclimates that have a bearing on what will grow and how much watering is required; the history, usage and culture; the ecology, plant pests and beneficial organisms — all will situate the garden in place-based education. Children are immersed in nature. Growing and maintaining fruit,

herbs and vegetables brings knowledge and understanding about the origins of food, and helps develop children's "connections" to the earth.

Place-based education provides a framework that can strengthen links to the local community. The nature of place-based education is specific to a particular location with its own cultural, economic, environmental and political inputs. Smith (2002) claims that:

The primary value of place-base education lies in the way that it serves to strengthen children's connections to others and to the regions in which they live (pp. 593–594).

Smith goes on to explain how this breaks down the isolation of school, "the wall between the school and the community becomes much more permeable and is crossed with frequency..." (p. 593). Schools are no longer seen in isolation — they are part of the community.

The kitchen garden is a place where community is valued, and links between the school and the wider community are strengthened. Gruenewald (2003a) uses the term "critical pedagogy of place". The aim of critical pedagogy of place is to blend critical pedagogy and place-based education.

A critical pedagogy of place aims to contribute to the production of educational discourses and practices that explicitly examine the place-specific nexus between environment, culture, and education (Gruenewald 2003a p. 10).

Critical pedagogy of place recognises both the importance of authentic learning pedagogy and also values the context and the real-life connection, giving social and personal significance to the sense of community.

Place-based pedagogy is reported as encouraging the understanding and connection to the local environment leading to the development of an appreciation and concern for nature (Johnson 2012; Sobel 2004). Environmental education resulting from a place-based approach is regarded as a precursor to a global environmental perspective. The phrase "think global, act local" in terms of place-based education can be expanded, and the "place" makes the connection between the *acting and thinking locally* and the *acting and thinking globally*. Place-based education is one way students can develop a global perspective of ecoliteracy essential for working towards solving global environmental problems, a springboard from which they can extend their local understanding to act globally (Van Eijck & Roth 2010).

School gardens are a way of reintroducing children to nature in a non-threatening way, and they assist in the development of an appreciation of nature and our place in the world ecosystem. In the Forward to *Smart by Nature* David Goleman explains the need to put human beings back inside the ecosystem,

We need to get beyond the thinking that puts humankind outside nature. We live enmeshed in ecological systems. We need to discover and show among ourselves all the ways this intimate interconnectedness operates, to see the hidden patterns that connect human activity to the larger flow of nature; to understand our true impact on it and to learn to do better (Goleman in Stone 2009).

Other writers have also identified this need to reconnect to nature (Louv 2008; Orr 1992; 2004; Suzuki 1997; Wake 2008). Sobel (1996) warns that before overwhelming children with the environmental disasters and problems, we must first instil a love of nature:

If we want children to flourish, to become truly empowered, then let us allow them to love the earth before we ask them to save it (p. 39).

Researchers believe that positive environmental attitudes are formed in childhood, and the groundwork for establishing ecoliteracy should be a priority in early childhood (Chawla 2007; Louv 2007; Skelly & Zajicek 1998; White 2004; Wilson 1996).

The importance of context

Many schools that have introduced kitchen gardens have found that the impact on the children's learning went beyond gaining knowledge about the origins of fresh food and what comprises a healthy diet (Alexander 2004; Block et al. 2012; Cutter-Mackenzie 2009; Thorp 2005). Researchers found that the children also scored significantly higher on general science achievement tests compared to the children who did not participate in experiential gardening activities. One of the main reasons suggested for the difference is the contextualising of the learning experiences (Dirks & Orvis 2005; Klemmer et al. 2005). This is an important finding, which has relevance for curriculum design. Learning facts or a body of knowledge without providing the context does not produce true learning (Bastiaens and Martens 2000; Herrington and Oliver 2000).

Abstract knowledge taught in schools ...is not retrievable in real-life, problem-solving contexts because this approach ignores the interdependence of situation and cognition (Herrington and Oliver 2000 p. 1).

The suggestion is not to *replace* spelling, mathematics or general knowledge, but to provide a purpose or a context for it. The kitchen garden may provide the context, a real-life situation of growing and cooking food. It is the application of knowledge, rather than the recall of information that is important. Sobel points out that it is the context that gives learning meaning; it's what you do with the facts and figures that are important (2008). Just learning facts or a body of knowledge has little relevance or value until you apply the knowledge and use it for a reason. He uses the words of Froebel to explain:

[T]he purpose of teaching and instruction is to bring ever more out of man rather than to put more and more into him (Froebel 1970, cited in Sobel 2008 p.79).

This idea can be partly explained by Kolb's experiential learning cycle. The concrete experience needs to go through abstract conceptualisation or an internal processing for the experience to evolve into understanding. This model contrasts with the banking model of education, where facts, knowledge and equations are transferred or "deposited", as critiqued by Freire (1970). Both Dewey's and Freire's philosophies have student-centred learning and participation in decision-making as key ideas, and lay the foundation for critical pedagogy. In *Pedagogy of the Oppressed*, Freire argues that rather than the recall of deposited knowledge; it is how we organise our knowledge, the conclusions we draw or what we do with the knowledge that is important (1970). Freire (1998) notes that learning must be situated in the lived experiences of the participants, and that a partnership needs to be formed between the teacher and student, so knowledge could be constructed with them not for them:

[O]ur relationship with the learners demands that we respect them and demands equally that we be aware of the concrete conditions of their world, the conditions that shape them. To try to know the reality that our students live is a task that the educational practice imposes on us: Without this, we have no access to the way they think, so only with great difficulty can we perceive what and how they know (p. 58).

Students have different prior knowledge, learn through different experiences, and at different rates, constructivism can be time consuming. One of the criticisms levelled against the constructivist approach is the time needed to set up learning experiences for children to go through this process. However, the higher level of retention and quality of learning can offset the inefficiency in time (Meyer 2003). Learning in the garden offers multiple opportunities for practising skills, both social and academic, enabling the

acquisition of new knowledge and the transformation and integration of knowledge to make it fit new tasks and observations.

Authentic learning and assessment

The preceding section discusses some potential theoretical constructs that may inform knowledge transfer. Many of the theories discussed, impact authentic learning and assessment. The matter of how the garden is authentic and the matter of the “value” of it as a space for assessment of learning are deliberated on in this section.

The “authentic performance” to be achieved provides the reason and context for learning the facts or body of knowledge. In their research into authentic learning, Newmann and Wehlage (1996) acknowledge that there may still be a place for learning factual information:

[R]epetitive practice, retrieving information, and memorization of facts or rules may be necessary to build knowledge and skills as foundations for authentic performance (p. 11).

Uhlenbeck (2002) and Wiggins (1993) argue that the design of authentic learning environments and authentic tasks must be complementary; one requires the other. “Authentic” is a subjective term open to interpretation, which needs to be clearly defined. Newmann and Wehlage (1996) use “the word authentic to distinguish between achievement that is significant and meaningful and that which is trivial and useless”. This definition appears problematic, because “significant and meaningful” is also subjective; however, the criteria Newmann and Wehlage use for judging authenticity provides clarification. Noteworthy is the manner in which the student is at the centre of the learning. The authors identify three criteria for achievement to be considered authentic:

students construct meaning and produce knowledge;

students use disciplined inquiry to construct meaning; and

students aim their work towards production of discourse, products, and performance that have value or meaning beyond success in school. [my emphasis]

They developed five criteria to judge whether the students were engaged in quality work deserving of the label “authentic”:

1. Higher-Order Thinking;

2. Depth of Knowledge;
3. Connectedness to the world beyond the classroom;
4. Substantial conversation; and
5. Social support for student achievement.

(Newmann & Wehlage 1996 pp. 8—10)

Audrey Rule’s review of literature on authentic learning has also attempted to define authenticity. She found four overarching themes in the research she reviewed:

real-world problems that engage learners in the work of professionals;
inquiry activities that practise thinking skills and metacognition;
discourse among a community of learners; and
student empowerment through choice. (Rule 2006 p. 2)

Researchers have defined “authentic” in various ways; they have expanded the criteria and attached the word to all the different stages in the learning process. These are variously labelled as authentic: pedagogy, curriculum, instruction, tasks, problems, learning, assessment or performance, culminating in authentic achievement. Authentic learning is always related to real-life situations and the challenges faced by learners. As the Canadian Council on Learning note “...authentic learning situations require teamwork, problem-solving skills and the ability to organise and prioritise tasks needed to complete the project” (Copian glossary, Canadian Council on Learning). Research into authentic learning aims to identify the common components of relevant, valid learning; to identify the skills, processes and thinking that will be useful and used in real contexts. The specific focus of the research is indicated in the label, showing where the lens of analysis for the research is focused.

Characteristics of authentic learning

This section of the literature review groups the key elements identified in research as important aspects of authentic learning into the sub-groups, titled:

- real context;
- working as professionals do — complexity, challenge and discourse;
- inquiry-based learning or poorly defined problem;
- multiple resources and perspectives;
- develop knowledge base and skills;
- technology;
- higher-order thinking;
- student ownership;
- teacher as facilitator;
- collaborative learners; and
- authentic integrated assessment.

The sub-groups provide a way of organising and examining the characteristics of authentic learning. These characteristics of authentic learning are further refined and summarised in Table 2.1 Key characteristics of authentic learning from the literature. The aim is to summarise the key elements from research to create a framework for evaluating whether tasks, inquiries or activities qualify for the “authentic” learning title.

Real context

The essential indicator for authenticity, the criterion that appears in all discourse about whether something falls under the banner of authentic learning, was the use of “real world”, whether it was in the form of the real-world context or using real-world problems or collecting real data. Learning and performance is significantly affected by context (Wiggins 1993). Savery and Duffy (2001) argue that the meaningful situation or context should be an extension of the learner’s world. Faith Maina (2004) also identifies that learning takes place in meaningful situations that are extensions of the learner’s world, and adds that authentic learning could involve activities that mimic real-world situations. However, Cumming & Maxwell (1997) warn that the addition of cursory real-world components sometimes acts as a distraction and hides the assessment intention, rather

than conferring authenticity. An example of this would be the creation of a market day stall where children are to practise giving change but instead get caught up in the creation of trinkets for sale. The components that make the experience more authentic, can act to direct attention away from the primary objective of putting the mathematic skills into an authentic market day context. It is important to remember creation of scenarios designed to mimic real-world situations can promote increased engagement but the underlying reason for the learning activity needs to be kept to the foreground.

The use of the real-world context or problem gives meaning and relevance, and promotes engagement. Engagement is a multifaceted construct; behavioural engagement is needed for active participation, emotional engagement influences motivation or the willingness to do the work. Cognitive engagement refers to commitment; the student needs to invest the time and effort to master complex ideas and skills. All three elements of engagement maybe melded to together in a complex dynamic within the individual (Fredricks et al. 2004). Issues that are meaningful and relevant to the students promote connectivity and ownership (Schlechty 2001).

The materials that the students use — their data, their resources and artefacts — should be useful, meaningful and real to the students, (Maina 2004; Rule 2006). Van Merriënboer (1997) argues persuasively that students need to integrate knowledge, skills and attitudes as professionals do in the real world. Students can see the value in what they are working on and develop skills that have value in the world beyond school.

Working as professionals do — complexity, challenge and discourse

The multiple perspectives, resources, research methodologies, technologies and data that are available to collaborative groups when they are working in a real context, solving real problems are grouped under one umbrella term “working as professionals do”. In collaborative work, the diverse resources available require evaluation and justification as to their relevance to the problem. The discussion generated by the multiple perspectives should deepen the understanding of the poorly defined problem and promote understanding of differing points of view. Part of learning to be a professional is using the vocabulary pertaining to the particular area. Actively participating in discourse, articulating and defending beliefs and ideas, the learner participates in “a culture of practice” and also contributes to the social construction of knowledge (Herrington &

Kervin 2007 p. 229). This criterion also connects to the use of technology and production of a product or performance that has value in the real world.

Inquiry-based learning or poorly defined problem

Approaches known variously as inquiry-based learning, problem-based or project-based learning, are often used in the journey to achieve authentic learning. Although given different names, the intention is to promote student-centred learning where real-world contexts make the learning relevant and as Stephanie Bell argues produces desirable outcomes such as “greater understanding of a topic, deeper learning, and increased motivation to learn” (Bell 2010).

The “poorly defined problem” has been promoted as a way of encouraging authenticity. In the poorly defined problem, the learners need to clarify and define the problem, and decide on the information and resources to use. The identification and clarification of the problem is part of the learning process (Herrington & Kervin 2007; Savery 2006). This criterion is supported by Vygotsky’s theory of cognitive development, where understanding needs to be articulated and made explicit between the community of collaborative learners (Vygotsky 1978). “Joint attention and shared problem solving is needed to create a process of cognitive, social, and emotional interchange” (Hausfather 1996). The poorly defined problem provides the social context that encourages discourse and interaction between the collaborators and enables the group to construct *their knowledge*.

The “poorly defined problem” is one way of starting an inquiry (Lombardi 2007). It can be used to launch an inquiry as students redefine the problem, set the parameters and priorities. Inquiry-based learning involves students forming their own questions and having time to explore the answers (Murdoch & Wilson 2004). Jeni Wilson and Kath Murdoch (2004) identify the important elements of inquiry-based learning:

- planned, direct and vicarious experiences that provide opportunities for students; to pose questions and gather information;
- activities that help students organise new information and use skills in a way that assists them to form concepts and generalisations about their world;

- opportunities for students to demonstrate what they have learned; and
- applying the knowledge, skills and values to other contexts.

Multiple resources and perspectives

Using multiple resources and different perspectives is an authentic learning criterion that crosses over into other criteria. Elements connected to the higher-order thinking criteria include evaluating the various arguments; prioritising and taking into account the differing views and perspectives from people with diverse interests and backgrounds; and researching, collating and synthesising information from multiple resources. They are also components of the poorly defined problem and working as professionals do in the real-world criteria, and require discourse and collaboration (Bell 2010; Herrington & Kervin 2007; Herrington & Oliver 2000; McKenzie et al. 2002; Van Merriënboer 1997).

Develop knowledge base and skills

Newmann and Archbald highlight the importance of producing new knowledge, not merely reproducing knowledge (1992). Knowledge, skills and processes required in authentic learning tasks or inquiries typically cross disciplines; the nature of the inquiry or research demands tools and data that are not confined to the artificial boundaries of subject areas (Maina 2004). The integration of knowledge, skills and attitudes that comes about when working collaboratively across disciplines may contribute to the new knowledge (Van Merriënboer 1997).

Technology

Rather than essential, “technology” can generally be regarded as a useful tool enabling learners to more closely mimic or access the “real world” as well as assisting in the making of a high quality product. Technology is used as a blanket term and includes a variety of tools such as digital cameras, computers, data projectors and audio-recording devices to name a few. Technology can be used to connect to real-world contexts or outside audiences and as a tool to enhance the “authenticity” of the other criteria (Laur 2013; Roschelle et al. 2000). Students can use technology as a cognitive tool to explore the knowledge, content and processes of the subject area (Bransford et al. 2000).

Technology can be used to promote student engagement and ownership (Roschelle et al.

2000), provide scaffolds and tools to assist in the analysis and interpretation of data, facilitating the learning processes, and promote higher-order thinking by increasing the opportunities for feedback and reflection (Branford et al. 2000; Choo 2007; Roschelle et al. 2000). Local and global communities can be networked, enabling access to experts and differing views and opinions, facilitating students' understanding (Bransford et al. 2000; Bell 2010; Herrington & Kervin 2007; Roschelle et al. 2000).

Technology is an essential component in curriculum promoting competencies required for 21st century learning (Bell 2010). Roschelle et al. (2000) found that "Students who participate in computer connected learning networks show increased motivation, a deeper understanding of concepts, and an increased willingness to tackle difficult questions". However, they warn that merely having access to technology does not guarantee improvements in learning. Some researchers caution that the use of technology can obscure the real purpose of the learning task. Merely using technology does not mean critical thinking skills are being employed; decisions and choices need to be justified (Laur 2013). Technologies must be used appropriately for any benefits to come to fruition. They should be used as professionals in the field use them, assisting in the production of a product that has value in the real world (Herrington & Kervin 2007; Laur 2013; Roschelle et al. 2000).

Higher-order thinking skills

Tasks or problems that require knowledge, skills and attitudes to be integrated not only reflect the real-world context, but also require higher-order thinking skills (Van Merriënboer 1997). The ability to analyse, prioritise and sort through various forms of data and differing perspectives to evaluate and shed light on the problem are seen as critical components of authentic learning. Dewey (1916) promotes the idea that to stimulate real involvement with learning, pupils should be given things to do, rather than to learn. He adds the qualification that the task should be cognitively challenging: "...and the doing is of such a nature as to demand thinking, or the intentional noting of connections; learning naturally results" (p. 181). Researchers agree that higher-order thinking skills are essential for authentic learning, but differ in their prioritisation of the skills, and various scaffolds for achieving deeper levels of thinking are promoted. Being able to reflect deeply is commonly regarded as a higher-order thinking skill prerequisite

for authentic learning (Herrington & Kervin 2007; Herrington & Oliver 2000; Lombardi 2007; Maina 2004; McKenzie et al. 2002). Being able to employ critical or logical thinking as essential for authentic learning in the kitchen garden (Choo 2007; Maina 2004). Lombardi (2007) promotes “habits of the mind” as a useful thinking tool. These tools are designed to help scaffold thinking. As Laur (2013) points out, no matter, which preferred thinking tool is used, students need to be taught how to think critically.

Student ownership

Student-centred learning is an important component of ownership, an essential characteristic of authentic learning (Savery & Duffy 1995). Transmissive modes of teaching that require passive listening and reading do not promote engagement or assist in knowledge retention and understanding. Student-centred learning shifts responsibility for learning from the teacher to the learner (O’Neill & McMahon 2005). When the learner is at the centre of instruction, the learning is meaningful and is an extension of the learner’s world (Callison & Lamb 2004; Maina 2004). Engagement is more than the desire to succeed, Newmann (1989) explains, “It involves participation, connection, attachment, and integration in particular settings and tasks”. He identifies “the amount of time they spend, the intensity of their concentration, their enthusiasm they express, and the degree of care that they show” on a task, as indicators of student engagement (1989).

Savery and Duffy (1995) found that to engage students in authentic learning and problem solving it was essential that students had ownership of both the task and the process for developing a solution. Having a sense of control over one’s work promotes both engagement and ownership (Newmann 1989; Savery & Duffy 1995). This can be promoted in several ways. Questions and wonderings that prompt an inquiry or problem-solving task can be initiated by the learner or as a result of meaningful discussion may be adopted by the learner. Problem-based learning and inquiry learning (discussed earlier in relation to the “ill-defined problem”) are two approaches that are used to make learning “authentic”. They have many similarities and rely on the curiosity of the learner (Savery 2006). Both are student centred, active learning approaches that encourage higher-order thinking. The main difference between the two approaches is the degree of responsibility and autonomy of the group in finding relevant knowledge and information, with the inquiry approach more supported by the instructor (Savery 2006). Savery and Duffy

(1995) warn that ownership does not automatically confer authenticity, and like Dewey, identify the need for the inquiry to be cognitively demanding:

It may well require discussion and negotiation with the learner to develop a problem or task which is authentic in its cognitive demands and for which the learner can take ownership (p. 5).

Student intention also needs to be considered, there has to be tangible benefits to both the students and the community (Kruger et al. 2001). The learner must regard the task or learning as being relevant to the real world, and the skills they develop as valuable transferrable skills (Kruger et al. 2001; McDowell 1995).

Teacher as facilitator

For the learner to take responsibility for their learning, the teacher must become a facilitator, rather than disseminator of knowledge (Maina 2004). The place for didactic teaching is acknowledged (Herrington & Kervin 2007; Laur 2013). Depending on the level of the students, the teacher may need to provide explicit teaching of a concept or scaffold learning. Teacher support can be reduced as the students take ownership and become more confident, competent and knowledgeable (Herrington and Kervin 2007).

Collaborative learners

A collaborative community of learners is also essential for authentic learning (Herrington & Kervin 2007; Herrington & Oliver 2000; Lombardi 2007; McKenzie et al. 2002).

Newmann and Wehlage (1993) argue that substantive conversation must be a characteristic of the community of learners. Students acquire additional information that needs to be evaluated and interpreted. Adams and Hamm (1996) explain that being exposed to different points of view broadens the opportunities for critical thinking:

[S]haring various interpretations of a material adds an extra dimension in the learning process as students not only learn how others perceive a certain issue, but also appreciate the various reasoning processes and life experiences that support different interpretations (p. 56).

This criterion goes hand in hand with inquiry-based learning. The community of learners should include both peers and experts (Choo 2007). Technology can be useful in gaining access to experts, and also be used to support collaboration between peers and experts, or set up virtual communities (Choo 2007; Herrington & Kervin 2007; Lombardi 2007). In

some collaborative learning communities the social context for learning is being transformed by cyberspace to the extent that the use of technology is regarded as an authentic learning criterion rather than a tool to assist the inquiry.

Authentic integrated assessment

Archbald and Newmann (1988) are attributed as being the first to use the term “authentic” in reference to assessment. Various interpretations of what authentic assessment entails have been made since (Cumming & Maxwell 1997). For example Gulikers et al. (2004) noted that “Authentic assessment requires students to demonstrate relevant competencies through a significant, meaningful, and worthwhile accomplishment” (p. 69). The concept of validity in authentic assessment relies on the assessment task being appropriate for assessing learning outcomes. As Messick (1994) explains, all assessments need to be subjected to rigorous principles:

[V]alidity, reliability, comparability, and fairness, need to be uniformly addressed because they are not just measurement principles, they are social values that have meaning and force outside of measurement wherever evaluative judgments and decisions are made (p.13).

Assessment strategies need to change from standardised tests that measure content knowledge or “facts”. Assessment strategies must take into account the switch in emphasis from learning facts or a body of knowledge, to assessment techniques that assess authentic learning where the outcomes are often process driven; where thinking skills are more important than the ability to memorise facts. The end product or performance needs to be valued by the students. If the end result is regarded as having real worth in the wider community, it validates the investment of time and effort put into its creation and reinforces the value placed on it by the students.

Authentic assessment and authentic instruction ought to be aligned; one demands the other (Biggs 1996; Gulikers et al. 2004; Van Merriënboer 1997). Cumming and Maxwell (1999) visually depict the interrelationship between learning goals, teaching activities, learning processes and assessment processes as “tensioned” tetrahedron (Figure 2.2).

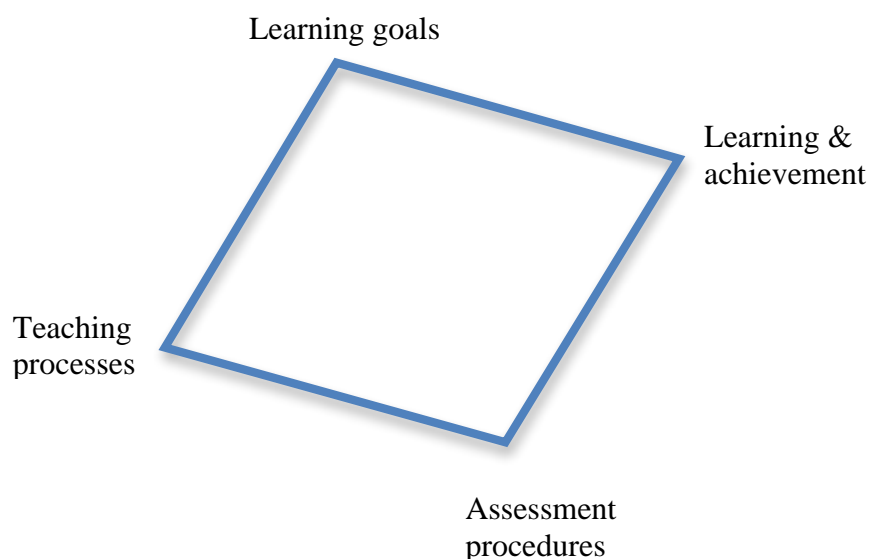


Figure 2.2: The teaching, learning, assessment domain (Cumming & Maxwell 1999 p.4)

They make the point that changes in one component will require adjustment of the other components. When assessment is integrated with the learning tasks, it contributes to the learning (Herrington & Herrington 1998). Authentic assessment requires that the assessment is directly relevant to what is being learned, and that the assessment is assessing what it purports to do (Gulikers et al. 2004). The theory stresses the importance of the compatibility between instruction, learning and assessment.

The researchers Gulikers et al. (2004) report that another aspect of authentic learning that should be taken into account, and is highly relevant to the kitchen garden, is the stage of development of the students. Compared with more experienced students and teachers, students at the start of their studies frequently have different conceptions of what “authenticity” means. Authenticity is subjective; students’ perception of authenticity develops as they progress, their perceptions need to go through the process of change before implementing authentic assessment. This is a cyclic argument, because participating in the authentic assessment should result in perceptual change of what authentic assessment means. Barab et al. (2000) warn that authenticity occurs “not in the learner, the task, or the environment, but in the dynamic interactions among these various components ...authenticity is manifest in the flow itself, and is not an objective feature of any one component in isolation” (p. 38). Comparing the various elements that researchers have identified as being important indicators of authentic pedagogy, learning, instruction or assessment clarifies what is meant by “authentic” (Table 2.1).

Table 2.1: Key characteristics of authentic learning from the literature

Key characteristics		Research supporting criteria	Additional features
Real context	Real-world problem / real context	Choo, B. C., 2007 Gulikers, Bastiaens & Kirschner, 2004 Herrington, J. & Kervin, L., 2007 Herrington, J. & Oliver, R., 2003-1 Lombardi, M., 2007 — 1 Maina, F., 2004 — 1, 3 McKenzie et al., 2002 Newmann, F. & Archbald, D. 1992-2 Newmann, F. & Wehlage, G., 1993 — 2 Rule A.C., 2006 Savery & Duffy, 2001-3 Wiggins, G., 1993	1 learning is multidisciplinary or interdisciplinary 2 connectedness 3 extension of learner’s world
	Open-ended inquiry or the poorly or ill-defined problem	Choo, B. C. 2007 — 1 Herrington, J. & Kervin, L., 2007 — 1 Herrington, J. & Oliver, R., 2003 — 1, 2 Lombardi, M., 2007 McKenzie et al 2002 Rule A.C., 2006	1 students need to articulate problem and/or their learning (links to higher-order thinking skills and reflection) 2 sustained investigation with a diversity of outcomes
Working as professionals do — complexity, challenge & discourse	Multiple resources, different perspectives and real data	Herrington, J. & Kervin, L., 2007 Herrington, J. & Oliver, R. 2003 Maina, F., 2004 — 2 McKenzie et al. 2002 — 1 Rule A.C., 2006 — 2	1 real-world exemplars 2 real-time data is also relevant
	Develop knowledge base and skills	Newmann, F. & Archbald, D. 1992-1 Van Merrienboer, J., 1997 — 2	1 production of knowledge 2 integrate knowledge, skills, attitudes
	Supported by technology	Choo, B. C., 2007 — 1 Herrington, J. & Kervin, L., 2007 Lombardi, M., 2007 Rule A.C., 2006	1 technology supports higher-order thinking & collaboration, and integration of new knowledge
Higher-order thinking	Involves Higher order thinking skills (HOTS)	Choo, B. C. 2007 — 5 Gulikers, Bastiaens & Kirschner, 2004 Herrington, J. & Kervin, L., 2007 — 3 Herrington, J. & Oliver, R., 2003 — 3 Lombardi, M., 2007 — 2 Maina, F., 2004 — 1 McKenzie et al 2002 — 5 Newmann, F. & Wehlage, G., 1993 — 4 Rule A.C., 2006 Van Merrienboer, J., 1997 — 6	1 critical thinking 2 habits of the mind & reflection 3 reflection 4 knowledge has depth 5 critical thinking and logic 6 integrate knowledge, skills, attitudes

Ownership	Learner-centred/ student-driven/ student ownership, engagement, choice, real/relevant, motivation	Callison, D. & Lamb, A., 2004 Gulikers, Bastiaens & Kirschner, 2004 Herrington, J. & Oliver, R., 2003 Kruger et al., 2001 Maina, F., 2004 — 1 Rule A.C., 2006 — 2	1 experiential, hands-on approach 2 empowerment through choice
	Teachers are facilitators (Not didactic)	Choo, B. C., 2007 Gulikers, Bastiaens & Kirschner, 2004 Herrington, J. & Kervin, L., 2007 — 1 Herrington, J. & Oliver, R., 2003 Maina, F., 2004 Rule A.C., 2006	1 learning scaffold
Collaborative Learners	Collaborative community of learners — substantive conversation and different perspectives	Choo, B. C., 2007 — 1 Gulikers, Bastiaens & Kirschner, 2004 Herrington, J. & Kervin, L., 2007 Herrington, J. & Oliver, R., 2003 Kruger et al., 2001-3 Lombardi, M., 2007 — 2 Maina, F., 2004 McKenzie et al., 2002 Newmann, F. & Wehlage, G., 1993 — 3 Rule A.C., 2006	1 combination of peers & experts 2 may involve virtual communities 3 substantive conversation is required
Assessment	The performance or product is directed to a real audience; it has value in the wider community	Choo, B. C., 2007-1 Gulikers, Bastiaens & Kirschner, 2004- 1,3,4 Herrington, J. & Herrington, A., 1998 — 1 Herrington, J. & Kervin, L., 2007 — 1 Herrington, J. & Oliver, R., 2003 — 1 Kruger et al., 2001-3 Lombardi, M., 2007-1 McDowell, 1995 — 2 Newmann, F. & Wehlage, G., 1993-6 Reeves, T. C., & Okey, J. R., 1996 — 1 Rule A.C., 2006 — 1 Wiggins, G., 1993 — 1, 5	1 assessment is integrated 2 relevant and transferrable skills 3 tangible benefits to learner 4 valid assessment 5 competency-based assessment 6 social support for achievement

Authenticity is a continuum, with some learning situations more “authentic” and realistic, rich in opportunities to practise higher-order thinking skills and collaboration, with students working cooperatively together, negotiating differences, owning their learning and producing new products or knowledge, than others, where maybe only one of the elements or criteria for authentic learning is present (Newmann & Wehlage 1993). It is a journey where teachers and students gradually progress towards “authenticity” as they

become more comfortable and knowledgeable about the process and more familiar with the necessary tools.

Many of the key characteristics of authentic learning, as identified in Table 2.1, overlap synergistically acting to reinforce the nature of authentic learning. For example, the use of technology to produce a professional-looking product is part of working as professionals do, a component of producing a product that the wider community values, and also promotes real-world connections and applications. The Authentic Learning Taxonomy (Appendix B) produces a visual representation of the relationship between the key characteristics of authentic learning synthesised from the literature. Colour coding indicates significant overlaps of the characteristics. As Hattie (2012) identifies various elements will be given priority by the teacher, shaping the children's learning.

Section 3: Teachers' work

Complexity

Darling-Hammond points out that as much of the work of teachers is hidden, people mistakenly believe that "teaching requires little formal study" (2006b). She summarises the work of teachers as needing to understand "many things about how people learn and how to teach effectively". The list is extensive and varied and includes pedagogical content knowledge including language, culture and community contexts for learning as well as the need to "understand the person, the spirit, of every child and find a way to nurture that spirit" (2006b). She elucidates, "teachers need the skills to construct and manage classroom activities efficiently, communicate well, use technology, and reflect on their practice to learn from and improve it continually" (2006b). Connecting the children's prior knowledge and understandings to what is to be learned, to establish that the learning is relevant to them also requires curriculum work (Darling-Hammond 2006b).

Kitchen gardens have been promoted as being a form of multidisciplinary education; a way of providing environmental education in a real-life context. They may be used as a unifying theme for subjects often taught as separate disciplines (Thorp 2005). This approach keeps the boundaries of the discipline, but adds to the theme or topic of investigation (Gibson & Ewing 2011). Others have aimed for a more integrated

pedagogical approach. They believe that the kitchen garden is interdisciplinary, the difference being the subject areas are not kept as separate curricula disciplines, but merge, enabling students to connect essential concepts that transcend individual disciplines, but may be informed by both (Block et al. 2012; Danks 2010; Moore 1995).

Robin Moore (1995) reports on the value of the garden as an interdisciplinary educational medium:

For teachers, gardening provided opportunities to connect individual personality, aesthetic expression, culture, and geography more closely than in any other areas of the curriculum (p. 79).

Moore further concludes that:

As a vehicle for interdisciplinary environmental education, gardens are unsurpassed. This is because they are a constantly changing, highly attractive, interactive, motivational setting — a fertile source of language and scientific investigation (pp. 79–80).

Gibson and Ewing (2011) clarify these terms in relation to education, and explain that multidisciplinary, interdisciplinary, transdisciplinary and integrated approaches are not hierarchical, or that one approach is better than the other. The names indicate varying degrees of merging of content and reduction in discipline boundaries. A multidisciplinary approach uses the lenses of the various disciplines to investigate the common problem, theme or issue, while the disciplines remain separate. An interdisciplinary approach puts the focus on the problem, theme or issue (Gibson & Ewing 2011). Veronica Strang uses a definition that evolved from the University of Queensland's 2004 interdisciplinary workshop. She defined "interdisciplinary" as a term used "to describe collaborative work by different disciplinary practitioners on a shared research project" (Strang 2009). Gibson and Ewing (2011) equate interdisciplinary and transdisciplinary approaches, and explain that although they have reduced the subject-specific boundaries to explore the problem, question or theme, some separation is retained. Other researchers differ in their definition of transdisciplinary and define it as having the highest degree of integration (Cronin 2008; Moore 2005; Sherren 2005).

Transdisciplinary (TDR) research involves a range of approaches that may see the breaking down of disciplinary boundaries, the merging of existing disciplines and the introduction of non-disciplinary knowledge from external stakeholders. It also holds the

potential to create new knowledge frameworks and an overarching synthesis from the diverse perspectives in the research setting (Cronin 2008).

This definition of the transdisciplinary approach emphasises the use of the skills, knowledge or processes that are relevant to a particular project without privileging any particular discipline. Practical knowledge from the field is valued alongside academic theory. The emphasis is placed on the merging and integration of disciplines and practices, into a new body of knowledge or holistic praxis relevant to the project.

Although there are differences in definition of terminology, there is, however, agreement from many researchers that the separation of knowledge into discrete disciplines is contrived, a matter of convenience. Real-world learning and problem solving requires a “holistic” approach. There needs to be a return to curriculum integration, where the interconnectedness through praxis is understood (Cronin 2008; Gibson & Ewing 2011; Lauritzen & Jaeger 1997; Orr 1992).

The movement toward curriculum integration has propelled a search for solutions that transcends the traditional subject-area approaches to learning. Finding links between mathematics, science, language and the arts, social sciences and aesthetic pursuits has become important in educational restructuring. Context becomes an essential element in linking different disciplines in meaningful and authentic ways (Lauritzen & Jaegar 1997).

An integrated approach to teaching in the kitchen garden has also been promoted by Thorp (2005). Her starting point was the garden. She researched where the standards or benchmarks could be incorporated into the garden theme so that she could justify using the garden as a focus. Thorp raises the concern over the difficulty of balancing the demands of a garden and the necessity of accountability, of being answerable to achieving set objectives in lesson plans. The present research illustrates how this pressure for measured evidence-based outcomes impacts on teachers’ planning. The principal at the school where Thorp was researching advised:

[A]ny time a child steps into the garden there must be a clearly stated teaching objective and state benchmark in the teacher’s lesson plan (pp. 123–124).

They would often work backwards, with produce from the garden providing the stimulus for a series of lessons. They would identify an appropriate children’s book, design a

literacy lesson, prepare and eat the fruit or vegetable (the stimulus) and link it back into the curriculum. Thorp found that rather than the garden just being an extra activity to fit into the teacher's busy schedule, that it helped them draw connections across the curriculum. She states that, "the garden provides the scaffolding to make these connections" (2005 p. 126). They were able to teach the writing process, maths, weights and measures, estimation and economics, including design of packaging and sale of produce. They found that starting with the garden, then looking for evidence of relevant benchmarks or objectives worked for them, instead of the more commonly accepted approach of looking at the curricula to be taught then developing an appropriate unit of work based on the children's interests, to teach via sequential lesson plans. Thorp found that the garden empowered the "underperforming" school to write "a new story, a story not based on numeric performance but rather on hope, creativity and community" (2005 p. 125). The curriculum was developed around the garden. The garden provided the "authenticity", the real-life context for the learning.

The present research contends that separating disciplines becomes artificial in the kitchen garden; the context, the seasons and needs of the kitchen garden are paramount and dictate the knowledge and skills relevant to a particular task. When designing a kitchen garden, one may need to measure up the space, check the orientation, analyse the soil, decide on the plants that are suitable for the climate and taste, record ideas and artistic representation of this planning, discuss and come to a consensus with fellow collaborators and then put the plan into action. It does not make sense to segment the activities into mathematics, geography, botany, literacy and art. Rather, it is the interconnected knowledge that is needed to make sense of the whole. The kitchen garden provides the context for the teacher's agenda, incorporating the knowledge across the academic disciplines. It also provides rich opportunities to develop personal and interpersonal skills with opportunities for collaboration on various inquiries relevant to the garden. These processes contribute rich learning opportunities and academic rigor. What is really valuable about this approach is that the children can see the significance and reasons for what they are doing; there is a real purpose. Valuing the children's experience and knowledge of their local context ultimately enhances learning. Children are exposed to different ideas, diverse values, cultures and ways of "knowing", thus increasing their

understanding that there is not just one correct way; things are complex, diverse and interconnected. According to Morin (1999):

The predominance of fragmented learning divided up into disciplines often makes us unable to connect parts and wholes; it should be replaced by learning that can grasp subjects within their context, their totality (p. 1).

Children can begin to understand the ecosystem of their garden. The kitchen or school garden provides the context and the opportunity to integrate the curriculum. A balance needs to be struck between the teaching and learning dictated by the curriculum standards and providing opportunities for children to follow their curiosity and inquire into the things that interest them. Morin makes the point that too often education instead of stimulating curiosity acts to inhibit it (1999). As Sobel (2008) reminds us, it is important to leave time for the serendipitous moments that are often the most rewarding:

[T]he spontaneous fruiting of some unplanned-for project and the abandonment of a well-planned unit that has worked in the past (p. 88).

When does one abandon a planned program to follow curiosity and unexpected questions? The judgment of the teacher comes into play; however, it is important to note that teachers programs can cater for student lead investigations; they are not mutually exclusive. Abstract scientific concepts can be made concrete by exploring these wonderings. The wonderings and questions can be used to provide the authentic context for the inquiry, connect the learning and make it relevant to the child.

Cooking in the classroom

Kitchen gardens traditionally combine working in the garden and cooking, to transform the garden produce into a healthy meal. Whether this takes place around an outdoor pizza oven, in a temporarily converted classroom or a purpose-built kitchen, preparing and sharing foods has an innate power to engage students. Some programs focus exclusively on the garden, others on health and nutrition, while others focus on cooking. How these experiential programs are used and for what purpose depend very much on the aims and goals of the programs. Like the garden, “cooking provides an ideal framework for multisensory experiential learning” (Trubek & Belliveau 2009 p. 16). Amy Trubek and Cynthia Belliveau explain how they adopted John Dewey’s belief that cooking could be used “as the ultimate example of producing knowledge through an activity and as a tool for student socialization” (p. 16). They found when they used cooking and eating

experiences as a teaching tool to get their students to explore the culture, traditions and foods of the people they were studying in their anthropology course, new and deeper levels of understanding were created.

The Stephanie Alexander Kitchen Garden Program combines garden-based learning and the preparation, cooking and sharing of healthy meals. Initially based in Victoria, the program is spreading across Australian primary schools. The evaluation of the Stephanie Alexander Kitchen Garden Program (SAKGP) found that student engagement and the appreciation of a diverse range of healthy foods were key outcomes for children participating in the program (Block et al. 2012). Reports of improvement in socialisation, interpersonal relationships and connection to community, were supported qualitatively. This is not surprising, because many “social effects” are difficult to measure quantitatively. Block et al. (2012) also came to the conclusion that it was better to “bring in specialist staff trained in horticulture and cooking respectively — rather than expect classroom teachers to add gardening or food preparation to their repertoire” (p. 430). A major drawback to the SAKGP, and a problem that needs urgent resolution, is the lack of teachers’ ownership of the program in some schools. When the funding ends after the four years of support, the school is left with a funding hole (Yeatman et al. 2013). Using specialist staff to help set up the initial programs and work alongside the teachers with the focus on empowering and helping to train the teachers, as well as the children, would be a way of resolving these problems. Teachers need to own the kitchen garden programs to use the garden resource in their day-to-day teaching. Many teachers have gardening, environmental and cooking expertise. With mentoring or additional professional development many more could confidently run the programs (Muehlhof, 2010).

One of the most important features of a kitchen garden program is its interdisciplinary, contextualised nature. Using the context of gardening or cooking makes learning relevant to the child and connects home and school. Teachers and children must have ownership of these programs for the benefits to be fully developed. With the extension of the SAKGP to a national program announced by the Australian Government in August 2012 (SAKGF 2013), and with the aim of helping to address some of these concerns and make the program more “accessible, affordable and flexible”, the SAKGP has recently changed the funding structure for schools wishing to join the program, and changed the focus to utilising resources already available in the school. Information on “affordable school

gardens and kitchens” has been added to the information resources on their website. This is a positive response to criticism that the program needed to be more flexible to facilitate implementation across a diverse range of school communities.

Standardisation of pedagogy and curriculum?

The current demand for schools to implement standards-based reforms may appear incompatible with place-based learning (Gruenewald 2003a; Gruenewald & Smith 2014; Kemp 2006; Trujillo & Woulfin 2014). The externally derived standards and decentralised, generalised curriculum encourages direct instruction and decontextualises learning or “teaches to the test” instruction (Gruenewald & Smith 2014; Jennings et al. 2005). Jennings and associates have made the case for uniting the two by regarding place-based curricula as a pedagogical tool, not only a learning outcome. Place-based curriculum is valued for the context it brings to the learning, making it real by giving tangible examples and connecting the student’s lifeworld and school (Gruenewald et al. 2007). The students’ *lifeworld* is the world as they live and experience it. It has social, historical and cultural aspects and affects the children’s way of experiencing, thinking and understanding (Samuelsson & Johansson 2006). Standards do not have to be in conflict; rather, they may be incorporated and used to enhance place-based education (Gruenewald & Smith 2014; Jennings et al. 2005; Thorp 2005).

Orr (1992) believes the changes need to be deeper. He not only outlines the need for major changes in the curriculum, he argues the need for a complete pedagogical transformation of education:

Ecological design requires the ability to comprehend patterns that connect, which means looking beyond the boxes we call disciplines to see things in their larger context. Ecological design is the careful meshing of human purposes with the larger patterns and flows of the natural world; it is the careful study of those patterns and flows to inform human purposes. Competence in ecological intelligence — knowledge about how nature works — through the curriculum. It means teaching students the basics of what they will need to know in order to stretch their horizons, to create a civilization that runs on sunlight; uses energy and materials with great efficiency; preserves biotic diversity, soils, and forest; develops sustainable local and regional economies; and restores the damage inflicted on the earth throughout the industrial era (p. 6).

Authentic curriculum starts with the student’s interests, where the centrality of curiosity and wondering is at the fore. From this space we can, if the need arises, look for where

the standards, outcomes and progression points can be accommodated. David Sobel (2008) defines authentic curriculum in his book *Childhood and Nature*:

Authentic curriculum refers to curriculum that springs forth from the genuine, unmediated individual and developmental fascinations of children and teacher (p. 76).

Rachel Carson (1956) identified the need to generate and connect with feelings:

[O]nce the emotions have been aroused—a sense of the beautiful, the excitement of the new and the unknown, a feeling of sympathy, pity, admiration or love — then we wish for knowledge about the object of our emotional response. Once found it has lasting meaning. It is more important to pave the way for the child to want to know than to put him on a diet of facts he is not ready to assimilate (p. 46).

Authentic curriculum is achieved when interest and curiosity is stimulated. The garden has the power to fascinate and inspire emotions, for children to build a connection to nature (Lekies & Sheavly 2007). Children's wondering or inquisitive observation then provides the opportunity to develop more structured inquiry. The teacher utilises the interests, fascination and wonderings of the children, to strengthen and enhance the intellectual curiosity they have with an artefact or phenomena. Brinegar and Bishop (2011) advocate using the children's questions to connect learning to the real world:

Curriculum integration, like other approaches that value student questions as the basis for curriculum and tasks that serve real-world purposes for real-world audiences, prepares students not only for high school but for active citizenship in a community (p. 220).

Fostering their interest in observable phenomena also encourages ownership of learning within the child. The teachers' role is in building on this connection to shape the investigation for educational purposes. The child's initial desire to "find out about..." is captured and provides an authentic context for the other learning arenas —the knowledge, skills and processes.

There is a need for a paradigm shift from disciplines that are ever more specialised and narrowed, to broader, collaborative, shared ways of knowing. Specialist areas need to learn how to talk to each other again and find a common language of understanding. Integration and recognition of the overlap and the interlinking relationships should be the goal to build up a more complete connected view. This does not mean that the differences should be simplified or forced into an artificial alignment, but the differences should be acknowledged as a response to different lenses being applied to multifaceted complex problems with political, social and economic implications. We need to visualise the big

interconnected picture, and establish priorities. The really important things, such as “sustainable ecology”, should come first. We need to know “our place”, to be familiar with the world around us. Sobel (2008) asked the pertinent questions, “how can we expect children to save the world, if we haven’t first allowed them to know and love nature? How can we expect them to value what they do not know or have a relationship with?”

Capra (2007) has drawn together these understandings and concepts into his systems thinking based on “relationships, connectedness, and context”. He synthesises the essential characteristics of the pedagogy required for the education for sustainable patterns of living. His major pedagogical implications for schools includes:

- emphasis on integrated curricula, rather than isolated single subjects;
- valuing relationship-based processes such as cooperation and decision-making by consensus;
- shift from analytical thinking to contextual thinking — explaining things in terms of their contexts or environments;
- evaluation processes that focus on quality rather than standardisation;
- project-based learning, which emphasises the application of knowledge within evolving real-life contexts; and
- incorporating art into the curriculum to develop and refine children’s natural ability to recognise and express patterns, including literature and poetry, the visual arts, music and the performing arts (pp. 12-13).

Almost any subject can be taught in and through the kitchen garden learning environment (Canaris 1995). The opportunities for connecting the disciplines, and the familiar context assisting the constructing of meaning, render the inclusion of a kitchen or food garden a valuable tool in schools. Brinegar and Bishop (2011) found that students reflecting on student-centred integrated curriculum, in which they had previously participated, identified that it was more “about life” (p. 220). This was in contrast with single subjects that they identified as academic learning. The degree of integration and interconnectedness of the disciplines will of course be variable, and depend on the individual teacher and their pedagogy. However, while this interdisciplinary aspect is important, it is also essential to note that the act of “gardening” is a social process with

interpersonal engagement at its core. Many of the benefits of learning in the garden come from the establishment of understanding and collaboration between the peer groups. Teamwork and collaboration increases significantly when children are required to work together in a gardening program (Robinson & Zajicek 2005 pp. 453–457). This way of learning encourages active participation and discourse, and aligns with the constructivist learning theory emphasising that knowledge is a social construct.

Active participation in learning requires teachers to *make the space* for children to be involved in relevant democratic decision-making. Simovska (2008) analyses what this involves and explains:

This presupposes fostering students' self-awareness, critical thinking, decision-making, and collaboration skills, connecting students among themselves and with the school, and empowering both students and school communities... (Simovska in Reid et al. 2008 p. 63).

Taking this democratic decision-making approach further has the potential to produce fundamental changes to school attitudes to teaching and learning. She explains this can take into account the whole school environment, broader community as well as the classroom as an arena for learning. Like Robinson and Zajicek, Simovska identifies this view of learning as being 'situated in a sociocultural context and located in process of participation or co-participation rather than solely with the individual', once again emphasising that knowledge is developed in the social context. Personally meaningful learning is negotiated within this social context and involves dialogue, reflection and co-constructed shared meanings (Simovska in Reid et al. 2008 p. 63).

In contrast to authentic learning, some researchers have reported the tendency to use curriculum standards as a checklist or a "teach to the test" approach (Gruenewald 2003a; Kincheloe 2003; McLaughlin & Shepard 1995). The move to curriculum standards was initiated by the publication of the report *A Nation at Risk* in 1983 by the National Commission on Excellence in Education (Marzano & Kendall 1996). In the United States, this report was followed up with legislation (*Goals 2000: Educate America Act 1994*), heralding the national framework for educational reform based on standards (McLaughlin & Shepard 1995).

Australia has also moved to raise the level of education through standards-based reforms. This has been widely condemned (Kincheloe 2003; Luke & Hogan 2006; Marzano 2006; Polesel et al, 2012; Savery 2006). Evidence-based policies promote accountability, generally supported by frequent testing of basic skills. This has been criticised by Allan Luke (2003), because it does not take into account the changes in Australian society. He argues that the model has not come to terms with the changes to a more “culturally and linguistically diverse population”, the localised “stratifications of wealth and the new pathways from school to work, community and civic life”. Another relevant consideration is the professionalism of teachers. Removing decision-making by authoritative and over-prescriptive curricula can eventually result in the *deskilling* of teachers. As Luke et al. (2012) point out, standards-based educational reforms are also used to “control and regulate teachers and teacher’s work” (p. 11).

Marzano and Kendall describe a broad range of objections raised by critics, including: the standards are too cumbersome to use; inaccurate or biased content; they disadvantage poorly performing schools; and that they are a drain on already stretched educational resources (Marzano & Kendall 1996). Kincheloe (2003) identifies how the issues are even deeper and involve ontological questions about knowledge. Implicit in the standards are assessments about what is worthy of being known. As he points out,

A planetary insight with an awareness of and respect to diverse ways of knowing, cultural humility, and an ecologically sustainable and ethical conception of progress is not on the conceptual map (p. 11).

The Gonski report (2011) also identified several problems with standardised testing—“excessive focus on what is testable, measurable and publicly reportable” was acknowledged as having the potential to negatively impact curriculum balance (Gonski, 2011 p. 217). He also drew attention to significant elements that are difficult to measure on external tests such as “independence, confidence, initiative and teamwork” (Gonski, 2011 p. 217). Fundamental concerns have been expressed about the impact NAPLAN⁵ tests are having on teaching practices range from, “a potential narrowing of teaching strategies” to the narrowing “of the curriculum offered to students” (Dulfer, Polesel &

5 NAPLAN: National Assessment Program — Literacy and Numeracy is an annual assessment for Australian students in Years 3, 5, 7 and 9. The standardised tests were introduced in 2008 to assess whether educational outcomes were being met.

Rice 2012 p. 29). Teachers focus on the areas that will be tested rather than the curriculum areas not included in the tests (Dulfer et al, 2012). Teaching to the test with the goal of improving results on standardised testing constrains the curriculum and tends to encourage instructional approaches and separation into disciplines, rather than problem-based or authentic interdisciplinary approaches (Lingard et al. 2013; Luke 2010; Roney & Lipka 2013; Savery 2006).

Pushkin argues the impossibility of connecting the many facts prescribed by “the top-down technical standards of the contemporary reform movement” in any depth — let alone connecting them to the lived experiences of students (Pushkin 2001). The lack of depth and inability of standardised tests to evaluate true learning is also condemned by Bereiter (2002).

Standardised testing enabling comparison between grades at the same level requires that the teachers cover the same curriculum content, have the same emphases on the content and evaluate the same way (Marzano and Kendall 1996). This is problematic because the standards often bundle processes together and give little guidance about the specific dimensions they cover (Marzano 2006). Kincheloe, like Friere, calls for quality, learning encounters emphasising critical and social justice. It is the lifeworld of the student that is at the core of the student’s experiences and understanding, and the student is located in the community of students.

When the real-life experiences and personal investigations of students are no-longer germane to curriculum development, the battle for a rigorous intellectual and motivating education is almost lost (Schubert and Thomas 2001; as cited in Kincheloe 2003 p. 7).

Supporters of the testing regime point out the analysis of the student achievement data can provide individual diagnostic assessment and also assist teachers in identifying the areas they need to target in their teaching (Howes 2013). However the five-month time lag between the testing and the reporting of the results severely limits the usefulness of the data as formative assessment (Doecke et al., 2013). The recently released Australia, Senate Education and Employment References Committee report into the *Effectiveness of the National Assessment Program*, recommended that ‘...the quick turnaround of test results should receive the highest priority in the design of NAPLAN Online with achievable and measurable targets built in to the system’ to address this problem (March 2014).

State-mandated curriculum and standardised tests [such as NAPLAN] used to evaluate children's learning are also used as a competitive accountability tool. In her submission to the NAPLAN Senate enquiry, *Inadequacies of NAPLAN results for measuring school performance*, Margaret Wu points out the inadequacies of using results that have a large margin of error built into them for providing 'accurate information on student performance, student progress, or school performance' (Wu 2013). Although NAPLAN tests are not designed for use as a ranking tool they are used as league tables to rank the performance achievement of schools against the standards and one another (Dulfer et al. 2012; Australia, Senate Education and Employment References Committee report, 2014; Wu 2010a, 2010b, 2013). This approach also implies that a uniform "product" will be produced. Homogeneity has the danger of removing the context for the learning, and shifts education away from an authentic and enjoyable curriculum. The requirement of the reporting and evaluation process becomes the focus rather than the needs of the child (Doecke et al., 2013).

Effective professional learning

This section of the literature review addresses the nature of teacher and student agency. These are more openly exemplified when classroom practice and pedagogy are taken as a point to begin the inquiry (Cochran-Smith & Lytle 1992; Kruger et al. 2001; O'Rourke 2003). Kincheloe states that if "...a new level of educational rigor and quality is to be achieved" teachers must act as critical researchers and the producers of knowledge. He argues that a rigorous and just education demands that teachers research their students (2003). Darling-Hammond (2006a) confirms his view that teachers need to be classroom researchers and advocates teachers become "...skilled in ferreting out students' thinking and reasoning as well as experiences that may serve as building blocks for learning", and then use this information to adapt the curriculum (p. 325).

Cochran-Smith and Lytle (1992) also argue the case for teacher researchers. They broaden the areas for research beyond students in the teacher's class and promote teacher research as "systematic and intentional inquiry about teaching, learning, and schooling carried out by teachers in their own school and classroom settings". They argue the case for encouraging and providing time for "reflective conversation" within a collaborative discourse community. The ensuing empowerment will enable the transformation of

pedagogical knowledge and practice. Cochran-Smith and Lytle (1992) maintain “legitimizing the knowledge that comes from practitioners’ research on their own practice — whether in schools or universities — is a critical dimension of change in both cultures [university and school]”. To enhance the knowledge base about teaching and how teachers and children learn, teacher researchers in their own schools and classrooms need to reconstruct practice as inquiry. Teacher research challenges the view of professional development being the “transmission and implementation of knowledge from outside to inside schools”. Instead of the outsider researcher perspective being the predominant way of informing professional development, insider practitioner knowledge and teacher inquiry into their own practice has the potential to provide a deeper understanding of teaching and learning: “teacher research makes visible the ways teachers and students co-construct knowledge and curriculum... it can support a more critical and democratic pedagogy” (p. xiv).

Many factors will affect the degree of success for individual students. Student-specific factors such as individual characteristics and family background can cause as much as 50 per cent of the variance in achievement (Hattie 2003). The degree of support from home, the peer group, curriculum and the school attended also have effect, but one of the largest individual variances at around 30 per cent, and arguably a factor that can be improved, is due to the teacher (DEECD 2013b; Hattie 2003). Although children’s achievement on narrow standardised tests cannot be used to evaluate teacher performance, research reports that effective, quality teachers do make a difference and help students achieve (Carey 2009; Darling-Hammond 2000; 2008; 2012; Hanushek & Rivkin 2004; Hattie 2003; 2012; Leigh 2010). The teacher’s pedagogy and practices are one of the biggest influences (that we can control) on the outcomes and the experiences of the children (DEECD 2013c; Hattie 2012). “What teachers know, do, expect and value has a significant influence on the nature, extent and rate of learning” (National Reference Group for Teacher Standards Quality and Professionalism 2003).

In this section, the review focuses on the nature of effective professional learning, a factor in enhancing quality teaching, (Desimone 2009; DE&T Blueprint 2003; Elmore 2002). Professional development is now a mandated requirement to remain a registered teacher in Australia. Professional development is the term commonly applied to teacher learning that occurs while in the profession of teaching, rather than during initial teacher

training. The term “professional development” covers a wide range of courses, activities, skills and workshops that vary greatly in their aims, outcomes and duration. More importantly, they also vary widely in their effectiveness; the majority of activities that come under this umbrella term have questionable effects on student outcomes (Elmore 2002). Effective professional development concentrates on improved teaching and learning, and translates into improved learning outcomes for students (Desimone 2009; DE&T Blueprint 2003; DEECD 2013b; Elmore 2002). Elmore argues that it is essential for teachers to be held accountable for student performance, and calls for teachers to adopt “standards based reform” (2002). Although he recognises the need to assist teachers so they can gain the knowledge and skills necessary to implement performance-based accountability, he argues that school administrations are inadequately equipped for providing this support (Elmore 2000; 2002).

In contrast with Elmore, other research recommends a “whole” school approach and found that, rather than outsourcing professional learning, the key to school improvement is to identify an area of important learning or teaching challenge relevant to the whole school as a focus to work on (Desimone 2009; Johnston 2003). Johnston emphasises that it must be “grounded in the reality of the school”. Four “inter-related” actions that schools have used to successfully “sustain and build staff and student learning and well-being in the intensified context” are identified in his research. The intensified context refers to the increased complexity and demands of improving student outcomes and catering for 21st century learning while dealing with professional and personal requirements.

According to Johnson (2003), the four inter-related actions include:

- identifying the learning and teaching challenges facing the school;
- planning coherent across-years program to address these challenges;
- choosing short-term projects that directly enhance learning and teaching, and contribute to the achievement of program goals; and
- formatting learning teams with a project focus.

The Seven Principles of Highly effective Professional Learning, outlined in Figure 2.6, have been developed to assist schools in the provision of quality professional learning

opportunities (DE&T 2005). Each of these protocols impacts on the delivery of the profession of teaching and learning.

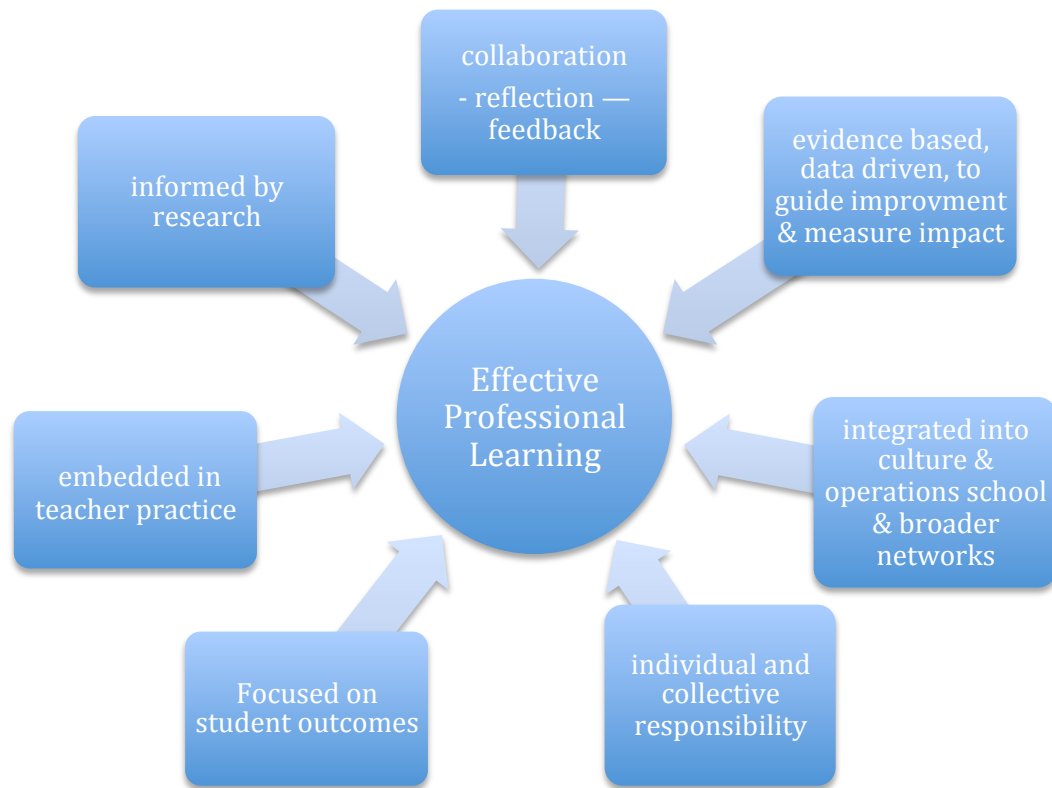


Figure 2.3: The seven principles of highly effective professional learning (adapted from DE&T 2005 pp. 14-16)

The seven principles of highly effective professional learning emphasises that collaborative teams should carry out the inquiries. The inquiry must be evidence based and data driven to guide improvement, and measure the impact on student outcomes.

The DEECD in Victoria has recommended the formation of professional learning teams in schools as a way of delivering effective professional development enabling the achievement of shared common goals: “Professional Learning Teams can contribute significantly to schools becoming learning communities by fostering a culture of collaboration and collective responsibility for the development of effective teaching practices” (DEECD 2013c).

Desimone (2009) calls for more research into the links between “professional development and changes in teaching practice to student achievement”. The professional learning team approach relies on teachers researching what is effective practice, and

while there is agreement on the potential to improve student outcomes, teacher practice and develop a collaborative community of learning in individual schools (Elmore 2000; Johnston 2003), there is no formal pathway for the collection and reporting on the results of these inquiries. This is a missed opportunity to broaden the knowledge base on teaching and learning from the informed point of view of teacher researchers. This may be about to change, because in the recently published a paper “From New Directions to Action”, where the strategic directions for Victorian education are outlined (DEECD 2013a; DEECD 2013c), the need to identify and share best practice as well as the need for teacher-lead research is acknowledged. Although no specific strategies or pathways for this to occur are outlined, it is encouraging that these needs are identified and expressed in this strategic document.

The questions researchers pose, and how they go about finding out the answers, will be influenced by their prior understandings about the world (Freedman 2007; Smith & Deemer 2000). Some writers question whether education — even education based on critical pedagogy principles — can ever be truly democratic, because the teachers bring their own agenda, preconceived views and ideas on what critical thinking is. Freedman (2007) warns, “Classroom instruction that encourages students to adopt political ideologies that they did not freely choose is typically referred to as indoctrination”. Children need to be aware of the multiple positions and points of view on salient issues. Issues around environmental sustainability need to be examined critically from all sides. They need to be taught critical thinking and multiple methods of analysis, so that they have both the knowledge and the skills to make informed decisions (Freedman 2007). Teachers need to set up and encourage experiences in the outdoors to reconnect children to nature, to question, promote discourse, reflection and collective understanding.

So, the message is clear, we need more “enchanters”—or put into educational jargon, we should call for the development of more interactive pedagogies and a new paradigm of transformative, rather than transmissive, education that encourages direct experience and engagement across all sectors of formal and non-formal education (Dyer 2007 p. 397).

Education for sustainability (EfS) has been promoted as a new approach to teaching children about the environment. EfS had its roots in environmental education, but rather than just knowledge about the environment, the aim is empowering, transformative learning. An ecologically orientated paradigm to connect education in a holistic way needs to develop.

Learning in the school garden is learning in the real world at its very best. It is beneficial for the development of the individual student and the school community, and it is one of the very best ways for children to become ecologically literate and thus able to contribute to building a sustainable future (Crabtree 2007 p. 50).

Education has long been promoted as being a key to social change and sustainability, although education is paradoxically also acknowledged as being largely conservative in nature (Sterling 2004). If education is to be a major part of the solution to climate change, habitat loss, degradation of cultural heritage, threats to biodiversity and ecological stability, then the dominant paradigm in education must change from a transmissive to a transformative mode (Dyer 2007 p. 393). There is an urgent demand for social transformation; for education to be revisioned to transcend the utilitarian, transmissive view of education and become instead more environmental and focussed on sustainability (Dyer 2007; Dymont & Reid 2005). Dymont and Reid call for school ground projects to be used to “bring forth a holistic and integrative, democratic and creative vision of education, making connections and grasping the wholeness of our living and learning environments” (Dymont & Reid 2005). The many researchers across the fields of environment and education have called for an increase in ecological and sustainability literacy, and have articulated the need for a fundamental change in the educative paradigm to reconnect children, nature and culture (Capra 2007; Dyer 2007; Dymont & Reid 2005; Louv 2008; Moore 1995; Orr 2004; Sobel 2008).

Conclusions and reasons for this study

This section outlined the Australian and International literature that informs this research project. It deliberates on ways of knowing, styles of engagement and student outcomes. The literature, signposts very real and significant positive benefits for the emotional, social and physical health of children when kitchen- and garden-based learning is incorporated into the school curriculum. The foregoing literature review holds to the centrality of the belief that kitchen gardens can and do provide the context for authentic learning experiences that will assist in reconnecting children to nature. The remainder of the thesis identifies the manner in which the work of the kitchen garden is so valuable, along with the growing need for education around awareness of changing environmental needs through ecoliteracy. The role of the teacher in structuring learning to optimise the opportunities provided by kitchen garden contexts are also explored.

Maina (2004) identifies the need for explicit documentation of successful authentic curricula: “What remains crucial is for individuals is to share and document their successes on implementing authentic activities in the classroom. By so doing, others will build on the successes and reduce the necessity to re-invent the process” (Maina 2004). A definition of the essential criteria for authenticity has been constructed and compiled from the literature and is used to examine the key components of the kitchen and gardening experience identified in the research.

The literature as identified in this section recommends involving teachers in research into their practice as a critical component of successful professional development and pedagogic change (Blair 2009; Cochran-Smith & Lytle 1992; Darling-Hammond 2006b; Kincheloe 2003; Kruger et al. 2001; O’Rourke 2003). This is because, as Dorothy Blair (2009) acknowledges, the participant researchers are “in the best position to unravel the garden-child interactions”. Blair identifies a key question that requires examination when she calls for research into “the level of structure versus self exploration in a garden that best serves the student’s learning needs” (2009). Her warning about guarding against biased or over-enthusiastic reporting is acknowledged, although it must be noted that enthusiasm for gardening, teaching and learning cannot be taken out of the research; they are important core components.

Dyment and Reid (2005) argue for green school grounds projects to become transformative. With this aim in mind they indicate two multi-layered areas that should be explored further:

- Learning and the nature of evidence of achievements, participation and barriers to participation in green school grounds projects; and
- What research, expertise, wisdom and experience, and in particular, that of participants, have to tell us about designing learning and professional development initiatives related to school ground projects? (p. 299)

Along similar lines, Johnson (2012) suggests research to advance gardening and inclusive environmental and sustainable development education should include:

- How schools plan effective and flexible learning experiences out of doors;
- Establish how teachers plan effectively for progression in gardening; and

- Establish how teachers identify critical incidents as children learn gardening skills and environmental education (p. 595).

As these researchers have identified, there is a need to examine in detail how teachers and students use these practical learning experiences in the garden. These same questions are applicable to the experiential learning experiences based on the harvest produced in the garden for example the cooking, preparing and sharing of healthy meals. Are they being used as a basis for authentic experiential learning inquiries, or only taken to the first step, “the doing”, not the thinking, learning and production of knowledge? This examination takes place in the current climate of education, where the tension between the urgent need for reconnecting children to nature, finding a sustainable way forward, helping children to develop both a healthy lifestyle and the key abilities that will be needed for the 21st century, are positioned against the demand for standardisation so teaching quality can be quantified and compared in the call for accountability.

Research into whether the kitchen garden experience can promote transformative change in education and help develop an ecoliterate vision for the future needs further examination. Does the kitchen garden fit into the critical pedagogy of place, as defined by Gruenewald (2003a)? In this research the children and teachers’ stories will become the “discourse” for the community of learners and reflect the sense of personal and communal empowerment experienced by the learners. It will contribute to the evaluation as to whether kitchen garden experiences contribute to ecoliteracy. This “discourse” will provide a deeper insight into the learning experiences provided by the kitchen garden and whether the kitchen and garden learning experiences can be considered authentic. The rest of the thesis shows how research now needs to go beyond a description of the kitchen- and garden-based learning and present a comprehensive examination of the different perspectives of the participants and their learning experiences. This thesis will address what the children are taking from these experiential gardening and cooking experiences. Additionally, we will need to question how teacher pedagogy and planning shape these experiences.

Chapter 3: Theoretical framework

Introduction

This chapter presents the theoretical framework and underlying philosophical assumptions in the social research approach taken in this thesis. The nature of the three layers of research at the primary school (the kitchen- and garden-based learning, the student learning and the teachers' work) dictated a qualitative case study methodology so that a detailed picture could emerge from the varied data sources and experiences of the participants. Participants' *meaning making* emerged from "fluid, social interactions", encouraged by the contextualised learning opportunities (Neuman 2006). Including the participants, both teachers and children, and giving them a "voice" so that the research was not on them but with them, were important research design considerations.

The purpose of this research was to understand the learning experiences of the children in the "Kitchen Garden" and "Pantry Plunder" units and understand how the planning of the teachers, and their different pedagogies, priorities and practices, shaped these experiences. Underlying this research is the broader question on whether experiential food and gardening programs in primary schools are pedagogically sound.

Social research paradigms

Sociologists study society and try to make sense of the world by examining societies' attitudes, beliefs, assumptions and rules. Social research methods vary, and although the basic aim is to produce knowledge, the various branches of research have very different ways of establishing this knowledge (Hammersley 2005). The underlying philosophical assumptions, or epistemology, result in completely different "ways of knowing". In the last fifty years there have been three dominant approaches or paradigms used to research social reality (Creswell 1998): positivism, interpretivism and critical social science.

The positivist or quantitative paradigm has traditionally been the approach of the natural sciences. The paradigm has evolved from an empiricist tradition, and emphasises that research should not be influenced by value judgments. The positivist paradigm aims to

eliminate researcher bias. Positivists assert that “scientific knowledge is utterly objective and that only scientific knowledge is valid, certain and accurate” (Crotty 1998 p. 29). The researcher’s subjective values and experience are irrelevant; “good” researchers should be able to set themselves apart from the research and achieve objective reality (Creswell 1994). The aim of the positivist paradigm is to determine causal laws or cause and effect relationships. This requires the formation of logical hypotheses and experimentation to test the theory, careful systematic, objective observations and accurate measurement of variables. Statistics are frequently used as tools to explain the significance of the results. Deductive reasoning that results in empirical knowledge is the desired objective. This procedure is often referred to as the experimental or scientific method.

The fundamental cornerstones of the scientific method are the principles of validity and reliability. One measure of reliability is whether other researchers, following the same procedure, can replicate the results. The reliability of the results relies on the measurement error within the methods used and the elimination of subjective judgements. The validity of the results refers to whether the scientific research method is carried out rigorously and actually measures what it intends to (Shuttleworth 2008). The positivists approach is summarised and clarified by Charmaz (2006):

Social researchers who adopted the positivist paradigm aimed to discover causal explanations and to make predictions about an external, knowable world. Their beliefs in scientific logic, a unitary method, objectivity, and truth legitimized reducing qualities of human experience to quantifiable variables. (p. 4)

Interpretivists argue that the positivist approach to research is insufficient for describing the experiences of people (Charmaz 2006; Neuman 2006; Polkinghorne 2010). According to Donald Polkinghorne (2010), the social reform movement in the 1970s aimed to study “the meanings and values through which people understood and made sense of their encounters with the world, with others, and with themselves” (p. 425). He explained their main criticism of the positivists, “their commitment to a numerical form of data and to statistical analyses, were inadequate for understanding human existence as it was experienced by persons” (p. 425).

Unlike the positivist approach, interpretive social science values socially constructed meaning and social action. Rather than explanation, the focus is on understanding. Rabinow and Sullivan (1979) use the term “interpretive turn” to emphasise the shift away

from the positive stance that research is neutral. Also called the qualitative paradigm, constructivist or naturalistic approach (Lincoln & Guba 1985), individual values and beliefs are acknowledged as being relevant to the construction of meaning, and the impossibility of being completely objective is recognised (Chamaz 2006; Denzin & Lincoln 1994; Neuman 2006). “*Lebenswelt*”, or the lived experience and *lifeworld*, shapes the way we interpret and understand the world; this is essentially subjective or “*Verstehen*” (Schutz & Luckmann 1973).

Constructivism takes on the essential understanding of interpretivism (that is, knowledge relies on shared meanings and understandings) and extends this to include how knowledge is produced and interpreted. Crotty (1998) clarifies this position:

Constructivism is based on the epistemological view that “all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context” (p. 42).

Research using a qualitative, interpretative approach generally focuses on understanding phenomena through the meanings people give them. Researchers who align themselves with an interpretivist paradigm are interested in studying the meanings, values or understandings of the world that individuals make in the context of their experiences (Polkinghorne 2010). The context is important and is essential for making sense of the experience. The authentic or natural setting “is not contrived, manipulated, or artificially fashioned by the inquirer” (Schwandt 2007). Any particular situation will involve multiple realities, involving “the researcher, those individuals being investigated, and the reader or audience interpreting the study” (Creswell 1994). According to Neuman (2006), “Social life exists as people experience it and give it meaning” (p. 88). Because people have different experiences and interpretations of these experiences, even within the same context, no one view is correct. The research design for this study required methods enabling both the individual and group understandings to emerge and develop. Naturalistic inquiry emphasises that understanding the nature of the social action requires “being there”; that is, the context that the action is performed in gives meaning to the action.

Where positivists rely on a deductive cause-and-effect approach, this is inappropriate for qualitative investigations. The constantly changing multiple realities makes it impossible

to establish causal laws. The interpretivist regime instead relies on methodology involving induction. Methods of analysis using inductive reasoning, where emergent categories coming from the data are used to establish shared meaning and understanding of a phenomenon, are the main tools of interpretative social science.

The third main approach to social research is critical social science (CSS). Neuman (2006) explains CSS shares a constructivist epistemology, but condemns the interpretive social science (ISS) approach as being too subjective, and deplores that the knowledge generated is not necessarily used for change or improvement:

To the CSS researchers, ISS is amoral and passive. It fails to take a strong value position or actively help people to see false illusions around them so that they can improve their lives (p. 95).

Critical social science examines society and its structures. This paradigm is also called the “transformative paradigm”, because the goal is to produce change. It aims to merge theory with action, and the aim is not merely to study society, but to change it. Critical social science is both reflexive and, by aiming to change society, it is also political (Bourdieu, cited in Neuman 2006 p. 95). Knowledge is power; this means that understanding the ways one is oppressed enables action to change the conditions that affect our lives; encouraging reflexivity and exposing discrimination can result in change, leading to emancipation and empowerment (Neuman 2006).

Denscombe also believes there are three main research paradigms, each with their own philosophical stance (2008). Two of these paradigms (quantitative with the positive belief system and qualitative with the constructivism belief system) align with Neuman’s research paradigms. However, Dencombe suggests the third paradigm employs mixed methods, with pragmatism underpinning its approach. One characteristic of mixed-methods research is the inclusion of both quantitative and qualitative components (Dencombe 2008; Miles & Huberman 1984). This paradigm includes the mixed-methods, mixed-models and participatory research approaches. Rather than a particular philosophical take, the mixed-method approach is practice driven, and generally selected for the “practical value for dealing with a specific research problem” (Denscombe 2008). The pragmatists reason that quantitative and qualitative methodologies can be seen as complementary approaches, suited to answering different types of questions (Thomas 2003), and that social researchers should take whatever elements are the most useful for

their research, from either qualitative or quantitative paradigms (Denscombe 2008). They “need to know and use a variety of methods to be responsive to the nuances of particular empirical questions and the idiosyncrasies of specific stakeholder needs” (Patton 2002 p. 585). The different methodologies can be used to minimise the weaknesses of individual methods, and strengthen and validate the research, resulting in more reliable findings (Laws & McLeod 2004). The reasons for using mixed methods should be made explicit. Miles and Huberman (1994) claim the important questions to ask are “not whether the two sorts of data and associated methods can be linked during study design, but whether it should be done, how it will be done, and for what purposes” (p. 41).

There is a growing group of researchers that believe instead of it being a case of one or the other, quantitative and qualitative methodologies can be seen as complementary approaches, suited to answering different types of questions (Creswell 1994; Denscombe 2008; Morse 1991; Neuman 2006; Patton 2002; Robson 2011; Thomas 2003). No matter whether it is a qualitative, mixed-methods, critical social research or quantitative approach, the research methodology and methods that are most appropriate for designing the research and collecting the data required to shed light on the research questions, should be intentionally and purposefully selected (Morse 1991; Neuman 2006; Patton 2002; Thomas 2003).

Research approach: constructivist epistemology

The design of this study is located in the qualitative paradigm, and draws on the philosophy of an interpretivist, constructivist epistemology as a theoretical framework (Creswell 1994; Crotty 1998; Guba & Lincoln 1994; Lincoln & Guba 1985). When the key differences between the quantitative and qualitative approaches outlined in Table 3.1 are studied, it is obvious that the research methodologies used for this research need to be selected from the qualitative approach.

Table 3.1 Quantitative versus qualitative

Quantitative approach	Qualitative approach
Measure objective facts	Construct social reality, cultural meaning
Focus on variables	Focus on interactive processes, events
Reliability is the key	Authenticity is key
Value free	Values are present and explicit
Theory and data are separate	Theory and data are fused
Independent of context	Situationally constrained
Many cases, subjects	Few cases, subjects
Statistical analysis	Thematic analysis
Researcher is detached	Researcher is involved

Source: Neuman (2006 p. 13)

This research does not attempt to measure objective facts or isolate variables; instead it employs an interpretive approach to explore subjective meanings and experiences that are constructed in the social reality of one school. The construction of knowledge while gardening or preparing food is subjective and personal; but it is also transactional. The shared experiences are discussed and reflected on. Understandings are modified by discourse within the group, and are hence socially constructed and imbued with the cultural meanings and multiple realities the individuals bring to the discussions (Neuman 2006). These stories cannot be effectively reduced down into a numerical value for statistical analysis; thematic analysis is more appropriate enabling the range of experiences to be captured.

The research cannot be independent of the context; the context of the kitchen and the garden is intrinsically linked to these experiences and meanings. The positivist tradition that relies on the researcher being objective and uses quantitative research methods focusing on reliable measureable variables, or quantities and statistics, is inappropriate for this research. This research cannot be value free. The researcher is not detached; she is involved and sited within the kitchen garden case study. It was the personal involvement of the researcher in the Kitchen Garden Project that initially stimulated the research. The reflexive interrogation of pedagogical practices and their effect on the children's learning experiences in the Kitchen Garden Unit and the Pantry Plunder Unit have also contributed to personal changes in pedagogy and practice for the researcher. It is important to be aware of this, and for the researcher to be explicit in the choices made

and directions taken allowing the reader to evaluate the study. Because the understanding generated by qualitative and quantitative methods has emerged from different philosophical grounding, the criteria for establishing the merit of research must also be appropriate and reflect these different paradigms.

In the design of this research four main elements needed to be made explicit (Crotty 1998). Each of these elements will affect the others. The ontological and epistemological stance taken depends on a researcher's *worldview* or understanding of reality and the nature of *knowing*. To understand the significance of the Kitchen Garden Project to the children and the learning that occurs through their interactions with one another while planting, maintaining and harvesting food plants with the aim of preparing and sharing healthy meals, the researcher took an interpretivist approach. The teachers' planning and pedagogy that informed the two units of work, the Grade 4 Kitchen Garden and the Grade 5 and 6 nutritional unit "Pantry Plunder", were examined from this same understanding; that is, that knowledge is constructed in a social context by collaborators bringing different experiences and understandings. This epistemological approach involves making sense of the meanings, contexts and processes as perceived from different participant perspectives and the shared meanings socially constructed by the group (See Figure 3.1).

Qualitative data collection methods enabling the participants' stories to be told in a fluid, descriptive manner are pertinent to this research. The children and their teachers are given a voice. In the hermeneutic tradition [discussed in greater detail in the following section], the multiple perspectives of the children and their teachers are broken down into themes to shed light on the "whole" and assist in understanding the relevance of the kitchen and garden in the learning and meaning-making of the children. The individual's previous knowledge, experience and views or *lifeworld*, influence their personal stories. The personal stories contribute to the group construction of knowledge and illuminate the experience of the Kitchen Garden Project.

These four elements inform the paradigm and each element informs one another as depicted in Figure 3.1.

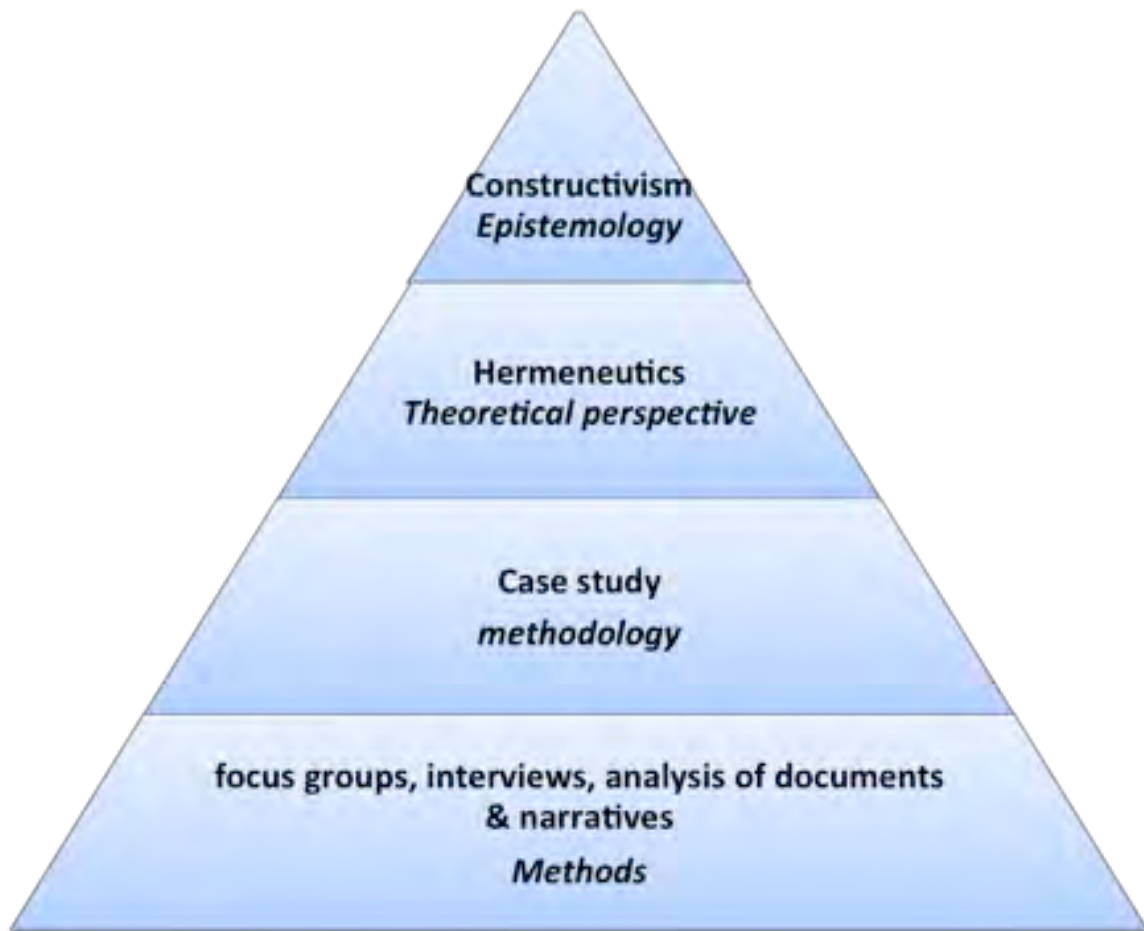


Figure 3.1: Elements of the research process (adapted from: *Elements of the research process*, Crotty 1998 p.3).

Epistemology: the theory of knowledge embedded in the theoretical perspective and thereby in the methodology.

Theoretical perspective: the philosophical stance informing the methodology, and thus providing a context for the process, grounding its logic and criteria.

Methodology: the strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes.

Methods: the techniques or procedures used to gather and analyse data related to some research question or hypothesis.

(Quoted in reverse order to reflect the hierarchy in Figure 3.1.)

The justification for the constructivist epistemology has been outlined; now the reasons for selecting hermeneutics, case study and specific research methods are discussed.

Hermeneutics (theoretical perspective)

The term hermeneutics is derived from Greek *hermeneutikos*, which means to interpret. Historically important works such as the *Bible* and the classics have been traditionally studied in detail to gain understanding and knowledge. This has led to the modern-day use of hermeneutics, where understanding is the priority, instead of the traditional empirical goal of explanation. Rather than causes, the goal is to understand the meaning or purpose (interpretivism). The meaning of the individual parts that make up a text can only be fully understood in the context of the whole. The whole text can only be understood if there is an understanding of the individual parts (Schwandt 2007). The whole and the individual components of a text are interdependent. The true meaning of a text can be understood if the meaning of the whole text and the meaning of the individual parts are understood and in complete agreement. Hermeneutics can be regarded as an underlying theory or philosophy, and as a deductive research method and mode of analysis aiming to make sense of what is said or written in a particular context (Bleicher 1980). The hermeneutic circle is shown in Figure 3.2, as conceptualised by Schwandt.

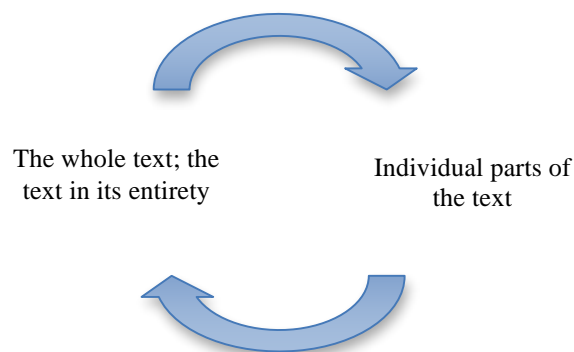


Figure 3.2: The hermeneutic circle as a method of interpretation (Adapted from Schwandt 2007 p. 133)

The understanding of the Kitchen Garden Project requires an understanding of the individual contributing parts of the program. The children, the teachers, the teachers' planning, the kitchen garden, the school community and the priorities of the administration of the school in which the Kitchen Garden Project evolved, have all shaped the Kitchen Garden Project. To gain understanding, both the contexts of the

kitchen and garden, “the whole” and the multiple perspectives and different experiences of the participants or “individual parts” need to be investigated to construct an understanding of the phenomenon of the Kitchen Garden Project. The case studies on the Grade 4 Kitchen Garden Unit, and Grade 5 and 6 nutritional unit “Pantry Plunder” are both part of the holistic experience of the Kitchen Garden Project and also independent parts. The “hermeneutic cycle” approach was used to examine the three layers of research: the nature of the kitchen and garden-based learning, the children’s learning, the teachers’ work, and how they interconnected. There is a constant juxtaposition and tension between deconstructing what was said across all the interviews to let common themes emerge, and hearing the story as a meaningful unit in its own right where the voices of the participants are transmitted through their narratives. This follows the hermeneutic cycle, where understanding the individual components is essential for understanding the unified whole, but does not tell the complete story. The whole also needs to be understood as a complex, complete, integrated entity; the sum of individual components may omit the context, the way the story unfolds and how one action or comment is a stimulus for another (Schwandt 2007).

Methodological choices and rationale

An evaluation of the differences between the qualitative and quantitative research approaches (see Table 3.1) established that the research demanded a qualitative approach. Creswell (2007) has outlined different reporting structures required for five of the main qualitative approaches: narrative, phenomenology, grounded theory, ethnography and case study. He explains that the type of question or problem to be answered, as well as the unit of analysis (number of participants) will dictate the structure and design of the study. While each could contribute to this research, the three approaches that align most closely to the research questions were case study, narrative research and grounded theory. The different characteristics of these are explored in Table 3.2, and will be discussed further in greater detail.

Table 3.2: Contrasting characteristics of case study and grounded theory approaches

Characteristics	Case study	Narrative research	Grounded theory
Focus	Developing an in-depth description and analysis of a case / multiple cases	Exploring the life of an individual	Developing a theory grounded in data from the field
Type of problem best suited for design	Providing an in-depth understanding of case/s	Needing to tell stories of individual experiences	Grounding a theory in the views of participants
Discipline background	Drawing from psychology, law, political science, medicine	Drawing from the humanities including anthropology, literature, history psychology and sociology	Drawing from sociology
Unit of analysis	Studying an event, a program, an activity, more than one individual	Studying one or more individuals	Studying a process, action, or interaction involving many individuals
General structure of study	Entry vignette Introduction (problem, questions, case study, data collection, analysis, outcomes) Description of the case/cases and its/their context Development of issues Assertions Closing vignette (Adapted from Stake 1995)	Introduction (problem, questions) Research procedures (a narrative, significance of individual, data collection, analysis outcomes) Report of stories Individuals theorise about their lives Narrative segments identified (events, processes, epiphanies, themes) Summary (Adapted from Denzin 1989)	Introduction (problem, questions) Research procedures (grounded theory, data collection, analysis, outcomes) Open coding Axial coding Selective coding and theoretical propositions and models Discussion of theory and contrasts with extant literature (Adapted from Strauss & Corbin 1990)

Adapted from Creswell 2013.

Case study methodology

Case studies focus on a particular phenomenon or object in its natural setting. The case study approach is useful when the research requires in-depth understanding of a contemporary case or cases (Creswell 2013). Like narrative inquiry, case studies may be regarded as both the process of inquiry and the phenomena of the inquiry (Pinnegar & Danes 2007; Stake 2005). Where grounded theory requires that the literature review is left until the data have been coded to avoid preconceptions, Yin (2003) states that “theory development as part of the design phase is essential, whether the ensuing case study’s

purpose is to develop or test theory” (2003 p. 28). The theory informs the research questions, design, data collection and strategies for analysing the data (Yin 2003).

A literature review focused on “authentic learning” was undertaken before data collection began. The review of the literature on authentic learning was used to synthesise the key characteristics of authentic learning; this formed the theoretical framework (see Chapter 2) used to analyse the children’s learning in the two cases. Given this a priori knowledge, case study methodology informed by narrative approaches for data analysis was purposively selected. The learning tasks have been broken down into steps and compared with the characteristics of authentic learning and these individual components are illuminated by quotes from the children to explain and illustrate their learning. The excerpts from the focus group interviews are used to illustrate the findings and demonstrate how the research findings were derived from the data (Polkinghorne 2004).

Case studies are able to detail the voices of the participants from multiple sources of data. These can be triangulated to confirm the validity of the processes and increase confidence in the interpretation of meaning (Stake 1995; Yin 1994). To ensure that individual and collective voices are captured, and in the tradition of hermeneutics, so that both the whole picture and the individual parts are understood and inform one another, vignettes were included in the reporting structure to illustrate the intrinsic interest of the Kitchen Garden Project. The need for selecting methodology enabling both individual and collective voices to be heard was also relevant to the second case study on the Grade 5 and 6 nutritional unit “Pantry Plunder”, as well as the layer of research “teachers’ work” investigating the input the teachers’ planning had on the two cases. The case study structure proposed by Stake (1995) and adapted by Creswell (2013) was used to structure this research (see Table 3.2). A graphic representation of the research design is presented in Figure 3.3.

“The advantage of the case study is that it can ‘close in’ on real-life situations and test views directly in relation to phenomena as they unfold in practice” (Flyvbjerg 2011 p. 301). The “case” should be the centre of the inquiry (Stake 1998). Yin (1994) elaborates on when case study methodology should be used. The three main types of case study research design include exploratory, explanatory and descriptive (Yin 2003). He specifies that the case be a contemporary phenomenon, and should be investigated within its real-

life context, particularly when multiple sources of evidence are used and the boundaries between the phenomena and context are poorly defined. Although the boundaries between the phenomena and the context may be poorly defined as in the kitchen garden, the case must have some boundaries (Merriam 1998; Stake 1995). Three main types of case studies have been defined by Stake according to the case study goal: *intrinsic*, *instrumental* and *collective* (Crowe et al. 2001; Stake 1995). A case study undertaken to learn about a unique phenomenon is labelled an intrinsic case study. Case studies that aim for a broad understanding of a phenomena or problem are labelled instrumental case studies. Where multiple case studies are examined, to gain a broader understanding of the phenomena or problem, they are called “collective” case studies (Crowe et al. 2001; Stake 1995). The advantage of developing more than one case study lies in the ability to make comparisons or to check whether themes or the theory are replicated. The reader is left to judge whether the case study “resonates” with their experience (Stake 1995).

A case study approach is an appropriate “holistic” way to frame the research. It is an appropriate method for this research because the natural, real-life contexts of the kitchen and the garden were central to the research. The two embedded cases were bounded; they explored the learning experience of clusters of students at three grade levels within two units of work at one semi-rural primary school, and the role the teachers’ planning, pedagogy and practices shaped the learning outcomes of the two units. Although the units of work were of different durations (the kitchen garden unit was timetabled throughout the year and the Pantry Plunder Unit only went for ten weeks in length), the two cases used broadly comparable multiple data sources for evidence (Figure 3.1). While the prior knowledge of the researcher built up by previous experience teaching the Kitchen Garden Unit, made grounded theory inappropriate, it may be beneficial in case study research and contribute to insights and understanding of the case. Stake created a checklist of criteria to be considered when assessing the quality of a case study report (Appendix C).

Approaches to data analysis

Grounded theory was initially developed as a method of inductive analysis for qualitative research, where the theory emerges from the data (Glaser & Strauss 1967). Glaser and Strauss make explicit the research strategies and the methodology used to develop theories from qualitative data. Their grounded theory methodology has pragmatist

underpinnings and “simultaneously employs techniques of induction, deduction, and verification to develop theory” (Schwandt 2007 p. 131). It is often used as a method for investigating particular phenomena in detail within a specific context, and generally involves gathering data from many individuals. Grounded theory has been widely used as a method of analysis, and has been adopted by different research paradigms including quantitative, or mixed-method approaches (Glaser 2002). When a theory or model has not been developed to explain phenomena, grounded theory can be used to *generate or discover a theory* using the data (Creswell 2013). Charmaz explains grounded theories are “products of emergent processes that occur through interaction” (2006 p. 178). Unlike Glaser’s and Strauss’s initial grounded theory method which aims to reduce or eliminate the researchers preconceived ideas and subjectivity, Charmaz takes the position that it is important to recognise that grounded theory must by nature be interpretative because the data are examined through the subjective lens of the researcher (Charmaz 2006; Neuman 2006). Charmaz (2006) takes the view that rather than discover the theory; we are part of the process and “construct” our theory:

We construct our grounded theories through our past and present involvements and interactions with people, perspectives and research practices. My approach explicitly assumes that any theoretical rendering offers an interpretive portrayal of the studied world, not an exact picture of it (p.10).

Charmaz (2006) expounds a constructivist grounded theory, acknowledging the subjective nature of the views and actions of the researcher, the multiple realities and lifeworlds making the grounded theory approach inherently interpretive (Creswell 2006). She also acknowledges the conclusions drawn from grounded theory are “suggestive, incomplete, and inconclusive” (Charmaz 2006). Bryant & Charmaz (2010) identify one of the key strengths of grounded theory methods as offering “... a foundation for rendering the processes and procedures of qualitative investigation visible, comprehensible, and replicable” (p. 33).

One of the criticisms of grounded theory is that in the hands of inexperienced researchers, grounded theory analysis may result in myriad categories that have nothing to do with generating theory. Instead of the final phase of selective coding being used to develop a conceptual framework, which can then be used to coalesce innovative theory, categories are merely grouped into themes (Creswell 2013; Silverman 1993). Creswell explains that

it is what is done with these themes that is important, and that linking and layering these themes can “add additional rigor and insight” into interpretive research (Creswell 2013).

The very nature of grounded theory dictates that if it is going to be used for generating original theory, the analysis should be completed before the review of the literature, so that the theory generated is grounded in the data and not distorted by prior expectations (Glaser 1998; Creswell 2013). It is this last point that makes grounded theory inappropriate for this research design. This research is informed by both the literature and the prior understandings of the researcher.

Narrative inquiry

The increasingly mainstream use of narrative inquiry has evolved from the desire of the interpretive research movement to understand social and cultural differences in the lived reality of individuals. The use of narrative methodologies in research has been critiqued as being humanistic, rather than rigorous and scientific. This criticism of narrative is also one of its strengths, and makes it particularly relevant in this research. Narratives are a way we make sense of the world (Polkinghorne 1988). Narratives research “seeks to understand and represent experiences through the stories individual(s) live and tell” (Creswell 2013). Oral, written and visual narratives illuminate individual experiences and can be used to provide insight into the complexity of human lives (Trahar 2009). The use of narrative in the case study of the Kitchen Garden Project is a way of gaining an insight into the meaning the participants place on the experience of being involved in the Kitchen Garden Project and subsequent Pantry Plunder Unit. Rather than one grand mono-logical truth, the subjective, the personal, the many different voices add layers of understanding. It is a subjective and dynamic knowing, dependent on the context and the people involved in the “story-making”. Polkinghorne supports the use of hermeneutic methods for understanding narrative. He explains that because language in its everyday use is able to carry meaning between people, inferences can be made about meaning through the “messages” people give about their experiences (1988). However, he also warns of the limitations of analysing narratives because linguistic statements are context dependent.

Narratives are crucial to this context-dependent research, where understanding the value and meaning the participants put on their involvement and experiences is pertinent to understanding the phenomena of the kitchen garden. A numerical result on a survey or

summative test would give limited information and completely ignore any wider social consequences of the kitchen garden.

Narrative analysis and analysis of narratives

Some narrative researchers draw a distinction between the terms “analysis of narratives” and “narrative analysis” (Polkinghorne 1995). According to Polkinghorne, the two main definitions and approaches for using narratives are:

1. analysis of narrative — involves using paradigmatic reasoning, identifying the common themes across a range of stories or narrative data; and
2. narrative analysis — involves shaping the data in narrative form, looking closely at one story in detail and how it is different or unique; it looks at the complexities.

In the hermeneutic tradition there are elements of both types of analysis in the treatment of the data. Analysis of narrative was selected as the most appropriate analytical method to allow the key elements and categories to emerge from the narrative data collected in the focus group interviews and students’ written work. Wherever these themes were mentioned in the focus group interviews or student writings, they were coded according to the meaning. To illustrate these meanings, examples of the children’s quotes are given. As Polkinghorne indicates, there are some similarities to Glaser and Strauss’ grounded theory method (1995). This thematic analysis was also used to analyse and interpret the Professional Learning Team interviews about the e5 inquiry. Repeating themes from the individual teacher’s interviews were threaded together into a collective narrative. Individual teachers member checked the collective story to ensure that it reflected their understandings.

A narrative analysis approach was used when an individual told a story. Kathleen Wells (2011) explains this approach where “Narrative analysis takes stories as its primary source of data and examines the content, structure, performance, or context of such narratives considered as a whole” (p. 7). Narrative analysis is concerned with how and why the narrative was constructed, as well as what the narrative achieves and how it is received (Bosk 2011). This approach to analysis was used in the vignettes, the anecdotal stories about the kitchen garden or about the participants. “At heart, narrative analysis

rests on the assumption that narratives themselves require an interpretive act. The report, the narrative, the story, is a socially produced account that should not stand alone as a social fact” (Wells 2011 p. 37). Even when one person is telling the story, as they give a personal, interpretive account, it is an incomplete account (Denzin & Lincoln 1994 Polkinghorne 2004). Riessman makes the additional point that excluding the interviewer’s questions from a narrative would be false, particularly when the questions have directed or shaped the narrative (2008). To address this pertinent point, examples of the interview questions are included (Appendix D: Sample questions for focus group interviews and Appendix E: Sample questions for teacher interviews), and where needed, to make sense of the story, the interview questions are included in the text and results tables. As the researcher is immersed in the school setting the case is supported by a naturalistic enquiry. The case study has two embedded cases, the Grade 4 Kitchen Garden Unit and the Grade 5 and 6 nutritional ‘Pantry Plunder’ unit. The three layers of research are explored across these two embedded cases using a hermeneutic approach. Narratives are co-constructed, the interviewer, listener or audience will affect what is said or explained, and their interpretive framework will affect the meaning given to the narrative (Denzin & Lincoln 1998; Polkinghorne 2004; Riessman 2008). These two different approaches for the analysis of the narrative data ground the research in interpretive hermeneutics. The research design is outlined in Figure 3.3.

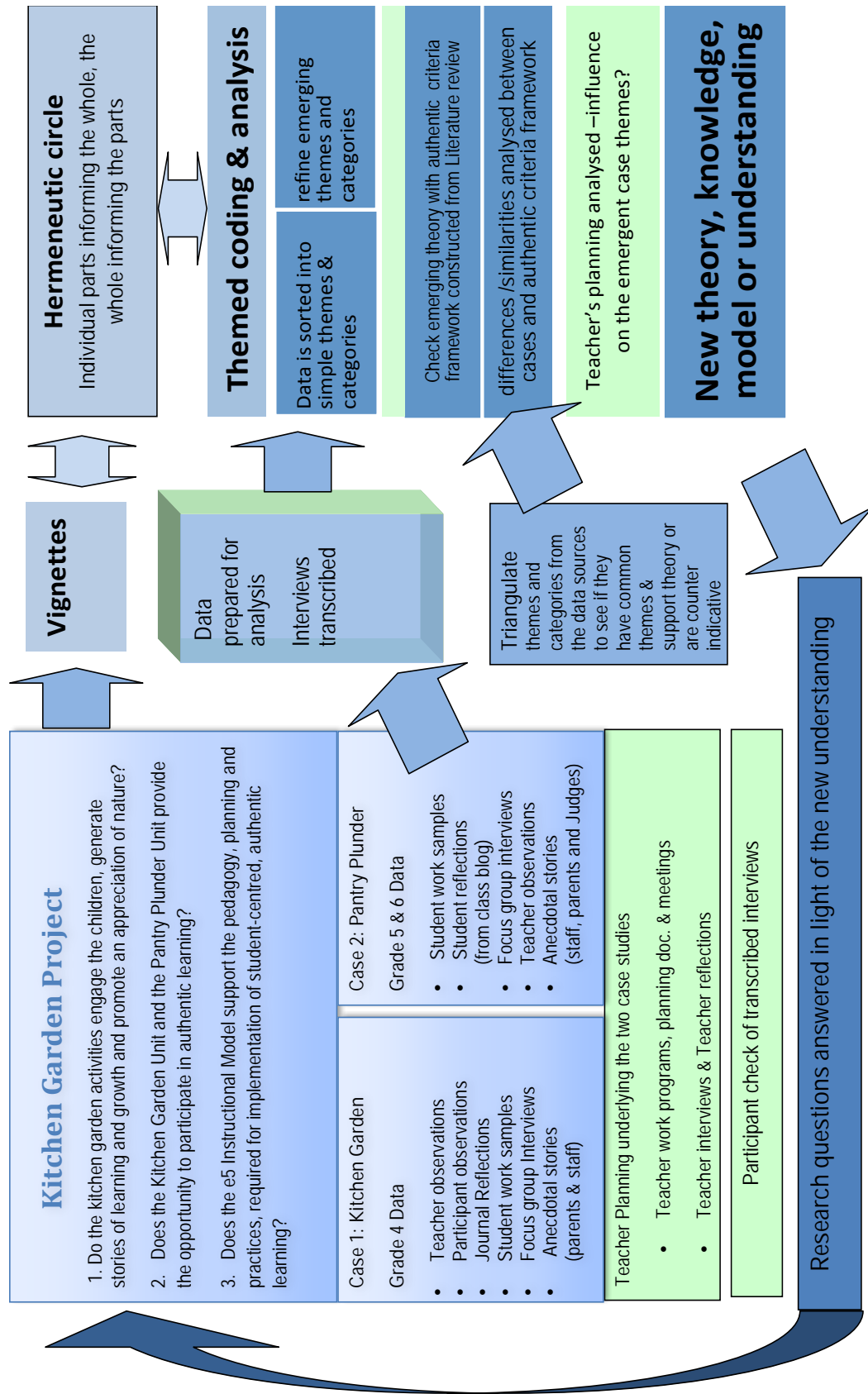


Figure 3.3: Research design

Rigour and trustworthiness of qualitative research

Maxwell (1996) outlines the advantages inherent in qualitative research:

“The strengths of qualitative research derive primarily from its inductive approach, its focus on specific situations of people, and its emphasis on words rather than numbers” (p. 17).

Positivist research values objectivity, reliability, as well as internal and external validity. The key criticisms of qualitative research are that the findings cannot be addressed in the same way. Researchers working in the qualitative paradigm have responded to these criticisms. The next section explores transferability, credibility, triangulation, confirmability and objectivity. These are criteria that should be addressed in qualitative research to ensure that the research is trustworthy (Bassey 1981; Guba 1981; Stake 2005).

Transferability

Transferability addresses the positivist equivalent of generalisability. Positivist research studies usually have a large sample size, because one of the aims is to apply the results from research to a larger population. In comparison, the sample size in a qualitative study is often small. The focus is on depth, rather than breadth. The findings of qualitative research are specific to the individuals and context. Stake observes that although each case is unique (because they are also part of a broader group), similar findings may occur in another group (Stake 1995). One of the measures of transferability is to compare the findings with previous research to see if the findings have any similarities.

Rather than use a case study to make scientific generalisations, Stake places importance on the “intrinsic interest” of a case (Stake 2005). Instead of large numbers that can be treated statistically to predict or generalise, the case study aims to provide a smaller, more in-depth and detailed study, and aims for explanation and understanding. “A successful case study will provide the reader with a three-dimensional picture and will illustrate relationships, micropolitical issues and patterns of influences in a particular context” (Bell 2010 p. 9). Not being able to generalise findings is one of the main criticisms levelled at case study research. Bassey (1981) counters this criticism:

[T]he extent to which the details are sufficient and appropriate for a teacher working in a similar situation to relate his decision making to that described in the case study’, is more important than generalizability (p. 85).

The reader will have knowledge they will use either to draw parallels or contrast with the case study (Mertens 2010). It is the responsibility of the researcher to provide a rich, thick description of the context so that the reader can judge whether it is appropriate to transfer the results and conclusions to another context (Bassey 1981; Lincoln & Guba 1985; Mertens 2010; Stake 1995). Guba and Lincoln note that “vicarious experience, often provided by case study reports” assists the transference of knowledge from one setting to another (1994). Apart from a description outlining the context of the phenomena being studied, the data also add another layer to the “thick description” of the case. The focus group interviews and participants’ quotes or stories based on the Kitchen Garden and Pantry Plunder units assist with the interpretation of the case and the reader’s evaluation of its transferability.

Credibility

Credibility is analogous to the positivist construct of internal validity, which refers to whether the study is actually testing what it purports to. Whether a study has credibility depends on how close the findings are to reality. To ensure credibility it is recommended that well-established research methods are followed (Yin 1994). Lincoln and Guba endorse prolonged engagement between the researcher and the participants for the researcher to develop an understanding of the organisation and to develop a relationship of trust between the participants and the researcher, although they also warn that professional judgements may be compromised if one becomes too immersed in the culture (1985). Participant selection also has a bearing on credibility. There is debate about whether to use random sampling of participants to avoid biased selection, or purposeful sampling to ensure that the contributions are useful. Sampling will be dictated to some extent on the parameters of the research. Participants need to feel as though they can answer questions honestly in response to an independent researcher, and also should be made aware that they can withdraw from the research at any time.

Another way to promote credibility is through member checks. Meaning is often given in non-verbal ways by pauses, tone or gesture. These may be omitted from the transcripts of interviews, altering the intended meaning even when interviews are transcribed accurately. Shenton (2004) suggests member checks as one way to counteract bias in reporting. When interviews were transcribed, the teachers were given the opportunity to view the transcripts to check whether their words said what they intended. Audio

recordings capture the fluid nature of conversations including the pauses, the repeated phrases and changes of wording or direction as the ideas form and are self-edited. The transcribed interviews required some editing to enhance the smooth translation from verbal to the written word. The corrections the teachers made to the transcripts were mainly grammatical in nature and were made to make the ideas flow in a logical manner rather than for the purpose of censorship. Due to the timing of the focus group interviews (at the end of the school year), the children were not given the interview transcripts to check. Where the children placed particular emphasis by tone or gesture, this was indicated in the transcription however due to the nature of the focus groups, occasionally children spoke over one another or it was difficult to attribute the words to a specific child. Where this happened the comments were identified by the focus group interview rather than pseudonym.

Thick or detailed descriptions of the phenomena assist the reader in evaluating whether the findings are believable and “ring true”. The nature of the research dictated purposeful selection of the teachers; teachers involved in planning and implementing the units were asked to participate. The student selection in this research was pragmatic, rather than purposeful. All students participating in the units were given the opportunity to participate provided they and their parents had signed the permission forms and were available when the focus group interviews were being held. Participant selection is discussed in greater detail in Chapter 4.

Triangulation

Triangulation is one of the most commonly used methods to check the credibility of qualitative data. Multiple sources of data can be used to extract the salient information and then triangulated to see if the different sources are in agreement or not. Triangulation has come from the use of multiple reference points to locate an objects position. In research, triangulation is used as a method to check the validity of the data by comparing the multiple sources of data. As defined by Denzin (1978 p. 291), triangulation is “the combination of methodologies in the study of the same phenomenon”. The accuracy of the research conclusions is improved by collecting different kinds of data on the same phenomenon. “Triangulation involves checking information that has been collected from different sources or methods for consistency of evidence across sources of data” (Mertens 2010 p.183). The limitations of the individual data collection methods are minimised.

Because triangulation uses multiple sources of data, it broadens and deepens one's understanding of the phenomena being examined (Olsen 2004; Yin 2003). Denzin agrees and clarifies: "Objective reality will never be captured. In-depth understanding, not validity, is sought in any interpretive study" (Denzin 1978 p. 246). Yin (2003) analyses the strengths and weaknesses of six sources of evidence. Different data sources will have different advantages and different faults. He explains one of the strengths of the case study methodology is the variety of sources of evidence that can be utilised in developing the case. He suggests that these "multiple sources of evidence" can be used to triangulate research findings to check for accuracy. Table 3.3 (adapted from Yin 2003) examines the strengths and weaknesses of the data sources relevant to this study.

These different sources provide a means to check the trustworthiness of the data via triangulation (Lincoln & Guba 1985). As the researcher is also part of the data collection process it is important to identify influences the researcher may have on the data collection. The researcher recorded personal responses and feelings alongside the observations and anecdotal notes made during the kitchen garden sessions and the focus group interviews in a research journal. Quotes from this journal are detailed when relevant.

The weaknesses of most concern in this research are the possibility of researcher bias and the reflexivity of the participants. As past teacher of some of the children, it is possible that they may try to give "what the interviewer wants to hear" (Yin 2003 p. 86). The researcher must guard against biased selectivity of the participants and documents, as well as bias in questioning and reporting. The strengths and weaknesses of the data sources relevant to this research are outlined in Table 3.3.

Table 3.3: Strengths and weaknesses of data sources (Yin 2003 p. 86)

Source of evidence	Strengths	Weaknesses
Documentation	Stable — can be viewed repeatedly Unobtrusive — not created as a result of the case study Exact — contains exact names, references, and details of an event Broad coverage — long span of time, many events, and many settings	Retrievability — can be low Biased selectivity, if collection is incomplete Reporting bias of author Access — may be deliberately blocked
Interviews/focus groups	Targeted — focuses directly on case study topic Insightful — provides perceived causal inferences	Bias due to poorly constructed questions Response bias Inaccuracies due to poor recall Reflexivity — interviewee gives what the interviewer wants to hear
Observations (participant and direct)	Reality — covers events in real time Contextual — covers context of event Insightful into interpersonal behaviour and motives	Time-consuming Selectivity — unless broad coverage Reflexivity — event may proceed differently because it is being observed Cost — hours needed by human observers

Confirmability

An audit trail is a record of everything that is done in a research project, from the start of the research project to the reporting of findings. Lincoln and Guba (1985 pp. 319–320) detail Halpern's (1983) categories for reporting and developing an audit trail:

Raw data — including electronically recorded materials such as videotapes and stenomask recordings; written field notes, unobtrusive measures such as documents and records and physical traces; and survey results;

Data reduction and analysis products — including write-ups of field notes, summaries such as condensed notes, unitized information and quantitative summaries; and theoretical notes, including working hypotheses, concepts, and hunches;

Data reconstruction and synthesis products — including structure of categories (themes, definitions, and relationships), findings and conclusions (interpretations and inferences); and a final report including connections to the existing literatures and an integration of concepts, relationships, and interpretations;

Process notes — including methodological notes (procedures, designs, strategies, rationale); trustworthiness notes (relating to credibility, dependability and confirmability) and audit trail notes;

Materials relating to intentions and dispositions — including inquiry proposal, personal notes (reflexive notes & motivations), expectations (predictions & intentions); and

Instrument development information — including pilot forms, preliminary schedules and observation formats.

A clear description of the research path should be given to make the decisions and rationale for choices transparent. The audit trail means that theoretically, someone could retrace the steps of the research. Shenton (2004) summarises and formulates Guba's criteria for trustworthiness, into a useful table for researchers—Table 3.4.

Table 3.4: Criteria for trustworthiness (Source: Shenton 2004 p. 64).

Quality criterion	Possible provision made by the researcher
Credibility	Adoption of appropriate, well-recognised research methods Development of early familiarity with culture of participating organisation Random sampling of individuals serving as informants
Triangulation via use of different methods, types of informants and sites	Tactics to help ensure honesty in informants Iterative questioning in data collection dialogues Negative case analysis Debriefing sessions between researcher and superiors Peer scrutiny of project Use of “reflective commentary” Description of background, qualifications & researcher experience Member checks of data and interpretations/theories formed Thick descriptions of phenomena under scrutiny Examination of previous research to frame findings
Transferability	Provision of background data to establish context of study and detailed description of phenomena in question to allow comparisons to be made
Dependability	Employment of “overlapping methods” In-depth methodological description to allow the study to be repeated
Confirmability	Triangulation to reduce investigator bias Admission of the researchers beliefs and assumptions Recognition of shortcomings in study's methods and their potential effects In-depth methodological description to allow integrity of research results to be scrutinised Use of diagrams to demonstrate “audit trail”

Objectivity

All research is guided by personal preferences and viewpoints; complete objectivity is impossible due to ideological biases of the researcher. If, however, the views and ideology of the researcher are made transparent, then the reader is able to judge the merits of the research. The researcher must try to control their biases and preferences and let the data dictate the direction. According to Stake (1995), the greater the intrinsic interest the researcher has in the case, the more necessary it is to control the “special interests” and endeavour to “discern and pursue issues critical” to the case (p. 4).

Chapter 3 provides an overview of the theoretical research paradigms that provide the framework for social inquiry. Constructivist epistemological approaches, together with the justification for the case study research method, are argued. The methods, data collection and data analysis undertaken in this research have been outlined. Denzin and Lincoln (1994 p. 2) draw attention to the context as well as the detailed examination, when they explain the importance and aim of qualitative research, “to study things in their natural settings, attempting to interpret or make sense of the meaning people bring to them”. Yin (2003) clarifies this further by adding that case studies do not rely on a controlled, artificial environment, but instead analyse existing, real-life situations in detail, examining the social interactions and complexities, and finally, explaining the findings in a clear and comprehensible way. These are characteristics inherent in the kitchen and garden program, are relevant to this research and justify the theoretical framework and approaches taken.

Summary

This research employs an interpretive lens to examine two embedded case studies, within the context of a primary school setting. The Grade 4 Kitchen Garden and the Grade 5 and 6 Pantry Plunder Units use experiential learning based on tasks relevant to the lifeworlds of the children. They provide the context for the children’s social interactions. As it is the detail and the stories that come out of the study that is of importance to this research a qualitative approach is demanded. Within the Kitchen Garden Project, the two cases (the Grade 4 Kitchen Garden and the Grade 5 and 6 nutritional unit “Pantry Plunder”) have three layers of inquiry relevant to both case studies: contextualised garden-based and kitchen learning, student learning and teachers’ work. These layers are used to order the multiple sources of data and structure the thesis. The overlap facilitates comparison, enabling triangulation, judgement about the dependability, and overall trustworthiness of the research.

Chapter 4: Research approaches

Introduction

Case study methodology with a narrative inquiry approach was selected as appropriate for this research because it is the overarching story of the kitchen garden, and the subjective stories of the children and their teachers, which are important in this study. Initially, the research focused on the Grade 4 kitchen garden. When the Grade 4 cohorts requested to continue the kitchen garden into Grade 5, the decision to develop a new nutritional unit of work provided the opportunity to extend the research and compare the two-contextualised units. The teachers' planning, pedagogies and practices were explored to gain insight into effective teaching approaches for implementing kitchen- and garden-based units of work.

This research examines the learning that occurs through the agency of the Grade 4 Kitchen Garden Unit and the Grade 5 and 6 Pantry Plunder Unit. It is the construction of knowledge in the social context of the garden, the preparation and sharing of food and the range of perspectives in evidence in the narrative created by the children and teachers that informs this inquiry. These two units of work both had learning about nutrition and producing healthy meals as key objectives, but they differed in many other ways, including the duration of the units, the age and level of the classes completing the units of work, the teachers and the planning underlying the two units. The Grade 4 Kitchen Garden Unit involved experiential outdoor work in the garden, kitchen-based food preparation and cooking, as well as classroom-based plant and health theory. The Grade 5 and 6 Pantry Plunder Unit built on the Grade 4 experience and focused on health, nutrition (including the recommended daily intake of the main food groups) and culminated in a competition to produce a healthy lunch.

The teacher's planning for the Pantry Plunder Unit was a focus for the Professional Learning Team 4 (PLT4), to trial the teaching framework provided by the e5 Instructional Model (DEECD 2009b). It provided the opportunity to examine in depth the teachers' planning, pedagogies and practices involved in the implementation of this unit. The planning for the Grade 4 kitchen garden was influenced by the demands of the garden;

that is, the seasons and what maintenance tasks needed to be done in the garden. The herbs, fruit and vegetables that were ready to be harvested shaped the food that was prepared in the cooking classes. The Victorian Essential Learning Standards (VELS⁶) informed the framework the Grade 4 teachers used for planning the Kitchen Garden Unit. The two units, the Grade 4 Kitchen Garden and the Grades 5 and 6 Pantry Plunder, became the two embedded cases under the umbrella term the Kitchen Garden Project.

Background information: The Kitchen Garden Project

The Kitchen Garden Project case study occurred at one state primary school, in the Loddon Campaspe region of Victoria. The school is not named to protect the anonymity of the children and teachers. In the years in which the data were collected between 2009 and December 2010 the school had an average enrolment of 400 students, approximately 53 per cent boys and 47 per cent girls (Data, Outcomes and Evaluation Division, DEECD 26 August 2011). The school community was predominately Anglo-Saxon; this is reflected in the school's low percentage of children (0.04 per cent) coming from a background where a language other than English is spoken at home (Data, Outcomes and Evaluation Division, DEECD updated 22 June 2011). The school has a low turnover of staff with the majority of staff having worked at the school for over eight years. The area has traditionally been regarded as being semi-rural, but due to regional corridor improvements and changes in demographics with increases in the number of retirees and rural "lifestyle" commuters, the area is experiencing growth and development pressure. Although small farms surround the school and local housing estates, the town is rapidly becoming suburban in nature.

⁶ Prior to the introduction of the AusVELS in 2013, the Victorian school curriculum was based the Victorian Essential Learning Standards (VELS). The VELS was first published in 2005. They outline what is essential for all Victorian students to learn during their time at school from Preparatory to Year 10, and provide a set of common statewide standards which schools use to plan student learning programs, assess student progress and report to parents.

The Kitchen Garden Project

The overarching objective of this research is to explore the participation of primary school children, evaluate the learning that occurs through participation in the kitchen garden program, and decide whether kitchen- and garden-based learning programs are worthwhile additions to the curriculum.

The Kitchen Garden Project consists of two case studies:

1. The Grade 4 Kitchen Garden Unit (gardening and cooking unit for Grade 4 children taken over the four terms of the school year), and
2. “Pantry Plunder” (a one-term, ten-week Grade 5 and 6 nutrition unit).

Research questions

1. Do the kitchen garden activities engage the children, generate stories of learning and growth and promote an appreciation of nature?
2. Do the Kitchen Garden Unit and the Pantry Plunder Unit provide the opportunity to participate in authentic learning?
3. Does the e5 Instructional Model support the pedagogy, planning and practices required for the implementation of student-centred, authentic learning?

Methodology

Interpretative case study methodology using multiple qualitative methods for data analysis were used to direct three layers of inquiry around kitchen and garden-based learning: the context, content and characteristics of kitchen and the garden-based learning, the student learning, and the teachers’ work (from Chapter 3).

Approach to participant selection

Students

The purpose of this research is to understand the phenomenon of the kitchen garden and the following unit “Pantry Plunder” from the subjective perspectives of the participants. The multiple participants provide accounts from different perspectives and enhance the ability to get to the core experience of the Kitchen Garden and the Pantry Plunder Units. The aim is to gain understanding of the experience from the points of view of the children and their teachers.

After consultation with the school principal, it was decided to be inclusive; all the children in Grade 4 were invited to participate in the initial study on the Grade 4 kitchen garden. When the additional case, the Grade 5 and 6 Pantry Plunder Unit was incorporated into the research, adherence to the same principle resulted in a general invitation to participate being issued to all of the Grade 5 and 6 children.

All Grade 4 children in 2009 and Grade 5 and 6 children in 2010 at the school were informed about the research and invited to participate. They were given a cover letter explaining the research and a permission form to be signed by the child if they wanted to participate and their parent or guardian. They were informed that they could withdraw from the research at any time. The consent form was approved by the Victorian University ethics committee and included information on the voluntary nature of participation, the confidentiality of information and the ability to withdraw from the research at any time. The participant interviews were open to any of the children in the Grades 4, 5 and 6 who returned the signed permission forms and were available to participate on the days of the focus group interviews.

To obtain rich information, purposive sampling is recommended to shed light on the phenomena (Creswell 2007); however, rather than purposive sampling, an inclusive, pragmatic approach was taken in respect to participant selection from the Grade 4, 5 and 6 classes for the following reasons:

- To promote inclusivity — focus group interviews were open to any students who returned signed permission forms and were available on the day for the focus group. The principal and the researcher did not wish to exclude any child;

- It was important to encourage all children to participate so that a wide range of views and experiences were articulated; and
- It was not known in advance which children would be a source of “rich data”.

To minimise disruption to normal school work, the class teachers nominated an appropriate time to hold the focus group interviews. Children who had returned permission forms and had the time to participate were selected. Because the focus group interviews took place near the end of the year, some children had other work to complete as a priority. Filtering out children who had not completed schoolwork or whom teachers believed would not be suitable for inclusion in the focus group interviews may have been a source of bias in the selection of participants for the focus group interviews.

Only one child out of the sixty-five Grade 4 children was refused permission to participate in the research; she had previously undergone testing to identify special learning needs and her mother did not want to subject her to more ‘testing’. Thirty-three, or just over fifty per cent of the children, returned the signed permission forms. Twenty-one of these children took part in the focus group interviews. In the following year, when the additional case study was added to explore the Grade 5 and 6 nutritional unit Pantry Plunder, the child refused permission in 2009 was allowed to contribute as her mother was reassured (by her daughter) that the focus group interviews were ‘just talking’—something she was good at.

Following Glaser and Strauss’ (1967) lead, rather than sampling accuracy, the aim of this research is to gain insight, and is founded on the standard of including all perspectives. Noll et al. (1997) suggest that non-participants may tend to be more disengaged from school-based activities for a variety of reasons, and the omission of these children from research may introduce a source of bias in the sample. Because children disinterested in kitchen- and garden-based learning may have avoided returning the permission forms, it cannot be claimed with absolute confidence that the views of the children interviewed were representative of the student population in Grades 4, 5 and 6 (Creswell 2007).

The sampling was static, in that all the participant data from the children were gathered prior to analysis. One of the ethical concerns in the planning of this research was to ensure the assessment and end-of-year school reports of the children were not affected in

any way by whether they elected to participate in this research or not. In the words of Polkinghorne (2004), “The concern is not how much data were gathered or from how many sources but whether the data that were collected are sufficiently rich to bring refinement and clarity to understanding an experience”.

Teachers

The teachers (5 in total) all volunteered to participate in the research, and were informed of their right to withdraw from the research at any time. Data from the teacher participants was collected directly from planning meetings, records of planning meetings, curriculum documents and interviews. Records of the teachers’ planning for the Grades 5 and 6 Pantry Plunder Unit of work were collected as the planning meetings occurred, where the researcher observed and audio-recorded the meetings on three occasions and from written minutes twice (when, due to the scheduled meeting time, the researcher was unable to attend). Follow-up interviews to record the teachers’ reflections, perceptions and experiences of the project were audio-recorded and transcribed. Teachers were interviewed at a time and place nominated by them. They were given transcripts of their interviews to check. The threaded statement of understanding that arose from the PLT4 e5 Inquiry was given to each member of the group. Only minor changes to grammar were made, otherwise all group members agreed that the document represented their understandings and that the meaning conveyed was accurate.

The researcher had the opportunity to clarify any further points, questions or meanings with the teachers. In addition to the planning information, the teachers provided anecdotal stories about the children and the Kitchen Garden or Pantry Plunder Unit. The assistant principal was responsible for the development of a professional learning culture at the school and was instrumental in nominating the e5 professional learning focus. He was interviewed to give his overview of both the units of work and also the e5 instructional planning model, which the professional learning teams were implementing and evaluating.

The interviews were conducted with the two Grade 4 teachers at the end of 2009. The teacher interviews were held after the completion of the grade 4 children’s focus group interviews. One of the teachers continued her involvement with the research in 2010 as a

Grade 5 teacher and was part of the PLT4 that designed the Pantry Plunder nutritional unit.

The PLT4 was made up of two grade 5 teachers and two grade 6 teachers. The planning documents using the e⁵ Instructional Model (DEECD 2009a, 2009b) and the teacher's reflections and evaluations of the lessons planned were copied. The interviews with the teachers were audio-recorded and transcribed for data analysis. One of the planning meetings where the teachers discussed and evaluated their planning and delivery of the Pantry Plunder Unit was audio-copied and transcribed for analysis. The following Table 4.2 Summary of participant groups, data sources and methods in the two case studies provides a summary of the data sources and methods used in this study.

Data sources

Data were collected from the following sources:

1. children's writing examples from their garden journals, class blogs or portfolios;
2. semi-structured focus group interviews Grade 4 Kitchen Garden Unit — three focus group Interviews with seven children. One focus group interview for each Grade 4 class. The focus group interviews took place in December 2009;
3. semi-structured focus group interviews, Pantry Plunder Grades 5 and 6
 - a) one focus group interview with children in Grade 5 (eight children)
 - b) one focus group interview with children in Grade 6 (eight children)
4. teacher interviews:
 - a) Assistant Principal (responsible for professional learning teams and the implementation Principles of Learning and Teaching —PoLT and the e⁵ Instructional Model);
 - b) teachers (five teachers in total) involved in teaching the Grade 4, 5 and 6 classes — note, however, that the replacement teacher for the researcher was not interviewed;
5. professional learning team 4 — planning and reflections;
6. curriculum and planning documents from the school;
7. anecdotal stories (children, teachers and parents); and
8. notes from parents or responses on class blogs.

Collection of data

a) **Children's writing examples** that were part of normal school work, not additional tasks for the research, were collected. The children's writing examples were photocopied at the end of the term, for analysis after school assessment had been completed. These writings were collected when the kitchen garden or the unit "Pantry Plunder" was written about directly and work based on the kitchen garden or Pantry Plunder was completed. Children's work was examined for examples of student learning relevant to the two cases or indications on how the children perceived the kitchen garden and the new unit of work, the Pantry Plunder.

Children's reflective journals (on personal learning), the daily planning diary and kitchen garden journal⁷ provide data to compare with the data from the focus group interviews and information from the children's writing examples. It is possible that the children regard the reflective journals, kitchen garden diary and daily planner in different ways, and their personal thoughts and responses may either support or contradict their general writing that teachers assess for learning.

b) **Participant observations/reflexive journal:** The researcher was present at the weekly kitchen garden sessions in Term 4 2009, while on leave, working with the staff and children as a voluntary assistant. Participant observations were written up after each of the weekly sessions.

c) **Focus group interviews:** Focus group interviews with groups of seven children were conducted at the end of Term 4, 2009. There were three groups of Grade 4 children interviewed for the Kitchen Garden Project with the interview being 25–30 minutes in duration. The interviews were semi-structured with several key prompt questions. Photos that were taken over the course of the kitchen garden sessions by teaching staff, the researcher or the children, were used as discussion starters in the focus groups. Focus group interviews were audio-recorded for later data analysis. This data was triangulated with the participants' stories, either verbal or written in garden journals. Riessman (2008)

⁷ Different classes use various diaries or journals for the children's reflections and goal setting.

explains that communicating through story telling is a way of demonstrating knowledge construction.

d) Class blogs: The class and the individual children's blogs from Grades 5 and 6 were available for public scrutiny. The views expressed correlated with the views and opinions expressed by the children who took part in the focus group interviews.

Methods

Focus groups and interviews

The teacher interviews and focus group interviews with the children were semi-structured. There were general topics or questions used to “focus” the research, to generate data, which could be analysed to achieve insight into different areas, covered by the research (Appendices D & E). Polkinghorne explains, “preset topics allow the researcher to recognise when the interviewee is saying something relevant to the study” (2010 p. 446). Because the nature of the narrative generated by the teacher interviews and focus group interviews can be regarded as “co-constructed”, the researcher was directly involved in the data generation (Polkinghorne 2010; Riessman 2008). This may be both a strength and a weakness. The interviewer can redirect the interview when it starts to stray off topic however, the interviewer must also be able to detect when a salient but unanticipated topic warrants further investigation (Polkinghorne 2010).

All participants were volunteers they were not pressured to be part of the research and they were informed that they were able to withdraw at any time. The children were told at the start of the focus group interviews that it was their views and opinions that were important. There were also respectful protocols in place to ensure that everyone could contribute to the discussions without the fear of putdowns (Appendix F). Guide questions were identified before the interviews and may have been a source of *preconceived ideas* (Appendix D: Interview guide for semi-structured focus group interviews). Statements from the children at the end of the focus group interviews indicated that the children had enjoyed the interviews rather than find them stressful.

The word “data” has different implications in quantitative research compared with qualitative. In quantitative research, data are regarded as a direct reflection of the thing being studied, and should be independent of the researcher. In contrast, stories, interview responses, participant observations and written reflections about events or feeling, forms of qualitative data used in this research cannot be exactly the same as the experience (Polkinghorne 2004). Polkinghorne (2004) clarifies the difference:

The purpose of data gathering in qualitative research is to provide evidence for the experience it is investigating... The evidence is the ideas and thoughts that have been expressed by the participants... the textual evidence [from the transcribed interview] is indirect evidence (p. 138).

The focus group interviews used a semi-structured format, where prompt questions were used to generate the narrative. The story and the meanings were thus co-constructed by multiple voices. Children often “leap-frogged” ideas —one person’s comments would encourage agreement, disagreement or additional stories. Fontana and Frey (1994) explain the strengths of the group interview:

The group interview also has the advantages of being inexpensive, data rich, flexible, stimulating to respondents, recall aiding, cumulative and elaborative over and above individual responses (p. 55).

Content analysis was used to break the conversations down into thematic categories (Polkinghorne 1995). The data were initially sorted by key phrases, and some topics recurred. Lincoln and Guba (1985) call these repeated themes or topics *recurring regularities*. These key phrases were then pasted under headings that were informed by the wording or topic of the key phrases, using an inductive approach, and partly informed by an a priori approach (literature review and personal understanding of the nature of the kitchen garden). Table 4.2 summarises the data to be collected.

Table 4.1: Summary of participant groups, data sources and methods in the two case studies

Research layers	Data	Participants	Methods
Kitchen- and garden-based learning Do the kitchen garden activities engage the children, generate stories of learning and growth and promote an appreciation of nature?	Design consideration: data needs to shed light on the content that can be covered, the context and characteristics of these learning experiences. Data sources: <ul style="list-style-type: none"> • focus group interviews • student journals • class blogs and parent notes • written classwork • Pantry Plunder booklet • participant observations. 	Case study 1: <ul style="list-style-type: none"> • the Grade 4 children—three focus groups of 7 children • total of 21 participants. Case study 2: <ul style="list-style-type: none"> • one group from Grade 5 and one group from Grade 6 • two focus groups of 8 children • additional written work from total of 22 participants. 	<ul style="list-style-type: none"> • Semi-structured focus group interviews — prompt questions and photographs —audio-recorded and later transcribed. • Student reflections. • Participant observations recorded in researcher’s journal. • Stories recounted by children, teachers and parents recorded in researcher’s journal.
Student learning Does the Kitchen Garden Unit and the Pantry Plunder Unit, provide the opportunity to participate in authentic learning?	Data needs to come from the children on their interpretations of their experiences in the kitchen and garden. What knowledge and understandings have they constructed? What is the nature of this learning? Data sources: <ul style="list-style-type: none"> • focus group interviews • student Journals • Grade 6 class blogs • written work • Pantry Plunder booklet • observations and reflections. 	Case study 1: <ul style="list-style-type: none"> • the Grade 4 children • three focus groups of seven children • total of 21 participants. Case study 2: <ul style="list-style-type: none"> • one group from Grade 5 and one group from Grade 6 • two focus groups of eight children • additional written work from total of 22 participants, portfolios and class/individual blogs. 	<ul style="list-style-type: none"> • Semi-structured focus group interviews — prompt questions and photographs —audio-recorded, transcribed and coded for themes. • Student reflections and student written work examples photocopied. • Participant observations recorded in researcher’s journal. • Stories recounted by children, teachers, parents and judges recorded in researcher’s journal.

Teachers' work Does the e5 Instructional Model support the pedagogy, planning and practices, required for implementation of student-centred, authentic learning?	Design consideration: data needs to collect examples of teachers' planning and also their rationale for inclusion. Reflections were collected as the PLT4 developed and implemented the units of work, and at the end when evaluating the effectiveness of the model.	Case study 1: • two Grade 4 Teachers (2009)	<ul style="list-style-type: none"> • Semi-structured individual teacher interviews and assistant principal interview.
Note: the e5 model was used for planning Pantry Plunder, not the Grade 4 Kitchen Garden. The different ways of planning are compared in Chapter 7.	Data sources: <ul style="list-style-type: none"> • planning documents • teacher interviews • records of planning meetings • reflections • evaluations/ evidence of student learning. 	Case study 2: <ul style="list-style-type: none"> • two Grade 5 teachers • two Grade 6 teachers together making up the PLT4 (2010) • overview relevant to both case studies • assistant principal responsible for establishment of professional learning culture at the school (2010). 	<ul style="list-style-type: none"> • Records of PLT planning meetings. • Annotated planning documents collected and photocopied. • Teacher work programs. Note: teacher participant check of transcribed interviews and the student-centred authentic learning model in Parts 5 and 6

In this research participants' discursive reflections have been used to gain insight into the learning or "meaning making" the participants attributed to the experiences. Participant quotes illustrate the themes that emerged from analysis of the focus group interviews.

The interviews were a way of generating discursive reflections as well as a way of giving students a voice. Barratt Hacking et al. (2007) promote "the value of listening to children and attending to choice in methodologies and methods that enable the child's voice to be heard" (p. 536). The focus group interview has been a popular way of contributing the children's voice to research, and undoubtedly the quotes from the children demonstrate that this is a successful way of doing this. Significantly, the focus group interviews were not just a way of collecting data, but also an example of how knowledge is a social construct.

Data analysis

The data were analysed by immersion in the data; the researcher personally conducting the interviews, completing the interview transcripts, rereading them and reflecting on the concepts, ideas and meanings in the transcripts. Using paradigmatic reasoning, the

researcher coded the data into preliminary conceptual categories according to what the segment indicated. Codes are the labels for the sections of data: the words, sentences and paragraphs which were used to categorise the data, to make them more manageable and to make it possible to see the themes, patterns and concepts within the data. Neuman states, “the researcher imposes order on the data”; the codes help to establish order (Neuman 2006 p. 460). Although an “analysis of narrative” approach was used, it was informed by grounded theory, which relies on the themes and codes emerging through the data as the documents, comments and observations are sorted and sifted through (Neuman 2006; Polkinghorne 1995). Charmaz (2006) also explains how theories emerge from the data:

As grounded theorists, we study our early data and begin to separate, sort and synthesize these data through qualitative coding. Coding means that we attach labels to segments of data that depict what each segment is about. Coding distils data, sorts them and gives us a handle for making comparisons with other segments of data (p. 3).

One of the main weaknesses of this approach is the danger of the researcher having a preconceived theory, and looking for evidence in the data to support the preferred theory using a deductive approach. This may result in missing what the data actually showing. Lather warns:

Building empirically grounded theory requires a reciprocal relationship between data and theory. Data must be allowed to generate propositions in a dialectical manner that permits use of a priori theoretical frameworks, but keeps a particular framework from becoming the container into which the data must be poured (Lather 1986 p. 267).

The transcribed focus group interviews, the children’s reflections, diaries and general writing were coded. The initial codes were reviewed were examined for identifiable patterns or topics. These key elements became the themes. The themes were examined for different meanings. A layer of theory on authentic learning informed by previous research formed the framework for analysis of the children’s experiences in the Grade 4 Kitchen Garden Unit and associated with the Grades 5 and 6 Pantry Plunder Unit.

Polkinghorne summarises the process qualitative researchers use: “they gather and generate a variety of linguistic descriptions about the aspect of experience that is the topic of the study. They carefully analyse these descriptions using techniques and tools appropriate for clarifying and refining the understanding of texts. They then communicate and justify the derived understanding through linguistic-based arguments” (2010). The

linguistic descriptions generated by the children about their experiences informed the themes or categories and provided the basis for comparison between the cases.

Teachers as researchers

Teachers are at the interface of education, policies and standards. As a participant researcher, the researcher is also situated within the context of the kitchen garden case study. Denzin and Lincoln (1994) have called for teachers to play an active part in research. “Teachers must join the culture of researchers if a new level of educational rigor and quality is ever to be achieved” (p. 165). This causes a dichotomy, because on one hand, there is a recognised demand for teachers to be involved in research; while on the other hand, the very expertise and insight they bring may be a cause of bias.

According to Miles and Hubberman (1994), interpretivists accept that researchers “have their own understandings, their own convictions, their own conceptual orientations” (p. 8). They also make the point that it is good practice to make the potential biases explicit by declaring the preferred paradigm. It is important that the researcher eliminates criticisms of bias wherever possible or be explicit about their stance. However, as Kolb (1991) concedes, it is impossible to be totally bias free in either quantitative or qualitative research.

The qualifications and background of the researcher will also have a bearing on the overall credibility of the research. Their background, qualifications and experience will affect how the research is viewed. The researcher’s background is summarised below.

The researcher’s prior teaching experiences has included: teaching primary school children (12 years), teaching apprentices in the horticultural trades (11 years) and part-time tertiary lecturing of pre-service teachers in science, environment and sustainability, a second-year subject in a Bachelor of Education degree. Teaching the Grade 4 Kitchen Garden Unit, as well as personal values and understandings, have stimulated and informed the research direction, study design and questions (Miles and Hubberman 1994).

Ethical considerations

Participants in this research involved school children in Grades 4, 5 and 6, their teachers and the assistant principal at one primary school. Participation at all stages of the research was voluntary and open to all children in Grades 4 (2009), Grades 5 and 6 (2010) at the

primary school. Participants could withdraw from this research at any time. Consent was obtained from Victoria University Human Research Ethics Committee, the Department of Education and Early Childhood Development (Vic), the school principal and all participants. In the case of the children, consent was obtained from both the students and their parents or guardians.

To ensure confidentiality, data was de-identified and fictitious names have been used for the participants. Using a pseudonym permits data to be presented in an engaging way. The conversations as well as the verbal and written reflections can be attributed allowing the personality of the participant to emerge while maintaining confidentiality.

A potential weakness of this research is that the researcher was in a position of power as teacher of some of the grade 4 participants, as a past teacher of several of the grade 5 and 6 participants and a colleague of the teachers. To reduce this bias the teacher was on leave when the focus group interviews took place. The focus group interviews were held after the end-of-year school reports had been written, so that the decision to participate or not would neither advantage nor disadvantage any of the children. Focus group interviews were held using respectful protocols (Appendix F). Risks to the participants involved in the research have been minimal.

Limitations of the research

This research was on the phenomena of the Kitchen Garden Project at one Victorian primary school, across three grade levels over two years. The research aimed to gain insight into the learning that occurs through participating in the Kitchen Garden Project and evaluate whether this learning can be regarded as “authentic learning”. Underlying this research focus was the additional objective to find out how teachers plan for authentic learning and assessment.

The Grade 4 Kitchen Garden Unit and the Grade 5 and 6 nutritional unit Pantry Plunder were both the subject of the cases and the context for data collection. Understanding the context in which the data is collected is essential for interpreting the data and the findings. The boundaries between the phenomena and the context were poorly defined, a criteria Yin identified as making this research suitable for a case study approach (Yin 2003).

Stake (1995) explains the development of the two cases offered the opportunity for comparison of the themes and as a check on whether any findings or theory were relevant to both cases. The specificity of findings to the unique setting, conditions and participants needs to be taken into account when deciding whether this research has any implications and application to other settings. As Stake (1995) recommends, it will be left up to the reader to decide whether this research is relevant to their situation and if the findings are transferrable.

Summary

Chapter 4 explains the methodology, data sources and analysis methods and participant selection used in this research. Rather than one story, the Kitchen Garden Project is multiple stories told by multiple voices. These numerous narratives give insight into the context-based learning within the two units of work. On occasion “stories” are detailed because they need to be told in context. Qualitative data collection methods enabling the participants’ stories to be told in a fluid, descriptive manner are pertinent to this research. The children and their teachers are given a voice. Chapter 5 details the multiple perspectives of the children and their teachers, shedding light on the “whole”. In the hermeneutic tradition this assists in understanding the context, characteristics and content of the learning experiences provided by the kitchen garden.

Chapter 5: The Grade 4 kitchen garden

Introduction

Chapter 5 outlines the first embedded case study within the Kitchen Garden Project: The Grade 4 kitchen garden. This case study explores the Grade 4 children's learning that occurred through work in the kitchen garden throughout one year, using a hermeneutic cycle approach. As outlined in Chapter 4, the children's stories, reflections written in their kitchen garden journals and discourse in the focus group interviews generated important themes or common threads. The themes give insight into the learning and knowledge the children internalised, and the significance the children placed on their experiences in the kitchen garden. To assist in qualifying the nature of this significance, this section uses "vignettes" to illustrate their learning. The vignettes included provide the opportunity to explore the significance of the children's learning in the broader social context of the kitchen garden. The two ways of looking at the children's stories are validated in and by the hermeneutic tradition, and add to the understanding of the kitchen garden as a holistic experience.

Case Study 1: The Grade 4 kitchen garden

Kitchen- and garden-based learning: putting the program in context

Permission was given by the school's Assistant Principal, Mark Wilson [quoted below] to site the proposed kitchen garden in a little-used part of the playground along the side of a portable classroom. The soil was exceedingly poor and heavily compacted from years of foot traffic; very little grass grew there and only the hardiest of weeds survived. The site was exposed to sun until late afternoon, when large cypress trees growing to the west shaded the garden. Although merely a transit between the classrooms and the playground, a barren place, this unloved and neglected part of the playground had the advantage of being in the centre of the school grounds, ensuring close proximity to classrooms and providing easy access to water.



“What are you doing, boys?” Mr. Wilson, the Assistant Principal, shouted out across the school playground. As he went closer to investigate what the group of boys gathered around the kitchen garden were doing, he sniffed the air. “I can smell that from here. What is it?”

“Mint, Sir, isn’t it strong!” was the enthusiastic reply.

(Story re-told in the Staff-room after yard duty, researcher’s journal 2009)

Several of the teachers did the initial work constructing the structural framework for the raised garden beds after school. They used hardwood planks bolted together in basic square structures to reduce the need for cutting the planks and maximise the area of each garden bed. The next day the Grade 4 children dug out as many weeds as they could. Sheets of newspaper were placed in overlapping layers as a base to prevent weeds returning. The children worked industriously, wheel barrowing load after load of purchased commercial garden soil to fill the beds. Excitedly they raked it level and laboriously carried overflowing watering cans over to dampen and settle the soil. The kitchen garden was in place, expectantly waiting for the first seedlings.

The Kitchen Garden Unit was timetabled for once a week, initially with two Grade 4 classes, their teachers and the help of several volunteer parents. The two classes rotated between a garden session and a cooking, food preparation session. This rotation occurred within the hour and a half between morning recess and the lunch break. The two classes, the teachers and parents came together to eat, whatever the children had prepared during lunchtime.

The kitchen garden is showing good progress so far. I have learned to plant carefully and how to tease the roots of a spring onion to separate it from its brothers. The broad beans are huge and we even have three strawberries. We have picked herbs and lettuce to use for our cooking. We have all enjoyed the cooking and the garden. I feel privileged that we are going to hand over our garden to the new Grade 4s. It will be very solemn (Rosanne, Grade 4 student, reflecting on the kitchen garden in the first year of its creation 2007).

The Grade 4 teachers were keen to continue the Kitchen Garden Unit the following year and the Grade 3/4 composite class teacher indicated that she would also like to be involved. The administration at the school, in conjunction with the teachers, decided that the kitchen garden would be a “special project” for Grade 4. Arrangements were made for the composite class to be split during the kitchen garden sessions, enabling the Grade 4 children from the composite class to participate in the Kitchen Garden Unit.

The structure of the program was modified. To make use of the extra teacher, a theory class addressing health and science was added. The children were divided into three equal groups. To facilitate communication and to even out the number of children participating in each activity it was decided to mix children from each class into the groups, aptly named by one of the teachers, “Parsley, Sage and Rosemary”. This grouping was done so

that as relationships could be “built up” between the children in the three classes (Grade 4 planning meeting, 2008). Each Wednesday the children went to two out of the three sessions. Across a three-week cycle they completed two theory classes, two cooking and two gardening sessions. The individual classes looked after the kitchen garden throughout the week, rostering watering duties and maintenance. Although considered a special Grade 4 project, other teachers also occasionally used the garden as an outdoor classroom. In particular, the junior classes found the garden and associated compost heap a great source of “mini-beasts” for their inquiry unit.

This research into the kitchen garden commenced in 2009, the third year after the initial setting up of the garden. There were additional changes to the way the Kitchen Garden Unit was managed. For example, one of the teachers who became responsible for setting up the initial kitchen garden was allocated a Grade 2 class. The author of this thesis as the teacher-researcher took leave in order to collect the data for the study. Two teachers were added to the Grade 4 teaching team, responsible for the three classes. These management matters were mainly in response to the concern about the amount of time and the added workload the kitchen garden would require. The teachers decided that the rotation would change so that the children would stay in their class group and would complete one session a week of either cooking, gardening or health science. The children on the cooking rotation prepared samples for all of the Grade 4.

In a three-week rotation the children covered one session of cooking, one of theory and one of gardening. It was important that the structure of the program remain flexible and adaptable for the teaching staff, as well as for the differing number of classes and student groups in each year.

Children’s learning: focus group interviews

One focus group interview was held for each class at the end of the school year. The focus group interviews were labelled A, B and C, so that the comments and reflections of the children could be triangulated across the three classes to check the validity of the results. Seven children from each Grade 4 class took part in the focus group interviews, a total of twenty-one children. The focus group interviews were semi-structured with open-ended prompt questions around what the children thought of the kitchen garden experience and what they had learned (Appendix D). Open-ended guide questions

stimulated the children's discussion. For example the interviews started with, "What sort of things did you learn in the Kitchen Garden?" The focus group was an important component of the children's experiential learning development; the social dimensions of the group enabled children to build on one another's ideas as one person's reflection prompted others and stimulated similar anecdotes or contrasting experiences. The flexible nature of the interviews meant the ideas that the children articulated could be explored, rather than having to abide by prescribed questions. Photographs taken throughout the year featuring work in the garden, and the meals the children had prepared were on the table to stimulate discussion, however they were rarely used. Occasionally when children spotted a photograph of themselves that they would be prompted, "Oh! I remember..." The audio-recorded interviews were transcribed.

Using a hermeneutic interpretive approach, the focus group interviews provided an opportunity to both gain an appreciation of the common group experience and the meaning the individual participant gave to the experience. Each sentence was analysed for the key idea. These were then linked together in themes. Analysis of the Grade 4 focus group interviews resulted in the development of four reoccurring key themes across the three focus groups. These themes were: relationships, life skills, health and nutrition, and nature, environment and ecoliteracy. Within each broad theme different meanings were identified. These are outlined below in Table 5.1.

Table 5.1: Grade 4 themes and meaning codes

Meaning codes:	Theme: <u>Relationships</u> Examples of quotes that illustrate themes/codes
Connecting with others/social skills	Kitchen garden is really good because you get to sit with people you like and have a nice conversation with them (Ellie, Focus group A).
	Eating together was good because you could have a nice conversation and be calm and relaxed (Leesa, Kitchen garden journal C).
	Well, I learnt that you need good table manners because if you are talking [loudly] and things at a restaurant everybody is disturbed (Rosie, Focus group C).
	When you talk really loud like shout and stuff people just turn around and yell back at you (Leesa, Focus group C).
Shared experience Equal footing	I am growing a veggie garden with my Dad; I help him take care of it and water it (Kim, Focus group B). Well, I used to hate gardening, but now me and Mum are designing a vege garden... (Lily, Focus group B).
	Yeah, me and Tom made the beetroot dip and it turned out really good (Ross, Focus group A).
Collaboration Intentions (peer group pressure?)	...I'm going to start [to make a garden] when my Mum gets on holidays, when we have more time and stuff (Fred, Focus group A).
	Well what I think is the Mums know how to cook, and how that you can cook, you can cook for her (Fred, Focus group A).
Affirmation and/or showing care	I'm sad it is over because I really enjoyed cooking and preparing food for myself and everyone else in Grade 4 to eat (Leesa, Kitchen garden Journal C).

Meaning codes:	Theme: Life skills Examples of quotes that illustrate themes/codes
Relevant to real life	You're actually doing something in cooking like... you've actually got to do at home (Mary, Focus group A). ...and when you're older of course you will have to cook and you know ... it's a nice way to have a nice dinner (Len, Focus group A).
Enjoyment	Well I've never really ever ...wanted to cook but thanks to kitchen garden it's gotten 'funner' (Kim, Focus group B).
Changed role at home	It gave me a lot more confidence with knives and graters (Lily, Focus group B). It has given me a lot more confidence with knives... at home I would never cut things up but now I have a lot more confidence and cook at home (Girl, Focus group B).
	Well what I think is the Mums know how to cook, and now that you can cook, you can cook for her (Fred, Focus group A, also coded in relationships). I found it was good with cooking and chopping and stuff because I never used to cook and now I do. I help Mum with meals and preparation. (Jim, Focus group C). The kitchen garden inspired me to make my own vege garden at home. I've got herbs and tomatoes and potatoes. I hope they grow well and not die from the heat (Kitchen garden journal C).
Confidence	After doing kitchen garden, I started growing things at home and cooked meals for my family. It also showed you that I can actually cook at home because most of the time Mum and Dad would do all of the cooking but now I try and get in like today because we are having the class party instead of just Mum making it I made a chocolate slice for the class party. So I make things at home now and cook a lot more (Liz, Focus group B).
Experimentation	Like with the dips we didn't even follow a recipe, we just chucked stuff in. Just made it up on the spot. We thought oh this will go well, chuck it in. It was great! (Fred, Focus group A).
Consequences of experimentation	We shouldn't change like the recipes because someone might add some things that someone is allergic to (Leesa, Focus group C). I don't like to add things because just in case you don't like it because if you've already tried it before then you know what it tastes like (Rosie, Focus group C).

Meaning codes:	Theme: <u>Health & nutrition</u> Examples of quotes that illustrate themes/codes
Developing broader tastes & willingness to try different foods	<p>Well... I like the cooking bit because it's quite interesting because I like meat and I'm not normally used to eating lots of vegetarian meals and I found out that vegetarian meals are actually quite nice (Simon, Focus group C).</p> <p>I really didn't like some foods but now I like a lot of them... but I didn't try them before (Lily, Focus group B).</p> <p>I used to look at something and well I used to think I'm not eating that! Now I'm prepared to try eating more things at home.</p> <p>We have got used to eating veggies once a week and then you start doing it loads and loads and loads (Ross, Focus group A).</p>
Appreciation of healthier foods	<p>Well, I think it was good because it gave me more confidence in cooking and chopping and I eat heaps more things now cause like ... I try things a lot more. More healthy things like vegetables and salads (Mandy, Focus group C).</p> <p>At the start I used to hate everything but now I'm starting to like it because I'm used to the taste of it (Ross, Focus group A).</p> <p>I definitely eat more veggies and stuff and enjoy it more (Fred, Focus group A).</p> <p>Well in the kitchen, I used to cook but I would cook cakes and things, now I cook like healthy things and ...salads (Jane, Focus Group B).</p> <p>Kitchen garden has definitely changed the way I eat because I have grown a better taste for green broccoli and cooked carrots. Now I love eating a fruit platter after school. My dinner last night had cooked carrots, broccoli and baked potatoes. I wanted seconds! (Kitchen garden journal Group A).</p> <p>I cook more and eat healthier (Alex, Focus group B).</p>
Growing your own food is better for you	<p>And it's tastier! And it's more fresher because you just pick them from the garden and eat them (Len Focus group A).</p> <p>You can grow peas and eat the shell, it's okay if it's your own; in the shops they could spray chemicals that's why I don't eat the shells (Joe, Focus group A).</p> <p>So you think the ones you grow at home are safer? (Interviewer).</p>
Pride in achievement	<p>Yeah, and it also tastes better because you know you've created it (Len, Focus group A).</p> <p>I cooked the zucchini and corn pancakes down at the beach and everyone loved them (Len, Focus group A).</p>
Economical	<p>Yeah, I reckon cooking is really fun...cause you know you've eaten your own food, and you've prepared it (Fred, Focus group A).</p> <p>And you don't have to buy anything after that you can just let them grow (Ellie, Focus group A).</p>

Meaning codes:	Theme: <u>Health & nutrition</u> Examples of quotes that illustrate themes/codes
Sub-theme: Hygiene	
Deeper understanding	When something is not right... if it was chicken... well chicken has to be kept cold if it gets to room temperature bacteria starts to grow on it (Lee, Focus group B).
More conscious of hygiene	It has also helped with remembering to wash my hands ...because I know I'm probably going to touch the food even with [using] a wooden spoon (Ian, Focus group C).
Hygiene concerns about other children	I used to wash my hands but I used to touch lots of stuff afterwards (Helen, Focus group B). ...but I get scared that in other classes... about germs on their hands (Ellie, Focus Group A).

Meaning codes:	Theme: Nature, environment and ecoliteracy Examples of quotes that illustrate themes/codes
Developing knowledge	I liked gardening and working outside and learning about plants... what they like and how they grow (Jim, Focus group C). ...and the mint. It smelled really strong when you picked it... the herbs grew really well (Mandy, Focus group C).
Curiosity/wondering	My favourite jobs in the garden were watering and planting things. I learnt about seed growth and what a plant needs (Joe, Kitchen garden journal group A). Plants need to have water, mulch and fertilizers and lots of sunlight (Rosie, Kitchen garden journal Group C). When we used to have science about kitchen garden and plants you learnt a lot and when we were doing our beans you learnt what was in the bean and then we planted them and they grew (Ellie, Focus group A). There is one thing that stands out to me which is the animals and bugs that you find in the garden. My particular favourite are the spiders (Mandy, Focus group C). Worms help with the garden so you put all the bad plants from the garden into the worm farm and then all the castings go back into the garden so it is like recycling (Lily, Focus group B). You plant a seed, water it and look after it, then pick it then eat it. I felt happy because I was helping life (Mary, Kitchen garden journal group A). I'm glad there is rain otherwise crops and stuff would be dead... and think any other planet ...there's no rain! (Joe, Focus group A).
Fascination	Interviewer: Do you think cooking, preparing and growing your own food is useful ...does it help the environment? ... it's better for the environment when we all garden (Mandy, Focus group C). I think actually it does help the environment [the kitchen garden] ...with animals like frogs and because it makes the environment more green and fresh (Ellie, Focus group A).
Connectedness of ... Being part of the web of life	I look after my garden at least once a week now. Cos last time, I had a garden, outside my window; I didn't water it or weed it or anything. Eventually it just died. So now I try and get out there as often as I can... at least once a week (Liz, Focus group B). Well... it is good for the environment because normally when you want to get some fresh vegetables a lot of people would drive down to the supermarket...pick it up...put it in a plastic bag which is bad for the environment...drive home again which is bad for the environment as well...whereas if you have a garden out the back you can just walk out the back door and pick something and walk back inside again. You know that it is fresh and not overdue (Simon, Focus group C interview). Yeah! It (the kitchen garden) is helping our generation of people learn more about keeping the earth alive... and keeping us fit with gardening and growing things (Liz, Focus group B). ...and it's encouraging people to do more and instead of using energy by cars and stuff it encourages you to go walking more because you are fitter (Alex, Focus group B continues on from Liz). ...because even vegetable plants are trees and trees help the environment because they make more oxygen ...so it is helping us in two ways because vegetables are also very healthy so...keeping us healthy and also making sure that we have plenty of oxygen (Ian, Focus group C).
Good for the environment	
Responsibility	
Interconnecting relationships Ecoliteracy	

Relationships

The theme of “relationships” was evident as core to the students’ work in the kitchen and garden, and was repeated numerous times across the three Grade 4 focus group interviews. All the children spoke of their sense of connectedness in the gardening, in sharing meals, cooking with or for other people, as a way to connect to friends or family. Very few children had previously cooked or gardened at home regularly. One child, Helen, remarked that the cooking and gardening was something that she had always done with her parents (Focus group B). To her, the kitchen garden experience was just an extension of normal life. She was in the minority; but the interviews illustrated that to most of the children the garden gave them not only new skills that they could demonstrate at home, but also new ways of relating to friends and family.

One child mentioned how he enjoyed having his effort in preparing a meal appreciated: “I made the spinach and ricotta cannelloni for the whole family and even my sister said that they were great... and she doesn’t like vegetables”. His comment demonstrates a sense of pride in making a meal for the whole family and also the sense of achievement that was generated by doing something that was valued by the important people in his life. It also indicates affirmation of his worth; with his ability to create a vegetable-based meal his sister enjoyed. Cooking at home, or helping with the preparation of food, were opportunities for the children to demonstrate their skills and to show off their confidence. The quotes illustrating relationships in Table 5.1 show how the experiences were used as opportunities to connect to friends and family. There was a shift in how gardening and preparing meals were perceived. Rather than just another chore, they were recognised as important life skills.

The children shared what they had learned in the Kitchen Garden Unit with parents. This was often the motivating force prompting the creation of a vegetable garden at home. In the end-of-year reflection many children mentioned how the Kitchen Garden Unit had inspired projects at home.

After doing kitchen garden I started growing things at home and cooked meals for my family. I started a worm farm. I am now even enthusiastic about gardening (Leesa, end-of-year reflection, workbook, 3 December 2009).

Ross’s comment gives a poignant insight into the developing relationship with his father:

I've started a veggie garden at home with my Dad, and it's got lettuce and tomatoes and lots of herbs. This is our second one (verge patch) and it's heaps better, but my dad could still improve cause he killed my favourite watermelon. [He smiled and affectionately emphasised the killing of the watermelon with mock indignation] (Ross, Focus group A interview).

Having ownership of some of the knowledge about vegetable gardens changed the relationship between this father and his son and shifted the power balance so that it was less about being told what to do; it was more of an equal partnership. Ross even gently criticises his father over the dead watermelon plant, although he doesn't explain what happened to it. The creating and maintaining the vegetable garden had become a shared activity, rather than a chore, and the relationship with his father had developed alongside. This theme of children valuing the shared quality time with parents, where they could demonstrate their skills and learning, was a common theme across all of the focus groups both in the garden and the kitchen.

The building of relationships was also seen between other children. Collaborating on a recipe was valued as a common "shared" experience with opportunities to discuss, negotiate and experiment with flavours. Engagement and choice are closely intertwined and contribute to ownership, adding to the significance of the experience.

Although there were complaints about some of the food prepared ("I didn't like the broad bean dip" — Ross, Focus group A) or moving smelly compost ("It was eye-bulgingly disgusting" — Mandy, kitchen garden journal C), all the children said they enjoyed participating in the kitchen garden sessions. The comments in the focus group interviews, the reflections in the kitchen garden journals, as well as anecdotal comments from parents and teaching staff supported the high value the children placed on the Kitchen Garden Unit. However, this result is possibly biased. Noll et al. (1997) identify that children who are disengaged or don't enjoy the gardening or cooking would be less likely to volunteer to participate in the research.

Life skills

Leanne T was thanked by a parent who spoke of how surprised she was when their son not only offered to prepare a meal for them, but then proceeded to do everything, including selection of ingredients at the supermarket, preparation, cooking, setting the table and serving the food. The children recognised and placed special importance on

learning skills that had importance beyond school: “You’re actually doing something in cooking like... you’ve actually got to do at home”. Cooking and preparing food at school (see Figure 5.1) gave them the confidence to participate at home and was another opportunity to share experience in the social and caring context of providing sustenance for friends and family.

I found it was good with cooking and chopping and stuff because I never used to cook and now I do. I help with meals and preparation. (Jim, Focus group C, December 2009).



Figure 5.1: Preparing food

Part of learning life skills that had value beyond school was educating the parents. Although the main reason for asking for parent “help” on kitchen garden days was to provide assistance and supervision, as Judy T noted, the unintended opportunity for children to demonstrate their knowledge and skills had the significant benefit of modelling for parents, ways to encourage participation at home.

I think it was wonderful to have all the parents in and they were really excited about the program... they seemed to see the benefits of it as well. After they had seen it in the classroom it made it easier for them to see how they could go home and involve their children in food preparation and cooking (Judy T, teacher interview December 2009).

The following reflective comment from one of the kitchen garden journals illustrates the sense of achievement one child felt when her chopping skills were noticed.

The best part of cooking is the chopping. I like the way I curl it up (lettuce) and then chop, chop, chop! It's so fun! One of the parents commented on the strategy... I felt good about myself (Mandy, reflection in kitchen garden journal, 2009).

The comment from Mandy indicating how she felt pleased when her chopping skills were noticed and commented on illustrates how the new skills, appreciated and praised by parents, assisted in the transference of knowledge between school and home. Len mentioned how he had cooked zucchini and corn pancakes when away on holidays and proudly commented, "Everybody liked them". The positive affirmation the children received while preparing and cooking confirmed that their efforts were worthwhile and valued.

Health and nutrition

Developing a broader palate

One of the health science theory sessions was based on a newspaper article on how you may need to try something eight to ten times before your palate adjusts to the unfamiliar flavour (Appendix G). The children were asked to identify something that they often found in their food but avoided eating.

I used to look at something and... well; I used to think I'm not eating that! Now I am prepared to try eating more things at home (Liz, Focus group interview B, 2009).

Remember Alan at the start of the year? Way too fussy to eat heaps of veggies and now he's giving it a go and he is eating it well [sic] (Len, Focus group A, 2009).

Some of the most commonly avoided foods mentioned were salad, tomatoes or mushrooms. They were set a challenge to next time just taste the "offending" item. They discussed the worst thing that could happen to them and decided being sick or allergic to the food was unlikely and that as long as they had a glass of water ready to wash the food down, that they would survive (researcher's journal, 2009).

I liked the kitchen garden because you got to try new foods and different cooking styles that you have never had an opportunity to try before. I especially liked the vegetarian spring rolls (written reflection from Grade 4 kitchen garden journal, 2009).

I like meat and I'm not normally used to eating lots of vegetarian meals and I found out that vegetarian meals are actually quite nice (Simon, Focus group A, 2009)

Most of the children reported that they were now more willing to try new vegetables: "at the start I used to hate everything but now I'm starting to like it because I'm used to the

taste of it” (Ian, Focus group interview C, 2009). One child would often bring a note from home asking that he be excused from trying new foods in the cooking session because he had “a sensitive stomach”. Although his mother said it was good for the children to learn to cook, she added that children should not “be forced to eat what they had cooked”. The parent thought that too much pressure was being put on her son to try foods he didn’t like. Interestingly, in the boys’ final reflection for the year he identified one of his big successes for the year as being willing to try more foods.

I tasted new foods like minestrone but I did not like it. I did like the golden soup and some of the dips. Last year I did not eat vegetables, but now I try them, and the spinach and ricotta ravioli are good (Grade 4 End-of-year reflection, 7 December 2009).

The majority of parents supported the program, as the following parent thank you note illustrates:

My daughter has gained an enormous amount from this program, she is now much more interested in trying new foods, which I simply couldn’t encourage her to eat at home. This program has benefited the whole family, thank you.

Other comments indicated a greater appreciation of cooking and the effort involved in creating a healthy, tasty meal. Some comments noted an increased willingness to cook and help with gardening or food preparation at home (Appendix I: Parent notes).

Health science

Comments about health science, the theory component of the Kitchen Garden Unit, featured frequently in the end-of-year reflection. Children acknowledged that they’d learned how to set a table properly and that they were more careful of hygiene. They identified that they were more aware of healthy foods, as the following excerpt indicates:

In health science we learned all about the healthy food pyramid. We learned all about what junk food can do to you if you have too much of it. We also learned that it is cheaper to make lunch yourself than to buy it. Kitchen garden has been one of the most exciting parts of Grade 4. (Lee, End-of-year reflection group B, 7 December 2009)

Knowledge about what foods were good for you improved the children’s willingness to try new foods. Awareness and knowledge about health and hygiene, as well as comprehending the necessity for budgeting, resulted in understanding how easy it was to produce cost effective healthy meals. These were layers of understanding that built up through multiple experiences in growing, preparing and sharing food. The World Education Forum 2000 identified many benefits of providing “effective school health,

hygiene and nutrition programs” and points out the synergistic nature of these programs resulting in improved educational outcomes (World Education Forum FRESH report 2000).

Science, nature, environment and ecoliteracy

An appreciation for the diversity of nature and the interconnecting relationships was another common theme that ran through the focus group interviews. The work in the garden immersed the children in a diverse living ecosystem. Capra acknowledges the body of work that researchers have built up identifying the importance of exposure to nature in the cognitive functions in the growing child and emphasises “that a rich, multi-sensory learning environment — the shapes and textures, the colours, smells, and sounds of the real world — is essential for the full cognitive and emotional development of the child” (Capra 1999). Working in the garden exposed the children to the diverse, multisensory world of nature — very different to the indoor classroom. The garden stimulated questions and offered children the opportunity to wonder, to show one another interesting things that they had observed, to look more closely. Working in the kitchen garden provided opportunities to connect with nature and one another in the natural world.

There is one thing that stands out to me, which is the animals and bugs that you find in the garden. My particular favourite is the spiders you find in a garden. I think they are so cool. I also like the butterflies we find in the garden. (Mandy, Grade 4 kitchen garden journal).

In Table 5.1 Mandy expresses her interest in the bugs that she came into contact with in the garden and again in her journal entry (above). The fascination with living things the children exhibited in the kitchen garden was reflected on by one of their teachers:

I remember them wondering why some of the plants grew such big leaves and why there were no flowers and also the wonderings about what if we did this to the plant or it didn't get watered... or what would happen if the soil weren't any good? (Judy T, Grade 4 teacher interview).

The children's wonderings indicate intrinsic interest and engagement with the garden; generated by the experiential learning experience of being in the garden and caring for the plants. They offer an opportunity to wonder, discuss and hypothesise. This corresponds to the concrete experience and observation and reflection stages of Kolb's experiential learning cycle.

The children's understanding and their confidence in their knowledge about gardening grew and is reflected in the following observations:

Well I sort of found out how like... a seed grows and all that and what they need and all that... and why worms are good for the garden and why you need to keep weeding because they will just steal all the water (Simon, Focus group C).

When you work in the garden you have to know what is what. You don't want to pull the wrong plant out [that you thought was a weed] and then you have to replant the plant. You also want to have the correct life in your garden; you never want snails, flies or mosquitoes. You want spiders or lizards that eat the insects (reflection in Grade 4 kitchen garden journal Group B, 2009).

The knowledge of the ecology of the kitchen garden increased as the children learned about the needs of living things ("Plants need to have water, mulch and fertilisers and lots of sunlight" — Rosie, reflection in Grade 4 kitchen garden journal, 2009, Group C), and made connections between their learning in the kitchen garden and the environment. This juxtapositioning between the familiar and noticing difference is the basis for extending the children's learning, a tension that Stephanie Sisk-Hilton encapsulates in her following comment:

It is that cycle of routine and novel, of "the same old and yet not" that allows children both the safety and the stimulation to build new ideas, attach them to existing ones, and become people who deeply understand and care about the world around them (Meier & Sisk-Hilton 2013).

The following vignettes demonstrate the children's curiosity and illustrate how the children built up their knowledge base, and at the same time built up their understanding and empathy towards living things.

Vignettes: stories from the garden

Ownership: The herb investigation

“What are you doing, boys?” Mr Wilson, the Assistant Principal, shouted out across the school playground. As he went closer to investigate what the group of boys gathered around the kitchen garden were doing, he sniffed the air. “I can smell that from here. What is it?”

“Mint, Sir, isn’t it strong!” was the enthusiastic reply.

Mr Wilson found that the boys were discussing the strengths of the various scents being given off by the herbs. The children were carefully pinching out the tips of the herbs as they had been shown in the kitchen garden class and were conducting their own investigation into the “smells” during their lunchtime. Mr Wilson added to the inquiry by stating that he could smell the peppermint from three metres away.

After listening to the story recounted in the staff room, the class teacher decided to capitalise on this engagement and proposed a more formal inquiry. The children created a two-way table and classified the herbs according to what the scent reminded them of, whether it was pleasant or unpleasant and the strength of odour. They then researched the traditional and current usage of the herbs and created information posters that were collated displayed around the classroom and later put into the student portfolios (researcher’s journal, 2009).

Worms the agents of empathy

“Look at these cute little potatoes, they look like eggs!”

“Yeah, careful you don’t put the fork through them and stab them.”

(The children enthusiastically dug over the soil searching for the new potatoes, much like a treasure hunt.)

“Why are there so many worms around the red potatoes?”

“Maybe they like them because they are the same colour... they are not around the white ones.”

“Yuck! They’re a bit slimy... I don’t think we can eat them.”

“Maybe if we wash them...”

When digging up the potatoes one boy observed that there were a lot of worms around the red potatoes but not the white ones, and wondered why the worms liked the red potatoes better. Another child suggested perhaps because they were similar colours (the worms and the red potatoes). Several theories were suggested in the class discussion. When we looked at the potatoes carefully it appeared that some of the red potatoes had brown bits on them and were going a bit slimy. This led to the next wondering: “Was the slime the cause or effect”?

Missed opportunity

I should have taken this wondering further; however, with the end of term fast approaching, there were other priorities (tests and report writing, there is always the pressure of time), but I should have set up an inquiry. It would have been the perfect opportunity to set up a “fair test”, to demonstrate science in action using the child’s observation as a starting point for the inquiry (researcher’s journal entry, 2009).

Worms: an indicator of change

During first term several boys were observed chopping worms in half when they were digging and turning over the soil. When asked why, one said that they were disgusting and slimy. Another said that he wanted to make two of them and another offered to feed them to his pet centipedes. Several of the girls ran away squealing, when the boys held them out towards them. They were asked not to do this and the teacher explained how worms were good for the garden and helped the plants by aerating and enriching the soil. She suggested that it would be good to get the worm farm started up again (researcher's journal, 2009). During second term a worm farm was started.

One of the food preparation jobs was to take the peelings and scraps from cooking preparation out to the worms. A class lesson on worms, examining their anatomy and in-class student research on how worms improved the soil structure and enriched the soil was followed by a literacy session on creating and describing the perfect menu for a worm café. The literacy lesson had two main objectives: to practise descriptive language and to create a poster (Appendix H: Annelid's Café menu) with the purpose of informing children from other grades about the sorts of food scraps that were suitable for inclusion in the worm bin. Later in the year, instead of worms being chopped in half, children were observed rescuing them (Figure 5.2) and moving them very carefully into safer places in the garden or placing them in the worm farm with special "offerings" of torn-up lettuce leaves and vegetable peelings to eat.



Figure 5.2: Rescuing worms

The new appreciation for worms and their role in creating a healthy garden came through in the focus group interviews.

I know what's good for the garden now. Like I know snails aren't good because they eat all the plants. Worms are good because they make the soil better (Rosie, Focus group C).

Some children took this learning further and made connection with sustainability; they explained how worms could improve the soil and assist in the recycling of nutrients:

Worms will help with the garden, so you put all the bad plants from the garden into the worm farm (Kim, Focus group B).

[A]nd then all the castings go back into the garden so it is like recycling (Liz, Focus group B).

[T]hey will aerate the soil so that you've got a bit of room for the roots to grow, so that it's not all compacted and hard (Simon, Focus group C).

The change in attitude towards worms developed over the course of 2009. Rather than being seen as revolting and slimy, the worms were seen as helpful. Children had many opportunities to come into contact with them, and it is this familiarity and understanding about the role worms play in the garden ecosystem, combined with a desire for their plants in the kitchen garden to thrive, that changed their attitudes. The layering of experiences and many opportunities to know and become familiar with the kitchen garden was a strength enabling the building on learning and understanding, rather than just a "one-off" activity.

Snails: pets or pest?

When children removed the snails from the broad beans during a gardening session it then caused a dilemma with what to do with them. They placed them in old plant pots and observed them closely as they ate the different leaves they offered, deciding which foods were the favourites and then running to get more. The snails were "looked after" for the rest of the day. Several of the children were observed making up names for their pets and involving them in imaginative games. The snails were gently moved into the shade and attempted escapes thwarted. All suggestions from the teacher of humane ways to dispose of them met with horror until a compromise was reached: it was decided that the old compost heap near the back of the oval might make an accommodating new home.



Figure 5.3: Rescuing snails

The children's emerging empathy with and for living things was not confined to the creatures beneficial to the garden. Their attachment to the snails they had observed and played with shows the "emotional affiliation" to other living things identified by Wilson as an indication of *Bilophila* (Wilson 1984; Suzuki 1997). It illustrates how children can develop a relationship with things or creatures through play and familiarity.

The nature of the learning: is it authentic?

The practical gardening work in the weekly rotations was dictated by the weather, the season and what needed to be done in the garden at the time. There were general maintenance tasks, including planting, weeding, watering and staking plants. There was also the task of picking and washing the herbs, fruit and vegetables that were needed by the group doing the cooking. All of these tasks were experiential and had elements of student direction, teacher direction, and at times co-constructed learning. The teacher's role in the garden changed, and the amount of direction reduced as the children understood and became familiar with the different tasks that needed to be carried out in the garden. An indication of the whether the tasks were teacher directed, student directed or involved co-constructed learning is signposted in Table 5.2: Authentic learning framework: kitchen garden learning.

To judge whether these experiences and stories of learning qualify for the term *authentic*, the children's narratives were analysed for themes and meaning codes and cross-referenced with the key characteristics of authentic learning identified from the literature (Chapter 2). The key characteristics of authentic learning were used as a framework to overlay the learning experiences (Table 5.2). Quotes illustrating the characteristics from the children's focus group interviews, teacher interviews or written reflective comments provide evidence and insight into the children's learning. Ownership of learning is an important criterion for authentic learning, and implies that the learning is significant and relevant to the learner, so that they become autonomous and motivated towards the creation of knowledge and meaning (Newmann 1989; Savery & Duffy 1995).

Table 5.2: Authentic learning framework: kitchen garden learning

Authentic learning	Ownership of learning Student directed (SD), Co-constructed (CC), Teacher directed (TD)	Quotes demonstrating authentic learning characteristic Research Commentary and analysis (bold)
Real context	<p>The practical gardening work in the weekly rotations was dictated by the season and what needed to be done in the garden at the time. There were general maintenance tasks including planting, weeding, watering and staking plants. There was also the task of picking and washing the herbs, fruit and vegetables that were needed by the group doing the cooking.</p> <p>These tasks had elements of student direction, teacher direction and at times co-constructed learning. The teacher direction reduced as the children understood and became familiar with the different tasks.</p>	<p>The children connected to the real context and the outdoor learning. The learning was relevant to the learner's world.</p> <p>"I liked going out and gardening and working outside and learning about plants" (Jim, Focus group C).</p> <p>The work outside in the kitchen garden stimulated curiosity and gave a reason for learning. The learning was interdisciplinary in nature; it wasn't pigeonholed into any one discipline.</p> <p>"I remember them wondering why some of the plants grew such big leaves and there were no flowers and also the wonderings about what if we did this to the plant or it didn't get watered or what would happen if the soil wasn't any good" (Judy, Teacher interview).</p>
Working as professionals do: complexity, challenge and discourse	<p>Looking after the worm farm, making sure that the kitchen scraps were put in and that the vermipost was not drying out CC).</p> <p>Turning or spreading the compost on the garden beds and adding straw to the compost also need to be done (CC).</p> <p>Cleaning the tools and organizing the tool shed (TD then SD).</p> <p>Application of liquid seaweed fertilizer or liquid from the worm farm (Initially TD then CC).</p> <p>Removing old plants (CC).</p> <p>Seed sowing, pricking out or thinning out seedlings (CC and then SD as children developed skills and knowledge)</p> <p>Crop rotation and garden planning (CC). Personalising the space with signs and labels (SD).</p>	<p>"For example you can grow peas and eat the shell. It's okay if it's your own because in the shops they could spray chemicals, that's why I don't eat the shells" (Joe, Focus group A).</p> <p>"Cos you know you've eaten your own food and you've prepared it" (Fred, Focus group A). Making connections, reasoning and valuing the fresh food.</p> <p>"And it's fresh! And it's more fresher because you just pick them from the garden and eat them" (Len, Focus Group A).</p> <p>Understanding the work involved, the consequences if it is not done and making a commitment. Overtime there was an integration of knowledge, skills and attitudes.</p> <p>"It has given me more confidence to do more things, like cook, to help out in the kitchen and garden and now... I look after my garden at least once a week now. Cos last time, I had a garden (outside my window) I didn't water it or weed it or anything. Eventually it just died. So now I try and get out there as often as I can... at least once a week" (Liz, Focus group B).</p> <p>"Well before I didn't really garden a lot but now that I know the different plants and stuff, I go out and garden a lot" (Jane, Focus group B).</p>

Ownership	The children's comments in the focus groups and the Kitchen garden journals demonstrate ownership (SD).	Producing something that they valued. "Cos you know you've eaten your own food and you've prepared it" (Fred, Focus group A). It feels nice eating food you planted (Kitchen garden journal A) "I reckon the Grade 3s will love it next year" (Kitchen garden journal B).
Collaborative Community	Children frequently refer to the collective group, [for example: we, everyone, us] rather than use personal pronouns to refer to themselves. However groupings were more fluid, and changed frequently compared with the Grade 5 and 6 unit.	"I'm sad it is over because I really enjoyed cooking and preparing food for myself and everyone else in Grade 4 to eat" (Kitchen garden journal C). Elements of both ownership and collaboration "Yes...and it is better for the environment when we all garden" (Mandy, Focus group C).
Higher order thinking (HOT)	They also show they understand the interconnectedness of different components of the kitchen garden ecosystem. They are starting to identify cause and effect (SD)	"The kitchen garden is helping out generation learn more about keeping the earth alive" (Liz, Focus group B) "...and keeping us fit" (interjection by Jane, Focus group B). "Yeah, with gardening and growing things. And it's encouraging everyone to do more because we are fitter" (Lily, Focus G- B). "Well it is good for the environment because normally when you want to get some fresh vegetables a lot of people would drive down to the supermarket...pick it up...put it in a plastic bag, which is bad for the environment... drive home again which is bad for the environment as well... whereas if you have a garden out the back you can just walk out the back door and pick something and walk back inside again. You know that it is fresh and not overdue" (Simon, Focus G- C).
Assessment is integrated	The assessment for the gardening sessions was informal and required participation in the experiential tasks listed above. The children's learning and developing understandings shone through in the focus group interviews (CC) and their reflections in Kitchen garden journals (SD) Once the children were shown how to do something, for example planting a seedling so that it was at the correct depth, the soil gently firmed around it and the plant watered (TD); then the responsibility for doing it properly rested with the individual (SD). Occasionally one of the other students might criticise (SD).	" Dan, they're not planted deep enough, when we water them the roots will stick out and the plant will flop over" (Comment by child during gardening session, Researcher's journal, Oct. 09). Reflecting on their learning and making healthier choices. "And growing things and picking them has changed some people's style... like I used to eat a lot of lollies" (Kim, Focus group B).

Social context of preparing and sharing

As noted earlier, during the kitchen garden rotation process the children in the theory class were asked to think about several topics that might stimulate conversation at their table, particularly with children they did not know well. When the Grade 4 children came together to eat, the children were asked to sit in mixed class groups.

Ian: "Talking while you are eating is sort of nice rather than just everyone being silent and having nothing to say and..." (Simon interjected "and just gobbling" and he made munching, gulping noises to illustrate).

Leesa: "Yeah! Kitchen garden is really good because you get to sit with people you like and have a nice conversation with them."

Simon: (nodded in agreement and changed the emphasis) "It puts you in a cheerful mood, so you have nice conversation."

(Focus group C, December 2009)

Sitting down and the sharing of their meals was also noted in the children's journals as being one of the aspects of the Kitchen Garden Unit that they appreciated.

Eating together was good because you could have a conversation and be calm and relaxed (Grade 4 kitchen garden journal, 2009, Focus group B).

The theme of relationships and making connections with other people was mentioned in all of the Grade 4 focus group interviews. The children valued preparing food for family and friends, sharing food and making the effort to converse "and have a nice conversation". Gardening as a shared activity to do with a parent was also frequently commented on:

I'm growing a veggie garden with my Dad. I help him look after it... weed, water and plant things. We grew some garlic and I gave some to Mrs X (Joe, Focus group A interview).

These children had gained confidence in their gardening and food preparation skills and could participate in these activities with parents with less of a master-apprentice relationship. Newmann and Archbald highlight the "kinds of mastery demonstrated by successful adults" as a characteristic of authentic learning (1992).

The teachers emphasised demonstrating good manners is noteworthy:

[T]here was a rule that everyone at the table had to wait until they all had the food served, and although there was some exaggerated politeness and play-acting, the children were

very good at passing the food and making sure that they didn't take more than their share, they even encouraged reluctant classmates to have a taste (researcher's journal, November 2009).

Instead of constraining the children, the focus on good manners added an element of caring and looking out for one another:

I learned that when you talk really loud, like shout and stuff, people just turn around and yell back at you (Leesa, Focus group C).

You need good table manners because if you are talking [loudly] and things at a restaurant everybody is disturbed (Rosie, Focus group C).

Judy T was surprised at how many of the children did not appear to use knives and forks properly. She suggested that it might have been because many of the children do not sit down and eat a family meal at a table, possibly due to time constraints. Many families are time poor, with both parents often working. Mealtimes are often staggered and children frequently sit down in front of a television with finger food or a bowl and a fork (researcher's journal, November 2009). Judy T elaborated this idea when interviewed:

I definitely think that in the current environment, where it seems that cooking is on the way out in many homes, it is even more important that kids are exposed to how easy it is to cook a simple meal and how easy it is to put vegetables into it and make it nice and tasty. And that even growing your own vegetables isn't that difficult. You can have some tubs out the back. (Judy, teacher interview, December 2009)



Figure 5.4: Sharing the dips

The children had been asked to write about a cooking experience they had enjoyed, and to use all their senses to describe the food they had made in the cooking experience. The direction to “use all their senses” to describe the food raised the quality of the writing in their reflections. Many of the children chose to write about the dips (Figure 5.4) or one of the soups made from ingredients picked from the garden.

The beetroot dip smelt like beetroot. It looked rough and chunky but tasted divine. I heard nothing (Jane, kitchen garden journal, group B, November 2009).

The golden soup was better than the lentil soup. It looked like pumpkin soup. It was smooth and orange with dark flecks of parsley. It smelt awesome and I gave it 100/100 for taste (Fred, kitchen garden journal, group A, November 2009).

It was surprising that the foods they chose to write about were not the popular sweet apple and cinnamon or beetroot muffins, but the foods where the children were required to make decisions on ingredients and had control over flavour. Simon’s reflection on cooking throughout the year illustrates this:

My favourite meal was when we made dips because we could change the flavour (Simon, kitchen garden journal, group C, December 2009).

The cooking experiences where the children were able to taste and experiment with flavours stood out to them as being memorable. The dips and soups were mentioned frequently, both in the focus group interviews and in the children’s reflective journals, and were obviously a highlight of the cooking sessions. The teacher had discussed using restraint in combining ingredients. She suggested trying a little seasoning, then stopping to taste and judge if they needed more.

What I loved most was the dip cooking because we just chucked random things in it and it tasted delicious (well not exactly random!) My favourite food all year was the sweet corn dip! (Mandy, Grade 4 focus group interview C, December 2009).

Experimenting with different flavour combinations and being encouraged to invent something new in collaboration with a partner, “creating a new recipe” was empowering for the children. The collaboration with a partner meant that the children had to discuss their ingredients and come to agreement on what flavours would combine well together. The children had control over the ingredients they used to create their dips and valued the creative aspect; they had ownership.

The kitchen garden as a context for schoolwork

The Grade 4 recipe book

The skills acquired in the production of herb information posters were later put into use in the compilation of a Grade 4 recipe book to generate funds for the purchase of more seedlings and seed for the kitchen garden. The Grade 4 recipe book had value in the “real world”, because parents wanted copies of the recipes the children had enthused about. The parents were willing to purchase the book and this added to the children’s sense of purpose and achievement.

The fair was really good with the kitchen garden books and with all the photos... with selling the books we all took different shifts. Amanda and I probably got the best shift cos we sold 14 to 15 books in the morning (Ellie, Focus group A).



Figure 5.5: Selling herbs and the kitchen garden recipe book at the fair

There were also significant benefits from the quality of collaboration required in undertaking these tasks. The children shared tasks and worked together to achieve the shared goal. This helped generate a feeling of connection and belonging. In alignment

with constructivist theory, the children not only shared experiences in an authentic context, but through discourse and “being there”, the children were also establishing shared understandings. They developed a sense of responsibility to the group and volunteered to work during lunchtime to complete the collation of the recipe book in time to sell at the fair. The children picked and bunched fresh herbs, created posters, set up the stall and created a display about the kitchen garden. It was a learning experience that they valued. They could see that their product was appreciated in the community because people stopped to chat about the kitchen garden and bought the recipe book.

We made some zucchini muffins the other day from the recipe book and Mum followed the entire recipe! So she made 16 of them and we'll be eating them for three nights! (Simon, Grade 4 Focus group interview, December 2009).

Teachers' work

Kitchen garden rotation groups were mixed ability class groups. Each group experienced a range of teacher practices, priorities and pedagogies. The teachers selected the recipes based on the season, whether the ingredients could be modified to cater for all the children and what was available to use in the kitchen garden. Additional ingredients required for the recipe were bought the day before. Occasionally, recipes needed to be adapted for health reasons, so versions adopted gluten-free flour or recipes using egg alternatives were made by one of the cooking groups so that everyone was able to sample the food. Parents coerced by their children to “volunteer” to help with the cooking and gardening sessions were timetabled to coincide with when their child was cooking or gardening, working with whichever teacher was rostered to work with the group.

Usually the teacher, with several children who'd offered to help, would spend the recess period preparing the classroom for cooking. The classroom tables were scrubbed clean and arranged into four workstations. Chopping placemats, vegetables or ingredients, and copies of the recipe in protective plastic pockets were shared out at the tables. The children in the cooking group came in after recess; hair tied back, hands cleaned and eager to start, demanding to know what they were going to be cooking. At times there were conflicts between children, particularly when competing for cooking tasks.

We learned from experience to select labour-intensive recipes that required a lot of chopping, shredding and mixing. Things like the Asian rice paper rolls were ideal because we could utilise fresh ingredients... the Vietnamese mint, chives, lettuce and

coriander from the garden and all the children could be involved in the preparation of the filling... and then they could all be involved in the wrapping and making of the rolls (Judy T).

The conflicts were when there were not enough tasks to keep everyone busy because they were all so keen to be involved (Leanne T).

We got around this by making smaller multiple batches of some recipes. This worked well because we could introduce variety, model how you could change a basic recipe and cater for any allergies (Judy T) (conversation between the Grade 4 teachers explaining their approach to cooking — researcher's journal, December 2009).

The negative, traditionally competitive practice of children competing over tasks was changed to a positive activity, and the teachers also noted that as the year progressed the children worked more as a team, realising that they needed to cooperate to get the food prepared and cooked on time. With teacher encouragement the focus changed from being all about wanting to be the “star” student doing all the most interesting things, to becoming a student capable of sharing tasks and helping others to work towards producing the end product. The teachers deliberately encouraged teamwork and sharing through noticing and praising those qualities when they saw them. It may also have been due to the novelty of specific tasks wearing off, as all the children became familiar with the preparation tasks.

Although the kitchen garden days were looked forwards to with enthusiasm by the majority of the children, there were some children that found the expectation that they at least tried the food confronting. One child brought a note from home requesting ‘please don’t *force* Johnny to eat the food, we allow him to decide if he wants to eat different foods’. His teacher explained that they were encouraged to try things but not force-fed. Looking back at the year, Judy T thought that she had limited success with changing his food tastes. There were a couple of new foods he’d nominated in his journal as being ‘nice’ but noted that he was always very keen to participate in the preparation. He enjoyed the chopping, grating and mixing, if not the food itself.

The reading of recipes in the weekly cooking sessions and the creation of the Grade 4 recipe book were used as opportunities to revise procedural writing.

Yes, one of the main improvements I noticed was the procedural text... and how well they could follow a recipe, and when they asked me questions I’d often say, “go back to the recipe and see what it says”, and sometimes that required some inferential skills even though it was a procedure and they had to make connections with things we had done in different weeks (Judy T).

The teachers let the growing and maintenance requirements of the kitchen garden dictate the tasks to be completed during the gardening sessions. Over time (Table 5.2) the children became more knowledgeable, the teacher's role changed to facilitator and co-worker, and more of the tasks were student directed. Table 5.4 analyses the separate components involved in the compilation of the Grade 4 recipe book. This also shows the Grade 4 children becoming more autonomous and self-directed as they developed ownership of the creation of the recipe book.

Table 5.3: Authentic learning framework: the Grade 4 recipe book

Authentic learning	Ownership of learning Student directed (SD), Co-constructed (CC), Teacher directed (TD)	Quotes demonstrating authentic learning characteristic Research Commentary and analysis (bold)
Real context	Creating the Grade 4 recipe book for sale at the school fair to generate funds to purchase seedlings was a real context (ownership), however the idea was first suggested by the teachers (TD), the task was co-constructed (CC) it had input from both students & teachers	The fair was really good with the kitchen garden books and with all the photos...X and Y doing the selling of some books (kitchen garden recipe books) and we all took different shifts
Working as professionals	The cooking book had many possible forms and decisions had to be made about what to be include. The students had some choice within the parameters of the task (CC). They needed to select popular recipes to include in the book (SD) Procedural & descriptive, modelled by the teachers (CC). Research using key words (TD). A roster for the stall was made up (SD)	And then a teacher came along ... and then she had that big microphone thing and she yells to the whole fair that we were selling the recipe book. Sooo... embarrassing! ...well it was a bit embarrassing because the teacher said we had to bargain but we sold lots (LEN, Focus group A)
Collaborative Community	Respecting different views and opinions (CC). Design & layout decisions (SD)	I told X, I think that we should put the salsa in because it looked delicious and it was nice and spicy (Kim, kitchen garden journal, group B) I think the salsa looked like something gross but it tasted yum! (Mandy, kitchen garden journal, group C).
Higher order thinking (HOT)	Justification for recipe inclusion in book (SD) Choice between multiple alternatives Required decisions but not really challenging (limited HOTS) Designing book, research, layout, editing and printing (CC)	... and the ricotta and rainbow chard gnocchi balls. I loved the flavour; it was great especially with the rainbow chard in it (Leesa, Focus group C). I recommended the sweet corn dip (Len, Focus group A)
Ownership	Setting up the display and talking to customers/parents, promoting the recipe book and the kitchen garden (SD)	X and I probably got the best shift because we sold about fifteen books (Ellie focus group A)
Assessment is integrated	The completed product, the recipe book was the evaluated product—the success was in the sale of the recipe book. It had value beyond school.	We under estimated the popularity of the recipe books, I think we printed fifty and they were sold out on the day (Leanne T. Grade 4 teacher)

The students understood what they were doing and could see the reasons for the task. They appreciated that they were working as professionals would in the “real world” and they were to produce a “real product” to be sold at the school fair. Internalising the experience and making the learning relevant to their lives demonstrates *emotional engagement* (Handlesman et al. 2005). The recipe book was the context or reason for the work. Maureen O’Rourke (2003) emphasises the importance of connecting with learning in generating engagement:

[T]asks need to present with more than a singular operational literacy intention if they are to maximize student engagement, persistence and perseverance. Harnessing social purposes that are meaningful and relevant to students, responsive to their cultural interests, and which provide opportunities for choice, decision-making and critical evaluation significantly expands the likelihood of increased student engagement with the operational demands of literacy and technology (p. 140).

O’Rourke’s statement is not exclusively related to literacy. It is essential for students to be engaged in their learning. Understanding the social purpose and application of their learning increases student engagement because they can identify with the objective of the task and see that the learning is real and relevant. When students have ownership of the task, engagement is increased. Authentic tasks such as the creation of the Grade 4 recipe book fitted the criteria O’Rourke identified as promoting engagement and student ownership.

The Grade 4 focus group interviews

Do we have to go back? I’ve had fun talking and if we go back to class we will have to work (Grade 4 focus group interview).

The children said that they enjoyed the focus group interviews that they appreciated the opportunity to escape from class and sit and chat. The group of seven children had been talking and reflecting on their experiences of the kitchen garden for thirty minutes. Evaluating the importance or significance of the various learning activities experienced throughout the Kitchen Garden Unit was not perceived as work for the children. It was appreciated as an opportunity to have a say about what they’d learned, felt or thought. This was not just one focus group, it was repeated across all the focus groups (Appendix J: Authentic learning framework: the focus group interviews).

The focus group interviews were a valuable reflection and learning tool. I think it is a wonderful way to demonstrate how construction of knowledge is a social construct. I must think of a way to work this into the curriculum, as the children appeared to get so much out of it. The group discourse around their learning and experiences actually consolidated their learning, and I could see children making connections and links where before there may not have been (researcher's journal, December 2009).

When the children in the focus group interviews were asked if they had any recommendations to improve the Kitchen Garden Unit, two of the focus groups discussed how they didn't want it to end when they went to Grade 5. It was after these focus group interviews that the request to continue the kitchen garden was made by the children.

The evidence for authentic learning from Tables 5.1, 5.2 and 5.3 identified by the Grade 4 teachers, parents or self-identified by the children was collated and summarised (see Table 5.4 Summary of authentic learning characteristics in the Grade 4 Kitchen Garden Unit).

Table 5.4: Summary of authentic learning characteristics in the Grade 4 Kitchen Garden Unit

Real-world context:

- working in the kitchen garden (KG) to grow and maintain plants
- producing food to eat, including the preparation and cooking of healthy meals
- children are immersed in interdisciplinary, experiential learning relevant to the real world
- familiarity and connection to the garden promoted curiosity, and fascination with the changes they observed
- interdisciplinary nature of the learning.

Working as professionals do:

- technology was used to research information about plant varieties and their growth requirements, and also recipes to utilise the garden produce and professional product
- evidence of the children developing a knowledge base in respect to the needs of plants and nutrition
- several children demonstrated a developing ecoliteracy in KG focus groups and reflections
- children worked collaboratively on gardening tasks and cooking tasks
- autonomy in selecting and prioritising tasks as confidence and knowledge built.

Higher-order thinking (HOT):

- understanding the interconnectedness of ecosystems
- understanding cause and effect relationships with the overuse of resources and health of environment
- cause and effect statements in respect to health or otherwise of plants
- reflections and critical thinking — analysing teamwork, feelings and outcomes; for example, the reasons for successful, timely preparation of meals
- reflections on building relationships through working together or the sharing of food.

Ownership:

- real context and life skills — relevance of producing healthy food in both the garden and kitchen builds ownership
- decisions regarding choice of tasks in KG (increasing autonomy)
- curiosity about nature/growth in KG
- comment about being proud to pass the kitchen garden onto the next year's group.

Collaborative community:

- discourse required in decision-making process in creation of dips so that different perspectives could be accommodated.
- teamwork assisted the formation of positive peer relationships
- group project — the compilation, production and sale of recipe book.

Authentic assessment:

- children and their parents valued weekly cooking and gardening sessions producing and preparing healthy meals
- tangible benefits include increased liking for a variety of foods, life skills of cooking and gardening, improved relationships
- children more conscious of a healthy lifestyle and improved their nutritional base
- evidence of increased knowledge about the needs of plants
- articulated understanding of interconnections — ecoliteracy.



I loved the flavour — it was great — especially with the colourful rainbow chard in it (Grade 4 kitchen garden journal entry).

Summary

The Kitchen Garden Unit was informed by the needs of the plants in the garden, and what was in season and ready for harvesting. As the children worked in the kitchen and the garden they built on their cooking and gardening knowledge and skills. However, they learned more than how to cook and garden. Analysis of the data resulted in four key themes:

- Relationships;
- life skills;
- health and nutrition; and
- nature, environment and ecoliteracy.

In the focus group interviews the children demonstrated a deeper understanding of relationships and personal feelings, and identified that they valued life skills — skills that were relevant and transferred readily to their home and social lives away from school. Several children also explained the interdependence of everything in nature when they linked cause and effect. Some of the children may have been trying to give the researcher the answers they thought were wanted. Although the children built on each other's ideas, the focus groups' review of the year appeared to be celebratory in nature; there were few dissenting voices. This will need to be considered when discussing the data. The Grade 4 children's learning through the kitchen- and garden-based unit of work was summarised in Table 5.4. This will be compared with the Grades 5 and 6 children's learning in Chapter 6: The Pantry Plunder Unit, the second embedded case study. The teachers' planning for the units is explored in Chapter 7.

Part 6: The Grade 5 & 6 health and nutritional unit

Introduction

This case study examines the Grades 5 and 6 health and nutritional unit of work, “Pantry Plunder” developed by the professional learning team 4 (PLT4). This was partly in response to the plea from the Grade 4 children themselves, to continue on with the kitchen garden when they went to Grade 5. It was also selected as a curriculum area focus by the PLT4, as the basis for the whole school inquiry into the e5 Instructional Model.

“Pantry Plunder” is a unit of work based on health and nutrition. While the Grade 4 Kitchen Garden Unit ran throughout the whole of the year, the Grade 5 and 6 Pantry Plunder Unit was designed to run over one ten-week term.

Chapter 6 focuses on the data collected from the Grade 5 and 6 children in the Pantry Plunder Unit using the three layers of:

- kitchen- and garden-based learning — context, content, and characteristics;
- the children’s learning — ownership, relevance and challenge; and
- the teachers’ work — planning, practice and pedagogy.

This case study details the students’ learning through their reflective discourse in the focus groups and their written work throughout the unit. The focus group interviews are deconstructed to capture the important themes. Participants’ quotes are used as examples to give the participants a voice and to illustrate the emergent themes. Examples of written work, photos and comments from the class blogs were used to add detail and context to the narrative. The themes that emerged through the discourse and stories of learning generated by the Grade 5 children and the Grade 6 children were compared and analysed for similarities and differences.

Case Study 2: The Pantry Plunder Unit

Kitchen- and garden based learning: context, content and characteristics

The background to the Pantry Plunder nutritional unit explains the context — why the unit was developed. The learning tasks the children undertook, and the reflections about the unit from the children and their teachers, illustrate the content and characteristics of the unit.

Judy T, interviewed in the initial Grade 4 kitchen garden case study, was particularly interested in the Grade 4 focus group interview data. When Judy was first involved in teaching Grade 4 she had resistance and reservations about the Kitchen Garden Unit's efficacy. She held the view that the Kitchen Garden Unit needed to be streamlined, first because it was a “lot of work” for the teachers and second; it took time away from “valuable” literacy and numeracy. She was worried about the value of the kitchen garden in terms of achieving outcomes in the VELS (Grade 4 weekly planning session, 2009).

Over the course of 2009, the children's engagement with the project, the perceived social and emotional benefits, opportunities to utilise the kitchen garden for contextualised learning (including literacy and numeracy) and the positive comments from parents changed her mind. She was particularly attentive to the desire they expressed to continue on with the kitchen garden when they were in Grade 5.

There was definitely authentic learning [Grade 4 kitchen garden]. I think that the program is something that they will take all through their lives. The children were really interested! I think that it is something they will remember forever. They have their little journal that is a reminder to them of the cooking and just the way they were so excited and interested in it. That is why I am so keen for it to go on this year... and the next year, so they might go on and keep the interest going. (Judy T interview, December 2009).

Judy T was allocated a Grade 5 class to teach in the following year, 2010. When she read the transcripts of the Grade 4 focus group interviews she realised PLT4 had the opportunity to capitalise on the children's interest and develop a nutritional unit that carried on and extended the nutritional work covered in the Grade 4 Kitchen Garden Unit and fulfil the health and nutrition curriculum requirements of VELS for Level 4 (Grades 5 and 6). As the professional learning teams in the school were starting an inquiry into

the e5 Instructional Model, it was decided to develop the Pantry Plunder Unit as a focus for the inquiry (Chapter 7).

Learning tasks

Mind map of nutritional knowledge (Task 1)

To ascertain the breadth and depth of the children's knowledge, and whether there were any obvious misconceptions, the Grade 5 and 6 children were asked to organise what they knew about food and nutrition. This was an open-ended task, allowing children to respond in different ways. Children explained their understanding in the form of lists using dot points, food pyramids and simple mind maps. The children were asked to self-assess; to identify areas that they thought they were lacking in knowledge and needed to research. These responses and mind maps were not marked. These mind maps were used by the teachers to establish a base level of nutritional understanding, as a starting point for the unit. The discussions about what good nutrition involved then led to research into the main food groups, why they were good for you and the role of different vitamins and minerals, as well as the foods that contained them. The children were asked to develop and add to their mind maps, summarising their nutritional knowledge as they progressed through the Pantry Plunder tasks. The mind map completed near the end of the unit (Appendix L) showed a more sophisticated knowledge of nutrients provided by different foods compared with the mind map (Appendix K) that was completed at the start of the unit.

Newspaper article highlighting personal lifestyle (Task 2)

The unit followed on with a literacy task using a newspaper article from the Melbourne local paper, *The Sunday Herald Sun*, featuring the lifestyle choices of a young person. The article included a photo and detailed their eating, exercise and sleeping habits. The children identified the main text and style features of the article and then used it as a model for their own lifestyle report. The report was written in the third person as though by an "expert" who assessed the positive aspects of their lifestyle choices and recommended areas for improvement (Appendix N).

Best breakfast (Task 3)

The next task (Task 3a) was to explore the characteristics of a “perfect breakfast cereal”. This was an inquiry into the nutrition provided by breakfast cereals and also to identify the advertising tricks that were used to promote and sell foods. The Grade 5 and 6 classes began by looking at cereal boxes and the type of information and nutritional value of the food supplied. Extravagant claims by the advertisers, claims impossible to prove, pseudo-scientific claims, emotive or misleading language, or sneaky serving sizes where the nutritional breakdown is on smaller or larger than normal portion sizes, were identified and discussed. Tricks to make children want the cereals such as vouchers, collectible cards, special toys (collect all ten), or appeals to emotional insecurities were identified. The children demonstrated their understandings by evaluating the nutritional information provided on the packaging of a range of common breakfast cereals and ranking them accordingly (Appendix O; Best breakfast cereal analysis); justifying their choice of the “best” cereal with statements such as “Uncle Toby’s Vita Brits — not only is it high in carbohydrates, fibre and energy, it’s also low in sugar and fats” and relegating cereals to the bottom of the list with statements, such as “Kellogg’s Fruit Loops — not only is it high in sugar and fats, Froot loops [sic] are low in fibre and protein” (Appendix P: Best breakfast cereal ranking). The children created the “perfect cereal” complete with nutritional information, attractive bright packaging, extravagant claims and special collectibles to demonstrate their understanding. A criteria rubric (Task 3b) was created to evaluate the cereal boxes (see Chapter 7 for discussion on the different ways this was done). The remainder of the work for the Pantry Plunder Unit was designed around the invention test (Appendix Q: Invention test).

Research and Negotiation of ingredient list (Task 4)

Task 4 (Appendix M) required the children to place their selected ingredients into a food pyramid to verify that they had all the main food groups that would be required in a balanced diet. In the weeks leading up to the invention test the teachers suggested to the children that they should begin their research at home; that they should start thinking about healthy meals and asking questions about food preparation.

The week before this (the invention test) is where we suggested that they needed to use their mum and dad... and brothers and sisters and ask why they put certain foods together

and how they prepared them. It is also when we started getting the guest chef videos and the guest chefs live, in to demonstrate, just so that they had an idea about food (Tom T Grade 6 teacher, interview 17 September 2010).

Children went to an online grocery site, Coles online. They used the local postcode to generate a list of prices for groceries and made a list of foods that they wanted. The different groups came back together as one large group (both Grade 6 classes) and the foods the groups had selected were written on the board under the following headings: meat/protein, grain/cereal, dairy and fruit/vegetables. The children's prior investigations into a healthy breakfast and research into the recommended daily intake (RDI) assisted in building up their knowledge base and enabled the children to identify these food groups as being essential in a balanced diet.

The kids that had done the experimentation and that extra research already were ahead of the kids that were perhaps not quite sure of what they wanted or what they were going to do with the focaccia wrap or the Turkish bread. So the way it went was the kids that had done the research in the groups got what they wanted [because they voted as a block] whereas the kids that hadn't, for example some just wanted wholemeal bread, didn't get what they wanted. There were thirteen different types of grain, generally over 8–9 different items for each category. All children got one vote in each category. The top five food items in each group were left [the others were deleted], except in the fruit and vegetable categories, where it was going to be easier to cater for individual choices. (Tom T, interview 17 September 2010)

The children were given an ingredient list. In their groups they had to highlight what ingredients they wanted to use to create their meal. They were allowed to select ten items. The children had to fill the food pyramid with their chosen ingredients, work out the RDI for the main food groups and check that they had a well-balanced, nutritional selection (Appendix M). This was a multi-layered task. It tested the children's knowledge of the nutritional groups and also required them to be flexible and problem solve. Many children had to adjust their ideas at this stage so that they stayed within the RDI for the different food groups. Tom T explained many children had too high protein, not enough cereal.

The invention test (Task 5).

The culmination of the Pantry Plunder Unit in grades 5 and 6 was the "invention test", a challenge to create a healthy meal. The Grade 6 challenge evolved to designing and producing a nutritional lunch that can come to school in a lunch box. The Grade 5 challenge evolved in a different direction, although the focus was the same, "designing a

healthy meal”, instead of the criteria of being able to come to school in a lunch box, their challenge involved designing a healthy “everyday meal” from the country they’d selected (see Chapter 7 for an explanation of difference).

The children were able to select a partner to work with. To make a group of four, the two Grade 6 teachers, then matched up these partners with another pair. The teachers had a variety of objectives informing the selection of partners. Initially simply convenience, as they put children together that had completed the initial planning task and were ready to start, and grouping the children that hadn’t completed the planning task together because the others had already started planning and testing their menus. However, they also divided friendship groups to increase the cooperative aspect of the group work and interpersonal challenges. Children nominating different countries cuisines they wished to explore formed the groups in Grade 5. The teachers facilitated this process making sure that the groups were balanced and that no one was left out.

RDI of selected menu

As part of Task 4, the children had to adjust the amounts of the various food items to work out a better nutritional balance and then calculate the percentage of the RDI for the foods they had selected. The children used the wolframalpha.com website to work out the RDI of the food items.

The children were set a target of 25–35 per cent of RDI for protein unless they could justify a different amount. Some children justified being outside this range by recognising that most breakfasts are high in cereal and dairy but low in protein.

The children worked out the quantities required per serving and total per group and then the total cost for the meals. Tom T reported that there was lots of revision and adjustments made due to the cost, for example chilli chicken strips were discarded in favour of the more economical plain chicken. Lyn identified that the children could appreciate that the necessity to budget was a real-life problem. This criterion not only added a degree of complexity but also authenticity. Because the teachers had anticipated in their planning of the task (see Chapter 7), most groups were over budget and then had the dilemma either to reduce or modify the grains or protein categories. This task incorporated many of the key characteristics of authentic learning: a collaborative

community with a diversity of ideas working on a common problem, using technology as professionals would to solve a real-life problem and higher-order thinking requiring decisions to be made and justified.

To promote the schools sustainable ethics,⁸ and the benefits of having your own garden anything that the children can prove comes from a home or the school kitchen garden was a “free” item and not counted in the final costing. Some children also had access to fruit trees or free-range eggs. Herbs and spices were also free items. Once the children had selected their ingredients, balanced the quantities and price, they went back to wolframalpha.com to check the RDI of the foods they’d selected. The PLT identified that this was very rigorous academically; there was a lot of challenging mathematics involved with working out fractions; for example, costing 1/8 of a lemon (LT4 planning meeting).

The children were exposed to guest chef demonstrations. This took the form of live demonstrations mainly by parents, chefs and videos by both parents and children. At the end of each demonstration the groups would discuss what they had got out of it and hints that they had taken on board as being relevant to what they were going to do. On the judging day several children tried special presentation techniques that they’d seen in these demonstrations; for example, made the vegetables or garnishes into flower shapes, another group skewered fruit slices and presented them vertically.

⁸ The school was in the ResourceSmart AuSSI Vic sustainable schools program, an initiative of the Victorian Government. Schools work through five modules to achieve five-star certification.



Figure 6.1: Food presentation

Tom T commented on the skills the children already had from their previous cooking experience.

We were a little bit... not concerned, but very aware of trying to make sure that it was safe and we had parents organised... but the parents became a little bit superfluous... they were there really just to talk to them. The knife work was good straight away. (Tom T, interview 17 September 2010)

Tom went on to observe that several children were really keen and wanted to become “chefs”. He also noticed that the children loved their parents coming in and being involved:

Even though it wasn’t really “cool”, you could see that it made them feel special (Conversation recorded in researcher’s journal October 2010).

The children had prepared tablecloths, with the name of their group, the menu and additional nutritional information such as where their ingredients were placed in the food pyramid and the RDI of the various parts of their menus. The information on their tablecloths could be used as reminders when the judges asked them questions about their menu. On the judging day they prepared and presented their chosen ingredients.



Figure 6.2: Food preparation

Children's learning: ownership, relevance and challenge

Each learning task was designed to carefully scaffold and build on the children's learning from the previous task. Tasks 1–4 aimed to build knowledge and understanding of health and nutrition, and were mainly used by the teachers as formative assessment (Chapter 7). Summative assessment of the children's learning for the Pantry Plunder Unit centred on the "invention test"; the judges, the teachers and the children evaluated the performance of understanding against negotiated criteria.

The performance of understanding had three layers:

1. The production of an appetising, healthy meal (the context for the learning), the meaningful task that emphasises authentic learning and motivates the learner. This task also had explicit criteria; for example, presentation, skill in preparation, timing and sharing preparation tasks. The \$10.00 limit was designed to add a degree of difficulty and complexity to the task.

2. The second layer was about the children showcasing their knowledge on health and nutrition. Their previous work on food groups and the vitamins needed for health, the work done in the selection of ingredients, the RDI percentage their meal provides, the deep knowledge and their confidence in speaking to the judges were all elements of this “performance of understanding”. The preparation for the judge’s questions (Grade 6 only), included prediction of the questions, rehearsal and coaching so that all of the group members could communicate their understanding and knowledge.

3. The third layer of understanding required personal reflection on their learning and the strategies needed for successful teamwork. This required initial discussion and agreement from the group on the strategies most relevant to their group, as well as an honest evaluation of how they could have improved their scores from the invention test (Appendix Q: Invention test).

Invention test judging day

The children stood by their creations and answered questions from the judges. One of the criteria was that each member of the group needed to contribute to the discussion. The following reflection for “Awesome pita pockets” (see Figure 6. 3 illustrates the complexity of the task.

The invention test was a group challenge, where we were asked to produce a nutritious meal suitable for a lunch box. We were being judged on our presentation, taste, ideas and how well we made our tablecloth. There were four judges. Our judges were our state parliamentarian, our school principal, a guest chef and an educational teacher. We were to choose 10 ingredients from a list of 30 with a budget of \$10.00! Our meal was called “Awesome pita pockets”. Our pita pockets contained cheese, egg, tomato, lettuce, carrot and chicken breast marinated in lemon, pepper and salt. Our side plate was a fruit skewer containing banana and apple. The judges scored my group an average score of 19/25. Our group was scored highly on the nutritional knowledge of nutritional criteria. I believe this was because we used our time wisely and had spare time to review the lunch planner and the nutritional content of the meal. Our customer service was the lowest score. In my opinion it was because we did not share the load of speaking to the judges and did not volunteer additional information on our teamwork (reflection published on Grade 6 blog, 15 September 2010).

Another child in the same group wrote a similar reflection, showing that the group had obviously analysed their results and discussed how they could have improved. After explaining the task she went on to reflect on the scoring of the various sections:

Our group scored highly in the knowledge of nutrition. I believe this was because we challenged each other and managed our time wisely. This allowed us some time to rehearse what we were going to say to the judges. Our weakest point was customer service. I think this was because only one or two people spoke to the judges and the others didn't really contribute. We could have improved this by making more progress checks so that we knew what we were all doing so we could talk about it at the end and we could have rehearsed using eye contact and speaking to the judges (reflection published on Grade 6 blog, 15 September 2010).



Figure 6.3 Grade 6 invention test: awesome pita pockets



Figure 6.4: Care with presentation, Grade 6 invention test: juicy chicken salad roll



Figure 6.5: The fruit salad glistened

[S]he brought along mint leaves, water and little bit of sugar and she boiled it all up and we all thought, “What...?” But as soon as you taste it you think... what a great flavour! I asked if she did that at home and she said, “No, I just had a practice at home and I made it up and it worked.” She said, “I told the others in my group that’s what we are doing” (Tom T, teacher interview 17 September 2010).

Table 6.1: Pantry Plunder: themes from Grade 5 & 6 focus groups

Themes	Examples of quotes from the focus group interviews that illustrate themes/codes		Key Characteristics of Authentic Learning
Meaning codes:	Grade 5	Grade 6	
Working as professionals do Need to research /build up knowledge base	“Probably the hardest activity was where they had to use a search engine called ‘wolfram alpha’. They had to analyse every ingredient in their meal, and break it down and put it into a table—there was a lot of math involved, they had to work out the percentage of nutrients in that ingredient, and how much of the RDI it contributed to the meal itself. So they had to work out how much of the ingredient they were using and then divide it by four because four people were eating it.” (Grade 5 teacher interview).	“Before we decided on a meal we also had to choose a meal off the internet and try it in the lunch planner, so we had to write the vitamins and minerals and nutritional benefits and stuff.” “Well before we could get started on our meal we had to complete a lunch planner that had a pyramid [food pyramid] of all the foods you were using in the meal. And then you had to work out the percentage of the daily intake for each of the foods.”	The task fitted the authentic learning characteristics of a poorly or ill-defined problem as well as open-ended inquiry. Knowledge & skills acquisition as well as multiple resources and different perspectives are demonstrated in the children’s comments. The multiple resources had to be narrowed down so the task was manageable. The different perspectives and tastes of the children also contribute to the “ill-defined problem”.
Academic rigour/ challenge	“We had to write out all the RDIs and how much your meal has of the RDIs for salt and protein and how much energy.” (Grade 5 focus group interview).	“This was very rigorous academically—there was a lot of challenging mathematics involved with working out fractions for costing 1/8 of a lemon” (Grade 6 teacher interviews). “Well they showed us a site called wolfram alpha where you could type in a food and it comes out with the dietary balance and stuff so we had to make sure that it wasn’t over the daily intake recommendations.”	“The kids could see why they had to budget. They could see why they had to know about carbohydrates and the protein and even the salt. Because we had done the previous work, they could understand why they had to have clean hands and utensils. They could understand why flavours and textures and colours were important...” (Grade 6 Teacher interview).
Use of technology as a research tool		“Yeah, well when we were deciding on the ingredients, you had to get on to the class blog and take a survey.” “...and we had a list of ingredients that we had to pick from.” “... we wanted to have a main dish and dessert as well... we ended up having both, but two people in our group didn’t want to have a dessert, they wanted to have more in the main meal. We sort of convinced them by working out that the added ingredients in the main meal would make it over 10 dollars but if we did a dessert it would be under.”	The task was supported by technology in the initial research of recipes, food prices, and the nutritional value of the various foods including fat, carbohydrate, protein, salt and the minerals and vitamins and RDI of their selected foods. Digital cameras were used to record products. Videos were produced or watched to demonstrate cooking and preparation techniques [both grades]. The class blog was used to publish the children’s work and as a communication tool [Grade 6 only].
HOT Decisions requiring discourse & justification	“They couldn’t just say my recipe is best...but my recipe is better because it has the daily recommended intake of...certain things and it has a good balance of vegetables to the meat... and they had to use all that type of language in their justification.” (Grade 5 teacher interview).		

Themes Meaning codes:	Examples of quotes from the focus group interviews that illustrate themes/codes		Key Characteristics of Authentic Learning
	Grade 5	Grade 6	
Higher-order thinking (HOT) Complex, multi-step tasks	<p>“We had to work out the RDIs for each ingredient and work out the fractions each provided so we could work out how much our menu had of the RDIs for salt and protein and how much energy and decide if we had to modify it.”</p> <p>“We all had different roles and a timeline.”</p> <p>“So within the group of four there was a lot of justification as to why one recipe was more nutritious than another. And it had to be tasty and presented well” (Grade 5 teacher interview).</p> <p>“It’s hard work but it is worth it ...it all pays off” (Grade 5 Focus group).</p> <p>“Well we tried a lot of foods that we had never tried before.”</p> <p>“...how simple it can be to make something taste really delicious”</p> <p>“I liked the judging part where they said a lot of positive things to us about the meals we made.”</p> <p>“We said what went well, the positives and the negatives and what we could have done better.”</p>	<p>“We had to write out all the RDIs and work out the fractions of each ingredient so we could work out how much our meal had of the RDIs for salt and protein and carbohydrates.”</p> <p>“...and so from there as a group we decided... we made a list of all the things we thought were important (about working together as a group) ...it helped you, knowing the skills of the people you worked with and knowing your own skills and abilities.”</p> <p>And if you go in to each of them (the reflections) they are all different but there are also similarities. Each group has got the shared knowledge and the assigning jobs. And the discussing and agreeing” (Grade 6 teacher interview).</p> <p>“I believe my group was scored highly in customer service and our tablecloth design because we shared our knowledge well with the judges, and while creating our tablecloth, we discussed and agreed as we went along.”</p> <p>“Our lowest score was presentation; I believe this is because my group did not research colours, textures and mixing of flavours” (Grade 6 reflection on class blog 14th September 2010).</p> <p>“It’s hard work but it is worth it ...it all pays off.”</p> <p>“Because it was fun and you learnt it, it stuck in your brain.” “... Yes, like hands on and stuff.” “So you know how to eat healthy.”</p>	<p>The task requires HOTS as the children reflected and evaluated the teamwork skills that they needed to complete the task successfully. They also illustrate characteristics of the collaborative community of learners.</p> <p>“What a great day! I just wanted to tell you all how much I enjoyed being a part of such a special day with Grade 6. I was amazed with all of the wonderful ideas, flavours and smells that you all came up with. There should be some great dinners being cooked over the holidays. Great job guys!” (Parent, class blog, 16th September 2010).</p> <p>“Yesterday we talked about group behaviour and they [the Grade 6 children] listed the things that helped make them successful. Most groups came up with 10-12 behaviours. We asked them to choose the 5 or 6 from their list that they thought were the most important. Then those 5 or 6 were placed into a pie chart and each was given a value by the group indicating how important they thought it was.” (Grade 6 teacher interview).</p> <p>The assessment was integrated and the performance or product was directed to a real audience including their peers, the children’s parents, teachers and judges. It had value in the wider community. The students demonstrated their engagement and the value they put on the learning task in their reflections.</p>
Ownership Engagement/ Worthwhile	<p>“Pantry Plunder was fun!”</p> <p>“It is really fun [speaking about the Pantry Plunder Unit]... It is really, really, fun!”</p> <p>“It was such a real life activity and it covered a lot of life skills” (Grade 5 teacher interview).</p>		

Themes Meaning codes:	Examples of quotes from the focus group interviews that illustrate themes/codes		Key Characteristics of Authentic Learning
	Grade 5	Grade 6	
Relationships Shared experience, different roles or strengths Collaboration — helping each other —or avoiding work	<p>“We improvised a lot with the food and how we made the food because we all had different roles and a timeline that we were going by.”</p> <p>“We had fun making our dish together and setting up our table.”</p> <p>“It can be annoying when people piggyback of ideas because he didn’t want to work out the RDI’s, he chose ingredients the same as mine; he wanted to use my information.”</p> <p>“They all had to work backwards from the time that the meal had to be completed and give everyone in the group a job and work out when they needed to start — they all had everything that they needed and I think it was that they had that action plan of who was doing what and when, and a list of materials.” (Grade 5 teacher interview).</p>	<p>“...it helped you knowing the skills and the skills of the people you worked with and knowing your own skills and abilities.”</p> <p>“I reckon they should have figured out who the experts were and mixed the groups up. Because there could have been some groups with no idea!”</p>	<p>“In this particular reflection you can see the behaviour of discussing and then agreeing is given a value of 20% so they said that discussing and agreeing was one-fifth of all the others. So it was very important and lots of the children had that sort of thing. They’ve got that everyone cooperated and completed any tasks that were given.” (Grade 6 teacher interview).</p>
Diversity	<p>“You get a heap of knowledge about all the different countries and what they eat and how they make their food... Mexican and ...Italian and stuff.”</p> <p>“Well we all learnt about foods from different countries because we all based our menus on foods from different countries....Spanish and Mexican and ...Italian and stuff.”</p>	<p>“I thought the groups were a good idea because in the groups, some of the people knew a lot and some of the people knew not much, so then you were able to learn from each other in the group.”</p>	<p>Sharing tasks and helping each other was an indication of collaborating together. Although, as directed by the Grade 6 teachers, the written reflections were based on collaborative strategies, the children’s verbal comments were focussed on different abilities.</p> <p>Grade 5 children’s comments tended to be about sharing the work and the origin of their recipes. The Grade 5 teacher identified the schedule the groups were required to plan, as being helpful in keeping the cooking groups organised and prepared. This was a task added into the Grade 5 procedure. It was not discussed as a strategy at the PLT planning meetings.</p>

Themes	Examples of quotes from the focus group interviews that illustrate themes/codes		Key Characteristics of Authentic Learning (See Part 2, Table 2.1: Key Characteristics of Authentic Learning) Research commentary and analysis (Bold)
Meaning Codes:	Grade 5 (Quotes from Grade 5 Focus group interviews unless specified)	Grade 6 (Quotes from Grade 6 Focus group interviews unless specified)	
Life skills Interpreting nutritional data Aware of advertising tricks Experimenting with recipes	“I learnt how to read the back of packets of food... you can read the labels to judge whether it is good for you or not.” “The chicken was a bit plain and it didn’t taste as good as it possibly could have with all of the herbs that we had access to so we spiced it up a bit.” “When we did the recipe we added extra herbs and things to the meat, we just kind of changed the whole recipe.”	“We had to design a cereal box that used at least three advertising tricks —tricks that big companies use to make you buy the products— this has made me much more aware of the ways they influence us.” “I learnt when we were cooking in Grade 4, I remembered that we put parsley and chives on the food to make it taste better.”	The real problem and context were relevant to the children. “I think authentic is the word at the moment but I think it is important... and I think that children today demand almost a relevance to what they are doing or a link in some way to their lives. And if you can provide or articulate that link you’ve got them on board straight away.” (Tom Teacher interview 17 September 2010). The relevance of the learning to the children’s life-world was also demonstrated when the children reflected on their learning [Links to ownership and relevance].
Budgeting Health & nutrition Link to adult world Cooking healthy meals Healthy lifestyle choices	“We could only have \$10 dollars per group to buy all the ingredients for five meals!” “When you leave home you don’t have to order takeaway every night because you know how to cook... like I learnt how to cook a healthy meal.” “You learn about making healthier meals and healthier options.” “You can read the labels to judge whether it is good for you or not.” “The pepperoni had too much fat so we thought that we would cut it out.”	“...and another challenge was that it had to cost under \$10 ... and serve 5 people!” “It gave you a good idea of how nutrition works or what nutritional value goes into foods.” “...you know how to eat healthy instead of just laying back and just eating all this junk food and all this fatty foods, you can increase your health in life ahead by eating healthy foods.”	

Students discussed their learning over the ten weeks of the Pantry Plunder Unit that built up to a performance of understanding on the judging day. The level of engagement and ownership the children exhibited was commented on by Tom T:

I took half a dozen from a distance, panoramic style photos and you can't see any child off task or not concentrating fiercely on what they were supposed to be doing. I think those sorts of panoramic photos are great anecdotal evidence of how authentic and how connected the children were with the task... in the photos where there are kids talking to the judges, they were acutely conscious of who the judges were and what they had to do to get their knowledge across (Teacher interview, 17 September 2010).

Relationships

Work in the collaborative groups involved contribution of different ideas and suggestions for different ways of doing things. Food was something all the children were interested in and all the children wanted to prepare their favourite dish. Resolving the different viewpoints required negotiation, as did allocating the various tasks and roles. As the Grade 6 student in Table 6.1 identified, “you could learn from each other”. At times there were also conflicts to sort out, as the Grade 5 student explained, “because he didn't want to work out the RDIs, he chose ingredients the same as mine”. These two comments illustrate the same point, but approach it from different perspectives. They illustrate how the collaborative group work built up understandings about the way people work together.

Life skills

The Pantry Plunder was a contextualised unit of work that had relevance to the children's lifeworlds. The children identified that knowing about healthy foods was beneficial and would help them make better food choices both now and in the future when they were responsible for their own nutrition. They also identified the cost saving benefits of knowing how to prepare foods instead of the alternative, less healthy and more expensive take-away option. Tom T acknowledged that the sorts of ingredients that they immediately started researching, pricing and looking for meant that they had a prior knowledge of foods and which foods to put together built up from experience in the Grade 4 Kitchen Garden Unit.

Learning how to decipher and make informed judgements around nutritional information and then to identify advertising gimmicks (on packaging) was also a life skill developed through the best breakfast task. Both the teachers and students appreciated this as noteworthy.

Health and nutrition

The children identified learning about how to make healthy food choices was an essential life skill. They identified knowing more about what role the vitamins and nutrients played in their health.

It gave you a good idea of how nutrition works, [interjection]... and how much we need per day like how much protein, how much fibre... and just [how to be] healthier.

You know how to eat healthy instead of just laying back and just eating all this junk food and all this fatty foods, you can increase your health in life ahead by eating healthy foods (quotes from Grade 6 Focus group).

The Grade 5 focus group summarised their learning as being “about making healthier meals and [choosing] healthier options” and “about reading the labels to judge whether it is good for you or not”. One of the children added to the general consensus and added you “get a heap of knowledge about all the different countries and what they eat and how they make their food”. One child said that he’d lost a kilo because he was more conscious of making healthy choices.

Teachers’ work

The teacher’s work was in the initial planning and sequencing of the Pantry Plunder Unit to maximise and scaffold the children’s learning. It was also putting the planned tasks into practice in the classroom, adapting and modifying the tasks for the children to ensure that all the children were engaged and learning. This is discussed in greater detail in Chapter 7. The

AusVELS⁹ relevant to the Pantry Plunder Unit are:

They describe the physical, social and emotional dimensions of health and establish health goals and plan strategies for improving their personal health. They describe a range of health services, products and information that can be accessed to help meet health needs and concerns. They analyse and explain physiological, social, cultural and economic reasons for food choices and analyse and describe food selection models. They describe how to prepare and store food hygienically.

The AusVELS above is a descriptor of Level 6 and the Grade 5 standard is to work towards the Level 6 standard. The teachers were aware of the curriculum standards for

⁹ Health and Physical Education — Level 6: <http://ausvels.vcaa.vic.edu.au/Health-and-Physical-Education/Curriculum#level=6>
accessed 1/2/2014

health; they provided the justification for developing the unit. It was however, the e5 inquiry that was the driving force behind their inquiry. Tom T explained that they found out what the children know and started from that point.

The only reason that we do it [look at the standards] is for reporting because we have to report according to VELs. So our use of VELs is around that assessment and being able to place the children on that continuum (Teacher interview, 17 September 2010).

AusVELs was considered and discussed before planning curriculum and at the end of a unit of work when teachers need to assess children's level of achievement for reporting to parents. The tendency to use the standards as a checklist rather than center learning on meaningful learning tasks has been reported in past research (Gruenewald 2003a; Kincheloe 2003; McLaughlin & Shepard 1995). However, this group of teachers was confident that by centring the inquiry on the preparation of a healthy meal they would involve the children in relevant, meaningful learning and also cover the curriculum requirements almost by default.

Teachers deliberately introduced elements to make the children's work intellectually challenging, and to increase the complexity of the learning task. They also made the children discuss and justify their preferences. Having criteria that demand negotiation and collaboration is part of setting the conditions for authentic learning. Examples of these include imposing the ten-dollar maximum cost and the limit on the number of ingredients that could be used.

The 30% RDI to be provided by the meal for the protein, carbohydrate and fats was another factor designed to make the exercise more rigorous; however, if the children could justify another amount (for example they could argue that they had cereal for breakfast and so needed to make up for the lack of protein in their diet by increasing the amount eaten in the lunch), they were allowed to increase this amount.

Setting up the conditions for children to reflect on their work throughout the unit was identified as a specific task by the PLT in the planning of the unit. The format for the Grade 6 reflection was more teacher directed and structured compared with the Grade 5 reflection. The two classes were combined for the session where the format was explained. The Grade 6 teachers guided a class discussion on the types of strategies that helped successful completion of the healthy lunch box challenge. All the children in

Grade 6 followed the same format worked out by the Grade 6 teachers. This is reflected in the homogeneity in the format of the reflections. However, Tom T explained that although they looked the same, some of the children were quite perceptive, and demonstrated deeper levels of reflection by pinpointing what their group did that contributed to their result. Tom reflected on the children's learning:

The Grade 6 children were quite critical about the results in their blogs. We gave them the group's strongest scoring area and their weakest scoring area and they were asked to say why they scored strongly and why thought they scored not as well in the lowest area. They were able to identify the items where they didn't do well and lots of them talked about presentation. It wasn't just a general comment; they talked about presentation in terms of the consistency of each plate against each other. The children recognised how well they allocated jobs or which jobs they thought needed to be done, made a difference to the final score in the invention test (Teacher interview, 17 September 2010).

In Grade 5 the children were given the general direction to reflect on their group's weaknesses and strengths, but were allowed to present the information in any way they liked. After explaining the tasks and discussing possible options, the decision on how to present their reflections was left up to the children. The following two figures (6.8 and 6.9) illustrate the variety in the way children reflected on their work. The children's reflections generally had a short discussion on what worked or didn't, and a photo taken on the day of the invention test showing the group and the meal they produced. These reflections were more a celebration of what the individual Grade 5 children had achieved and how they felt. The children had ownership of the solution as well as ownership of their learning. By allowing choice, the Grade 5 teachers demonstrated once again how they valued student ownership.

The destinations for the reflections for the two grade levels were also different. The Grade 5 reflections went into the children's portfolios as a personal record of their learning. The Grade 6 reflections were showcased in a more public domain by being published on the children's blogs (refer to Figures 6.10 and 6.11 for examples of the Grade 6 blog reflections).

Nutrition

Our nutrition subject has changed allot of my eating habits. I have started reading the contents of packaged foods. I've started eating tones of fruit and vegetables and making foods at home such as cakes cookies and other things with sugar salt and fats so I can lower the amounts in them to make the food healthier. I make sure I don't go over my daily intake so I'm not eating too much salt, sugar or fat.

<u><i>P</i></u> _{ositives}	<u><i>M</i></u> _{inuses}	<u><i>I</i></u> _{deas}
*We had fun making our dish and se ting up our table	* was ill so we took longer preparing our dish and setting our table	*Next time we will keep the chicken worm until the judges come so it's not cold when they eat it.
*The tacos were nice even though they where cold when we ate them.	*we didn't score that much with our dish in many different categories	*Next time I will check wether everyone will be there and they will bring everything we need
* our table setting was very creative but simple it got a couple of WOW's which probably meant it was good	*the tacos were not that colourful which lost us a couple of points	*next time we will try to make our dish more colourful and youse many different vegetables

Figure 6.6: Grade 5 portfolio reflection



Figure 6.7: Grade 5 portfolio reflection

Pantry Plunder Invention Test 13/09/2010

The invention test was a group challenge where we were asked to produce a nutritious meal that would be suitable for a lunchbox. We were being judged on our presentation, taste, ideas and how well we made our tablecloth. There were 4 judges. Our judges were our state parliamentarian, our school principal, a guest chef and an educational teacher. We were to choose 10 ingredients from a list of 30 with a budget of \$10!!!

In my group there was XXX. Our meal was called 'Awesome Pita Pockets'. Our pita pockets contained cheese, egg, tomato, lettuce, carrot and chicken breast marinated in lemon, pepper and salt. Our side plate was fruit-skewers containing bananas and apples. The judges scored my group an average score of 19.33.

Below is a pie chart that indicates the key behaviours that the group used to help us become successful. It shows the importance of each skill.

Our group was scored highly on the knowledge of nutrition criteria. I believe this was because we used our time wisely and had spare time to review the lunch planner and the nutritional content.

Our customer service scored us the lowest. In my opinion it was because of the rehearsal aspect. We did not share the load of speaking and did not volunteer to share what happened through this challenge. On the invention test day we did not speak confidently and did not maintain eye contact.

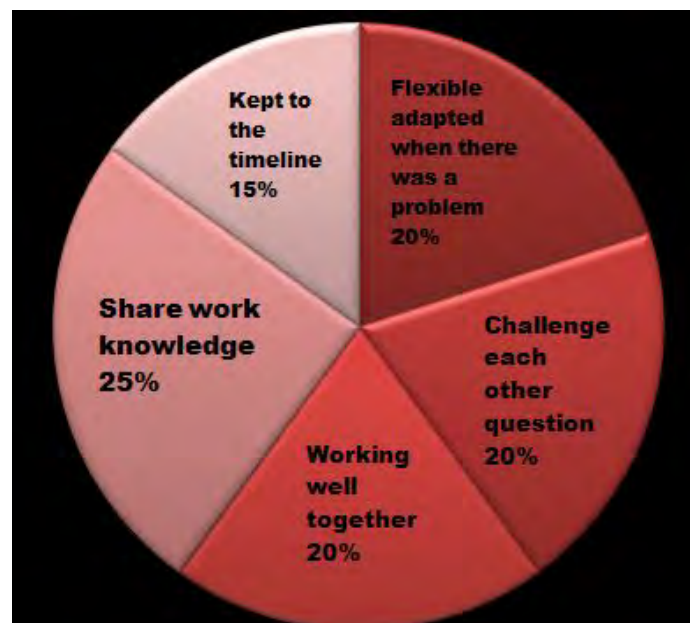


Figure 6.8: Grade 6 blog reflection

The pantry plunder invention test 13 09 2010

As a group of four, we were required to produce a simple, nutritious lunch for five people that could be packed in a lunch box. This was the Pantry Plunder Challenge! The people in my group were xxx.

We were judged on presentation, taste, ideas and how well we have put together our tablecloth. There were four judges. They were our school principal, our local state parliamentarian, a guest chef and one of our teachers.

We had to choose 10 ingredients from a list of 30 ingredients. Our budget had to be under \$10! Flavoursings and produce we could supply from home vegetable gardens were free, but still had to be included on our lunch planner.

Our meal was called “Trendy tortillas with a sweet and sour salad” (YUM!). This was a tortilla with a tomato, capsicum, lemon juice and mint salsa with chicken, cooked in lemon zest, lemon juice, salt, pepper, mint and olive oil, and avocado with a rocket lettuce, pear, parmesan cheese and balsamic vinegar salad.

Our group finished fourth with an average score of 20.33/25 from the judges.

Below is a pie chart that indicates skills that my group used and identified to become successful. It also shows the importance of the skills. We performed well with our customer service and tablecloth. I believe that shared work/knowledge and assigned jobs contributed highly in this achievement.

Our presentation scored us the lowest. This is most likely because our group didn’t allocate someone to research appearance, textures etc.

Invention test group reflection

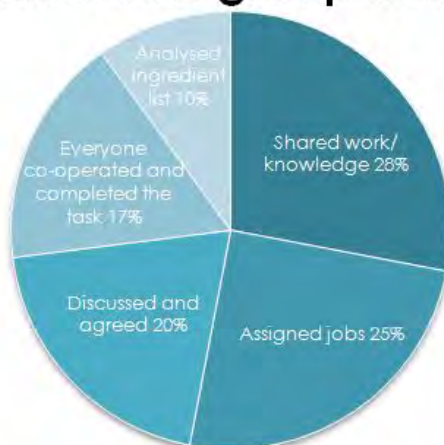


Figure 6.9: Grade 6 Blog reflection

Table 6.2: Summary of authentic learning characteristics exhibited in the Pantry Plunder Unit

<p>Real-world context</p> <ul style="list-style-type: none"> • The selection, preparation and cooking of healthy meals • Children are immersed in interdisciplinary, experiential learning relevant to their every day world • Keeping to a budget
<p>Working as professionals do</p> <ul style="list-style-type: none"> • Technology was used to research information about recipes, RDI of the ingredients, in the presentation of their table cloths showcasing their knowledge • Using technology as a communication tool — reflections on the class blog • Evidence of the children developing a knowledge base in respect to dietary requirements for health and nutrition • Teamwork, sharing and allocating tasks • Poorly defined problem in the Pantry Plunder Unit of creating a healthy a meal required discourse, definition and justification for choices • Grade 5 and 6 defined their parameters differently and ended up with different outcomes • Grade 5 worked to a timeline/schedule
<p>Higher-order thinking (HOT)</p> <ul style="list-style-type: none"> • Justification of menu selection • Reflections & critical thinking — analysing teamwork, feelings and outcomes for example the reasons for successful, timely preparation of meals • Reflections on building relationships through working together on a common task • Challenging multi-step task requiring critical thinking
<p>Ownership</p> <ul style="list-style-type: none"> • Real context and life skill relevance of producing healthy food builds ownership • Choice of menu • Unit was instigated by student request • Cognitive investment and perseverance required to achieve challenging multistep task (working out RDI & percentages identified as particularly challenging)
<p>Collaborative community</p> <ul style="list-style-type: none"> • Discourse required in decision-making process in selection of menu • Teamwork and extensive discourse assisted the formation of positive peer relationships • Group project — the preparation, presentation and evaluation of a healthy meal
<p>Authentic assessment</p> <ul style="list-style-type: none"> • Children and their parents valued the healthy meal challenge • Tangible benefits include increased understanding about nutrition and life skills of preparing healthy meal • Assessment was integrated and multi-stepped culminating in the ‘invention test’ where not only food and presentation was judged but also nutritional understanding • Elements of peer, self and expert assessment

Summary

Chapter 6 centres on the case study of the Grade 5 & 6 Pantry Plunder nutritional unit. The key themes that emerged from the focus group interviews were on the nature of relationships, improved life skills and how the children's notions of health and nutrition had become more informed. The students also identified that the work was academically rigorous, and although challenging, was worth all the effort. When the tasks were broken down into smaller components and placed into the authentic learning framework (Table 6.2 all the key characteristics of authentic learning were present. Close examination of the student reported outcomes exposed differences in the way the unit was unpacked in Grade 5 and Grade 6. These differences are analysed in Parts 7, 8 and 10.

Chapter 7: The teachers' planning

Introduction

This section briefly looks at the teachers' planning for the Grade 4 Kitchen Garden Unit as a contrast to the more extensive planning that went into the Pantry Plunder nutritional unit. Planning for the Grade 5 and 6 Pantry Plunder Unit was the focus of the PLT4's e5 inquiry and is examined in greater depth. The teachers' reflective discourses generated by the experience of collaborating on the planning and implementation of the "Pantry Plunder" were examined to give insight into using the e5 Instructional Model to support teacher's instructional practices. The effectiveness of using PLTs to provide a supportive collegial platform for the examination of teacher planning, practices and pedagogies were also considered.

Kitchen- and garden-based learning

Children participating in the Grade 4 Kitchen Garden Unit rotated through the gardening, cooking and health science theory sessions with various teachers. They come into contact with more than one teaching style or pedagogical framework. The key ideas behind the kitchen garden were that it would be about nutrition, preparing healthy foods using produce from the garden and learning about what plants need to grow. The aim was to involve the Grade 4 children in growing and producing healthy food in a collaborative, experiential and engaging way. Although the planning for the Grade 4 kitchen garden was informed by VELs and PoLT, it was ultimately determined by the demands of the weather, the garden and the produce available, as well as the individual priorities of the teachers and their classes. One of the teachers, Leanne T, had the view that the kitchen garden was a *nice activity*; however, she expressed concern over the amount of teacher preparation and student time taken away from what she regarded as "real" classroom-based learning. To address this concern the VELs at Level 3 were audited and outcomes that could be achieved through the Kitchen Garden Unit were highlighted (Appendix R). The Grade 4 teachers discussed the VELs audit in one of their weekly planning meetings. The conversation was reflected on in the following journal entry:

Once we were reassured that we were covering multiple outcomes, particularly in science, health, personal and interpersonal learning... and also numeracy and literacy, we knew we would be reinforcing and enhancing the VELS outcomes, so planning became less of an issue. We tended to emphasise the learning in whatever we were doing whether it was measuring the ingredients for a recipe, writing about the garden for the newsletter or planting seedlings. We often planned the week before but let the season and the garden dictate what we did (researcher's journal, September 2009).

The kitchen garden provided the context for the learning and provided the opportunity to connect the learning children did at school with their home lives.

Children's learning: ownership, relevance and challenge

The Grade 4 teachers did not rigorously plan each kitchen garden session for maximum achievement of learning outcomes; there wasn't time. In the one-hour allocated for collaborative weekly planning, the Grade 4 teachers had many things to cover. Individual teachers took responsibility for developing particular lessons that they taught across the three Grade 4 classes. The teacher responsible for cooking would mention what they planned to prepare. Identifying what vegetables or herbs that might be ready and suitable for inclusion would be discussed. This would be followed by a quick conversation around what the theory session would cover, with a range of suggestions thrown in, and perhaps ideas mentioned for working on in the future, and then it was time to move on to other more urgent matters. This wasn't ideal, and lack of time to prepare is a common complaint from teachers.

On occasion, individual teachers identified a need or an opportunity developed a lesson to address specific VELS outcomes. The study on worms to help children appreciate the role they played in the recycling of nutrients, and the associated literacy task where the children developed the worm "café menu" to inform other classes about what should or should not go in the worm bins are examples of where learning tasks were developed in response to a perceived need in the context of the kitchen garden, and were also used to cover outcomes in both science and literacy (Appendix H). Likewise, the task of creating a plan view of the kitchen garden was used for the purpose of recording plantings for crop rotation, and also to report on the achievement of measurement outcomes in the mathematics domain (Appendix V). Teachers referred to the VELS/kitchen garden audit when planning classes; however, the outcomes were not covered in a systematic way or planned as a team. Despite the lack of collaborative teacher planning, children developed

key understandings particularly in personal and interpersonal learning, as was seen in the students' reflections about relationships in Chapter 5. The relaxed kitchen and the garden context where children already had a prior knowledge base or schema enabled the children to make connections to their own lifeworlds. The children were able to relate to the learning experiences in different ways; diversity was interesting and acceptable, and supported the development of positive relationships.

The evidence for the children's learning in the Grade 4 Kitchen Garden Unit came from the focus group interviews, the children's written work (including reflections in their kitchen garden journals), as well as anecdotal stories from teachers and parents. The data from Parts 5 and 6 provides evidence of the children's learning, and is connected to the teachers' planning in this section. The remainder of this part focuses on the teachers' work, particularly in reference to the PLT4 e5 inquiry and planning the Grade 5 and 6 Pantry Plunder Unit.

Teachers' work

Teachers' beliefs about how children learn influence the learning experiences and instruction provided. To enable best practice instruction, it is essential, as Bruner points out (1996), to equip teachers with the best available learning theory. There are many guidelines, theories, policies and pedagogies that influence teachers' planning. The Victorian Essential Learning Standards (VELS), Principles of Teaching and Learning (PoLT), The Thinking Curriculum (in particular Bloom's Taxonomy) and 21st Century Learning were identified by the PLT4 as informing the planning for the Pantry Plunder Unit using the e5 Instructional Model. Overarching these theories and models (although not specifically named) was a constructivist paradigm. This underlies the models and theories adopted by the learning team and was in evidence in the approach to teaching and learning where the focus was placed on the learners and the process of meaning making in their *collaborative* groups. The teachers identified the benefits of contextualising the learning and actually making a healthy lunch, rather than theoretical lessons on nutrition. Tom T observed:

Their achievement and the level of knowledge that they gained was still far greater than if we had just had a couple of sessions just talking about the food pyramid, and then a couple of sessions of making up a lunch that were never actually going to shop for or prepare and taste (Tom T, interview 17 September 2010).

Teaching is complex, because many differing goals, outcomes and competing needs demand to be addressed simultaneously. A diverse group of children with differing learning needs and multiple goals (including social and intellectual, differing cultural backgrounds, different experiences and ways of “knowing”) are just some of the intricacies that need to be taken into account when teachers plan for effective student learning.

Professional learning team 4: e5 Instructional Model inquiry

In 2010 there was a school-wide professional learning focus requiring the PLTs to implement and examine their use of the DEECD, e5 Instructional Model. In the previous three years the focus had been on PoLT. PoLT was a school priority and was incorporated into the day-to-day teaching of the teachers in their weekly teaching plan. Teachers also kept a personal “PoLT diary” to record their reflections and evidence of work on the current PoLT focus. The PLTs identified a PoLT component to focus on, for example, deeper levels of questioning. This would then be incorporated into the whole teaching plan.

Mark, the Assistant Principal (AP) stressed that e5 was not instead of PoLT, but needed to work in conjunction with it:

At the start of the year where we married up the PoLT principles with e5 and saw where the shortcomings were— the biggest problem was that there were no student-based outcomes in relation to the e5 model (Mark, Assistant Principal, interview 2010).

Mark identified the main reasons for asking the professional learning teams to undertake an inquiry into the e5 Instructional Model was to reflect on their teaching and generate professional discussions based on the evidence generated by their practice:

The benefit must be the rich discussion and that reflection requiring the evidence... having the reflection about what they did or why they changed things... (Mark AP, interview 2010).

He promoted e5 because it was an initiative from the DEECD and he believed that it would work well in conjunction with PoLT. One of the aims of the PLT inquiry was further development of the professional learning culture at the school. Mark explained that the inquiry would assist in the development of a common language, and “give the teachers an opportunity to look closely at e5 and how they can get the best results using

it.” He stressed the need for accountability and that the inquiry needed to be evidence based: “it’s about reflecting on what did or didn’t work” (Mark AP, interview 2010).

Mark repeatedly emphasised to the teaching staff that although the focus was on the e5 Instructional Model, PoLT and VELs were not discarded; all three were expected to inform their planning. His view was that PoLT helped with structuring the teaching experiences to achieve the learning outcomes, VELs was the curriculum they were expected to implement and that e5 was an instructional model designed to improve teaching.

It is not about the curriculum you teach, it is about the way you are teaching it. So the e5 model is how you teach. Not what work you cover. It’s not the content (Mark AP, interview 2010).

For the school-wide focus on the e5 Instructional Model, the professional learning teams were generally made up from two grade levels; for example, all the teachers who taught in Grade 5 and Grade 6 made up the Level 4 professional learning team (PLT4 — Level 4 is the VEL standard that the children in Grade 5 and 6 work towards). All teams were required to develop a curriculum project focus and document their use of the e5 Instructional Model in its implementation.

Deciding on the focus of the inquiry

Judy, an expert¹⁰ teacher involved in the Grade 4 Kitchen Garden Unit in 2009, became the Grade 5 coordinator in 2010. In conjunction with this role, she gained the responsibility for leading the curriculum development within the grade level and teaching a Grade 5 class. She suggested to her colleagues in the PLT4 that they should develop a unit with a healthy eating theme to extend the children’s learning. She wanted to build on the children’s interest in food preparation and cooking developed through the Grade 4 Kitchen Garden Unit.

The kids were so enthusiastic at the end of last year with the whole process and I thought they were starting to get a lot more out of it. I felt we should take it somewhere. Next term we are going to have a health, nutrition and the human body unit. They will only cook once but they have to do all the planning, shopping and choosing themselves. Then they will cook a meal that will be purely done by them (Judy T, Grade 5 teacher interview).

¹⁰ A DEECD teacher classification.

PLT4 decided the new unit “Pantry Plunder” (see Chapter 5) would be used as the focus for examining their planning, practices and pedagogy in the implementation of the e5 Instructional Model. Pantry Plunder was the “vehicle” for the PLT’s research.

Pantry Plunder e5 inquiry

The Grade 5 and 6 teachers’ planning, practices and underlying pedagogies are examined in greater depth because the planning of the Pantry Plunder Unit of work was the focus for the PLT e5 inquiry. This meant that the steps in the planning were discussed and recorded in greater detail. Teacher interviews and discussions in the PLT4 meetings explained their rationale behind the planning. Although the PLT4 planned the lessons together, the teachers were individually responsible for implementing the jointly planned lessons with their own class. On a day-to-day basis the two Grade 5 teachers planned and collaborated on the work for their adjoining Grade 5 classes, occasionally team teaching. The two Grade 6 teachers also had adjoining classrooms and collaborated on the week’s activities. The two classes frequently came together when a new task was started to discuss the parameters, model the expected language and discuss the depth of the task. As the teachers planned collaboratively together, the separation between Grades 5 and 6 means that teacher’s pedagogy and practices can be examined for clues to explain the differences in the student outcomes (see Chapter 6). The teachers’ discourse about their experience with, and reflections on how they used the e5 Instructional Model to plan the unit provides information about the practices of the teachers and insight into the pedagogical approaches they used.

Beginning the unit: checking prior knowledge and misconceptions

The unit began with a mind map to establish a base level of nutritional understanding, as a starting point for the unit (Chapter 6). This activity fitted into the e5 domain¹¹ of Engage: in which teachers: stimulate interest and curiosity; promote questioning and connect learning to real-world experiences; the teacher structures tasks; elicits students’ prior knowledge and supports them to make connections to past learning experiences. This baseline data was then used to inform the planning of the Pantry Plunder Unit.

¹¹ Office for Government School Education, Department of Education and Early Childhood Development (2009a) e5 Instruction Model, Victoria.

The unit followed on with a literacy task (Task 2) using a newspaper article featuring the lifestyle choices of a young person (see Chapter 6). At the end of the report there was a commentary by an “expert” who assessed the positive aspects of the lifestyle choices and recommended areas for improvement. The children demonstrated varying levels of comprehension as they took on the role of the expert, and reflected on and self-assessed their lifestyle. All the following components of the “Explore” domain were evident in the task:

- The teacher presents challenging tasks to support students to generate and investigate questions, gather relevant information and develop ideas.
- They provide tools and procedures for students to organise information and ideas.
- The teacher identifies students’ conceptions and challenges misconceptions.
- They assist students to expand their perspectives and reflect on their learning.

Using the newspaper article as a model, the students demonstrated their understanding of the text type and personalised the account with information from their own lives. By choosing a rich interdisciplinary task that included elements of reflective self-assessment, the teachers were able to do formative assessment gauging the extent of the children’s knowledge and identify where children held misconceptions about what constituted a healthy lifestyle (Appendix N: Personal lifestyle profile). Black and William, (2001) identify that these types of activities not only inform the teacher and provide information about the current level of student understanding, but also provide opportunities for learning to be extended. Their research emphasised that:

Opportunities for pupils to express their understanding should be designed into any piece of teaching, for this will initiate the interaction whereby formative assessment aids learning (Black & William 2001).

When the PLT4 planned the “lifestyle report” learning task, it was planned across the domains of Explore, Explain and Elaborate. The teachers explained by constant weaving in and out of the various e5 domains in their teaching practice, they could assist children to make connections and could generally meet the learning needs of all the children. Tom T explained the necessity of finding out where the children were at in terms of their knowledge and understanding (interview 17 September 2010). These initial activities informed the planning for the following task, and each task provided scaffolding to expand and broaden the learning for the next task. The scaffold provided a way to

structure or “chunk” the learning so that there was a logical flow and gradual building of knowledge.

Task 3a, where the teachers asked the children to evaluate a range of breakfast cereals, was designed to introduce children to nutritional language and explore key concepts such as serving size and the way nutritional information was reported, for example, percentage of recommended daily intake (RDI). The teachers explicitly planned to model the language. The PLT4 positioned this task in the e5 planning framework (Table 7.1) across the domains of Explore and Explain. Children explained their decisions (see Chapter 6) with teachers specifically requiring the children to use “because...” in their justification for their ranking of breakfast cereals. Judy T reflected on the value of the task and how “the best breakfast activity where they looked on the sides of packaging and saw how many grams are in things” helped the children. She believed the best thing about the activity was that they learned how to analyse an ingredient list themselves; they don’t have to believe the advertising... When somebody says this is good for you, they now grab the package and/or look on the Wolfram Alpha site for the raw ingredients... they can work out if it is nutritious (Judy T, interview 16 September 2010).

Evidence was provided for this in the focus group interviews, with children reporting how they had returned to the site to research information and also how they now read the nutritional information on packets of food regularly.

Several weeks into the Pantry Plunder Unit, Ruby T, a teacher who had not taken an upper-level class for several years, took over the responsibility for teaching the class while the class teacher was on leave. She participated in the PLT4 planning for the Pantry Plunder Unit and taught the majority of the unit. Ruby T identified that the e5 focus and the 6 dimensions of quality had made her look at the e5 focus questions closely. She commented that the criteria rubric that she developed with the class to evaluate the cereal box, was very useful (especially when she came to assessment):

This was really good... the sheet with the questions, the question about how we actually decide the nature and the quality of the assessment task? The *Six dimensions of quality*¹²

¹² *Six dimensions of quality* is a teacher support resource:

<http://www.education.vic.gov.au/school/teachers/support/pages/e5quality.aspx>

actually made me negotiate the criteria rubric with the children (Ruby T, PLT4 planning meeting).

The criteria rubric was developed as a whole class, where children could make suggestions and moderate the outcomes. Ruby T found that she only had to make the first suggestion for one of the criteria then the children took over while she typed in their suggestions. She identified the advantages of this as being that the children had ownership, but also everyone had a clear idea of what was involved in the task and the standard aimed at. When asked if she would use this process of developing a criteria rubric again with another class, she agreed that she would. During discussion in the PLT4 meeting the two Grade 5 teachers expressed concern that even though the children knew that they had left out some of the criteria and had time to remedy this, very few took the opportunity, resulting in a lower score than what they were capable of achieving. An example of this was that when the children presented their cereal boxes to the class, the peer feedback identified that the barcode on their product had been left off. The inclusion of a barcode was a criterion. The omission of one could have easily been fixed. Both the Grade 5 teachers agreed that although the children knew what was in the criteria rubric, rather than just presenting their work to the class, formal self and/or peer assessment before the final grading would have helped raise the standard of the work presented.

The Grade 6 teachers used a different approach to the criteria rubric. The Grade 6 criteria rubric had a list of things that had to be included in the work. They made the criteria the expected level. If the child had not achieved the criteria, they had not completed the task. Children could not opt to do some things and not others. The product also looked different. The Grade 6 children made a 3D representation of their cereal boxes. As they had access to net books, they typed or printed images for the finished product. The Grade 5 children drew a 3D representation of their cereal box. Judy T and Ruby T admitted that they hadn't thought of doing a mock-up of the product and commented that if the Grade 5 children had the same access to computers, they also would have constructed a 3D representation of the cereal boxes. The task was part of the unit and planned in the PLT meeting; however, the end product and what it should look like had not been discussed in detail; nor had the planning meeting discussed how the criteria would be decided, or how the criteria rubric would be created and used.

Deciding on a healthy menu

Teachers in PLT4 identified making the unit of work academically rigorous as one of their key goals. They also spoke about how challenging some components of the unit were; specifically, the section where the children needed to work out the amount of the RDA of nutrients that their recipe was going to supply. Catering for the different stages of learning was identified as important by PLT4. Some of the more cognitively challenging tasks needed to be simplified to keep the task within the zone of proximal development for particular children (Vygotsky 1978). Carol Tomlinson (2005) explains the complexity of getting the degree of challenge just right:

Ensuring challenge is calibrated to the particular needs of a learner at a particular time is one of the most essential roles of a teacher and appears non-negotiable for student growth. Our best understanding suggests that a student only learns when work is moderately challenging that student, and where there is assistance to help the student master at what initially seems out of reach.

Task 4, where the children were required to change grams into a percentage of daily allowance was acknowledged as challenging but also worthwhile (by both the teachers and the children). The teachers modified and streamlined this task so that all children could experience success and contribute to the task. The Grade 5s were working on fractions in mathematics; so working out the percentages was seen as a logical extension. The two Grade 5 teachers said that the timing was fortuitous, because the Pantry Plunder Unit gave a valid reason and context for completing the mathematics. Judy T explained that they differentiated the work for the children not capable of the challenge by setting individual goals and tasks or sections of the work that they were expected to complete. Linda Darling-Hammond describes this process:

[T]he teacher bends the curriculum towards the students by making connections and adaptations and then nudges students towards the curriculum by scaffolding and motivating their learning. Attending to the demands of the curriculum and the needs of the child without losing sight of either requires deep understanding of subject matter and students, and the potential for connections between the two (Darling-Hammond 2012).

By doing this it was felt that the children were kept engaged, on task and intellectually stimulated — instead of the alternative, where there was a danger of them either opting out or being “passengers” carried by other children completing all of the work. Laur (2013) identifies being able to differentiate the work according to student needs as being key to ensuring student success in authentic learning experiences.

The PLT4 designed a planning document (Table 7.1) with the domain capabilities and profile statements for the first level of each domain at the top of each column as a reminder of what they were aiming to achieve. The tasks were planned directly into this document as the scope, connections and depth of each task was discussed in the planning meetings. Table 7.1 demonstrates how tasks crossed domains. This is a simplified model of what actually happened, because all the teachers in the PLT4 explained the need to weave in the e5 domains, depending on the needs of the children. They emphasised that although e5 is designed as a sequential model, and useful for designing tasks that scaffold learning, in practice, it is not a straight sequence. An inquiry or theme will start with the Engage and Explore phases, however when teaching we return to them many times. Sometimes the whole class would be “explaining” or “elaborating”, while at other times individual children required assistance or extension. Tasks were planned using the e5s, and nominated as belonging to at least one of the domains; for example, the Pantry Plunder Task 4 involved placing the components of a menu into a food pyramid and was put under “Explore”; however, because it was a tool to assist students in organising their ideas and enable the teachers to monitor understanding, it would also come under “Explain”. There were also some elements of “Elaborate”, because the task supported the transfer of learning from familiar to unfamiliar, and “Evaluate”, because the teachers asked questions and monitored understanding. As Linda Darling-Hammond identifies above, it takes a profound understanding of the child to best facilitate understanding of the skills, knowledge and processes (2012). It also requires thoughtful planning by the teacher to maximise the learning potential of each task or activity, adjusting the degree of difficulty to the capability of the child.

Table 7.1* Tasks planning: Pantry Plunder shows the teachers’ planning of tasks to cover the e5 domains. The e5 dimensions applicable to the tasks, together with the teachers’ reflective comments connecting the dimensions and the planned tasks, gives insight into their thinking (Appendix S: The teacher’s planning for the Pantry Plunder Unit).

*Note the 3 pages forming Table 7.1 were on one A3 sized planning sheet — the e5 profile statements were directly above the columns the teachers recorded their planning into so that they could refer to them.

Table 7.1: Tasks planning: Pantry Plunder

Domain: engage	Domain: explore	Domain: explain	Domain: elaborate	Domain: evaluate
Capabilities <ul style="list-style-type: none"> • Develops shared norms • Determines readiness for learning • Establishes learning goals • Develops metacognitive capacity 	Capabilities <ul style="list-style-type: none"> • Prompts inquiry • Structures inquiry • Maintains session momentum 	Capabilities <ul style="list-style-type: none"> • Presents new content • Develops language and literacy • Strengthens connections 	Capabilities <ul style="list-style-type: none"> • Facilitates substantive conversation • Cultivates higher order thinking • Monitors progress 	Capabilities <ul style="list-style-type: none"> • Assesses performance against standards • Facilitates student
Profile statement: Level 1 The teacher promotes a safe and orderly learning environment by providing the class with rules and modelling expected behaviours. They treat individuals with courtesy and promote effort and hard work. The teacher stimulates interest and curiosity in the learning, making links to students' interests. They explain the purpose for learning and assess students' prior knowledge by asking students what they know about the topic. The teacher articulates learning goals based on the expected year level standard and informs students of assessment requirements. They use tools and strategies to support students' thinking processes and to develop students' understanding of metacognition. The teacher supports students to identify what they know and what they need to know, enabling students to monitor their own learning.	Profile statement: Level 1 The teacher uses a range of question types and encourages students to share their prior experiences to involve students in the inquiry. They ask students to explain their understanding of key concepts and ideas to identify misconceptions. The teacher selects resources relevant to the inquiry and presents examples of information in an organised format. They use guiding questions to assist students to select relevant information. The teacher contributes to a productive learning environment, presenting an outline for the session, informing students of the time frame for tasks. They refer to class rules to manage student behaviour.	Profile statement: Level 1 The teacher supports students to develop explanations to make sense of the inquiry. They present new content based on year level standards and represent the content in different ways to enhance students' understanding. The teacher verbalises the connections between new content and past learning, and continuously prompts students to clarify their understanding. They provide opportunities for students to practise new skills and processes. The teacher identifies students' level of English language proficiency to inform their teaching. They model the use of English language conventions to develop students' language and literacy. The teacher models the language of the discipline and uses tasks that incorporate different modes of language.	Profile statement: Level 1 The teacher provides intellectually challenging tasks and articulates the cognitive demands of the task to students. They provide examples of the concept in similar contexts to assist students to apply their learning. The teacher uses strategies to involve all students in focused conversation, facilitating the sharing of ideas. The teacher selects the topic and structures the conversation to generate student thinking about the key concepts. They monitor student understanding, providing students with feedback specific to the task and modifying instruction based on student responses.	Profile statement: Level 1 The teacher assists students to prepare for a performance of understanding. They assess student achievement and communicate progress. The teacher presents guiding questions to enable students to reflect on their learning. They support students to frame future learning goals based on identified strengths and areas for improvement.

Domain: engage	Domain: explore	Domain: explain	Domain: elaborate	Domain: evaluate
<i>Teachers' Planning</i>				
<p>Assess students' prior knowledge by asking students to write and/or label pictures or diagrams based</p> <p>Students are made aware of the goals of Pantry Plunder challenge i.e. research, plan and create a</p> <p>Work in a team to create restaurant experience — consider good food hygiene, menu planning and table setting.</p>	<p>Teacher will provide a table about the RDI (based upon 8000 kilojoules) of specified nutrients such as carbohydrate, fibre, and protein and will establish criteria for the task including that these nutrients should be between ¼ to 1/3 of the daily intake in the lunch. Fat, (especially saturated), sugar and sodium must be less than ¼ of RDI.</p> <p>The teacher will provide guidelines for students to use the search engine wolfram alpha to research nutrients in various ingredients (used task 3 and 4).</p>	<p>Teachers will model language and clarify key concepts, terminology and misconceptions</p>		
<p><u>Task 1: Mind map</u> -review elements of a mind map with children -model use of mind map to organise information -question nutritional knowledge</p>				
<p><u>Resources</u> *lunch menu planner * RDI *top 10 Melbourne Restaurants * Jamie Oliver recipes *wolfram alpha</p>			<p><u>Task 2: Personal lifestyle profile</u> Teacher will use the newspaper article as a model for the children to write a lifestyle report for a weekend newspaper on their own exercise and eating habits.</p> <p><u>Task 3a: Best breakfast cereal analysis</u> Evaluate a range of breakfast cereals and decide which is the healthiest option. Design packaging with all the relevant nutritional information.</p>	<p><u>Task 3b: Best breakfast cereal ranking</u> Lead discussion — guiding questions on key points to consider and essential requirements of task 3a — create a criteria rubric with/by children for evaluation of task 3a.</p>

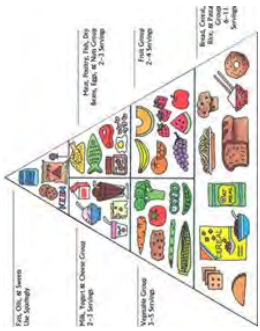
Domain: engage	Domain: explore	Domain: explain	Domain: elaborate	Domain: evaluate
	 <p>Task 4: Decide on menu Research healthy recipes and trial at home for task 5. Fill out nutritional chart (RDI of main nutrients as well as salt, sugar and fats) and food pyramid for the selected recipe* (builds on task 3). Requires team to justify their nutritional lunch selection. Class discussion/justification/vote for ingredients — some limits to choice Cost for 5 meals must be under \$10 — work out grams of each ingredient and fraction of RDI provided by different foods. *teacher to modify task depending on students' capability</p> <p>Source http://www.worldsmostunique.com/images/worldshealthiestfoods-food-pyramid.jpg</p>	<p>Task 5: Pantry Plunder Invention test Design and produce a nutritional lunch. Work in a team to produce healthy meal for 5 people. Must have RDI for carbohydrate, fibre, protein of between 25 to 30 % unless children can justify different amount Fat, sugar and salt must be less than 25% of RDI. Performance of understanding: Team explain and justify choices as judges discuss and evaluate their meal *Children had input into grading criteria judges used (see Appendix Q for Invention Test summary with judging criteria)</p>	<p>Task 6: Reflections Children write reflection on their learning throughout the unit and the Pantry Plunder Invention test Using the judges feedback and through reflection on their individual and team performance, they identify their strengths and weakness. (See Figures 6.8—6.11 for different approaches to this task)</p>	

Table 7.1 shows how the PLT4 planned tasks in a sequence to scaffold the children's learning. Quotes illustrating the teacher's thinking are aligned with the tasks developed in the unit and the e5 dimensions in Appendix S (DEECD 2009b). Although the teachers were planning using the first proficiency level within the five domain profiles in the e5 Instructional Model of Engage, Explore, Explain, Elaborate and Evaluate, at times, the performance quality aligned with higher levels. Engage L2 indicates the engage domain and that the performance indicated aligned with a profile statement within Level 2. For example, Task 2: Write a lifestyle report, would fit into Engage L2 (Appendix S: The teacher's planning for the Pantry Plunder Unit). The task stimulates interest and curiosity in the learning; making links to students' interests and connects learning to real-world experiences (Engage L1). It also draws out what students know and support students to link their experiences to the topic (Engage L2), a higher level. The proficiency levels are hierarchical and sequential, with the higher levels generally precursors to the lower levels (DEECD 2009b: 19).

Although the tasks initially appeared straightforward, teachers indicated the complexity of the task and the underlying pedagogies informing it. Judy T explains how when the children in each group were required to decide their menu for the Pantry Plunder invention test, the teachers carefully planned the questions:

We wrote down what our guiding questions would be, to make the children justify their choices as we went around to each group. We had a lot of ideas on the type of language we wanted them to use (Judy T).

By requiring the children to justify their choices and refer to the RDI of the ingredients, the teachers were modelling the expected language and also pushing the children to make connections and perform HOT skills. The students could not say, "We chose this meal because it is healthy". They had to be more specific about what made the meal healthy; for example, that the meal provided the daily recommended allowance of the main nutritional groups, that it was low in fats, salt and sugar and that it came in on budget. Key tasks from Table 7.1, the relevant e5 domains and the outcomes reported by the children (Chapter 6) and teachers (Appendix: S) have been clarified in an input and output model in Figure 7.1. As previously indicated, the teachers in the PLT4 emphasised that although the planning and the learning tasks were designed to build on one another, the e5 Instructional Model could not be implemented sequentially within the classroom

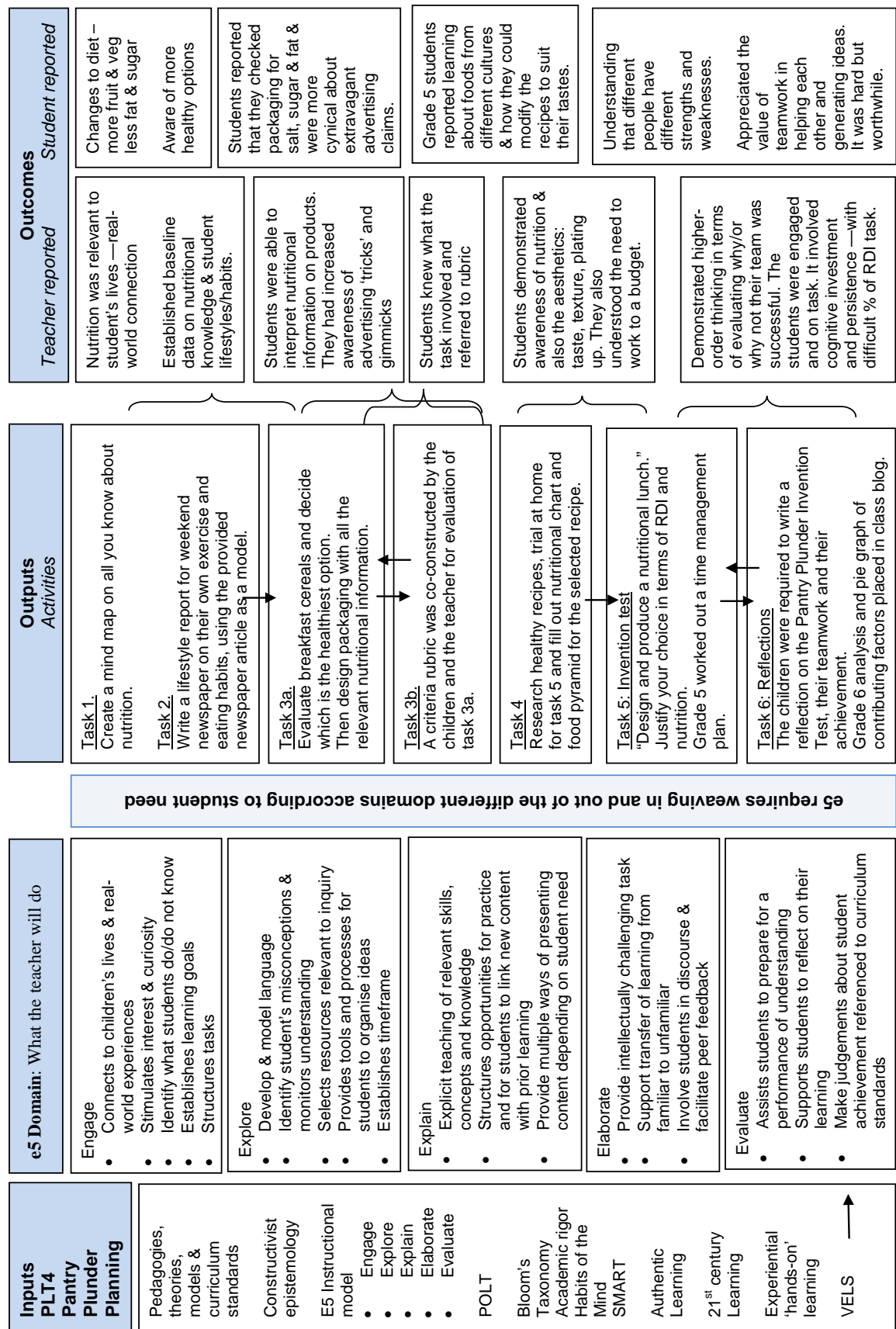
— there needed to be a weaving in and out of the domains, depending on what was needed at the time by the students.

We worked out which children had the required knowledge and which children didn't, so we either had to go to explain or elaborate for the next session; to make it the most demanding task that we possibly could (Tom T, teacher interview).

The tasks were designed to support and scaffold the children's learning. Each task built on the next. This is shown in the outputs column by the arrows going from one task to another, except where the task required reflection and evaluation, where the arrow returns to the previous task. Lyn described how the children reflected on the sequential nature of the learning:

One step asked for elaboration on the previous, so it was almost like building blocks. The first building block was, "What do you know about nutrition?" and so the next step was the food pyramid, and from there the deeper nutritional knowledge of the foods, and then going to the RDI of the foods, and then the rubric on what their food had to be and then there was the further elaboration on what food goes with what... and the price constraints. They found that if they hadn't done one thing properly then it led to something else not being done properly (Lyn T, teacher interview, 22 October 2010).

The cumulative end products for each of the authentic learning tasks fed into the summative assessment of each child's learning. Apart from facilitating the learning, the teachers' task was to check and question the team's understanding before they moved on to the next task. In Figure 7.1 the completion of the tasks in the "outputs" column leads to "outcomes" in the final column. There is a high degree of correlation between the teacher reported outcomes and the outcomes reported by the children.



e5 requires weaving in and out of the different domains according to student need

Figure 7.1: Inputs and outputs model: Pantry Plunder

The PLT e5 inquiry was successful in establishing a professional learning community with a shared common language. In the teacher interviews all the teachers used the e5 language Engage, Explore, Explain, Elaborate and Evaluate. They valued the collaborative nature of planning together because it promoted diverse ideas of and the opportunity to discuss different approaches. Judy T explained drawing on the ideas and experiences of other members in the PLT4 was useful for providing alternative strategies to try when something didn't work well with her class. All of the seven principles of highly effective professional learning have been addressed by the PLT4 e5 learning inquiry (this is discussed in Chapter 10). The teachers did not explicitly investigate the research behind the e5 Instructional Model to fulfil Principle 7: The professional learning is supported by research; this was implicit in the research used to create the e5 Instructional Model (DEECD 2009b).

The PLT4 participated in reflective discourse about making the children's tasks challenging. Depth and academic rigour were mentioned frequently as key goals, because "we wanted them to get a deeper understanding of what was happening" or "we had to query the depth of what we were doing" (Lyn T, teacher interview, 22 October 13). The tablecloths were used to show case the child's learning so that parents would "understand the complexity and depth of the task..." In planning the tasks, the goal of academic rigour was addressed by using Bloom's Revised Taxonomy of Thinking (Anderson & Krathwohl 2001). Lyn T expanded on the strategies she used to extend the children's thinking:

We talked about "these are teacher's secrets and we are letting you in on the secrets... these are the skills you need to have... the collaboration the communication... all the 21st century skills that you need to have". And then there are the habits of the mind... "Are we really asking you to strive for accuracy or we are asking you to apply past knowledge?" And there is Bloom's... "So why am I concentrating so heavily on content... You should be challenging me... the lowest level of thinking is just facts..." So you see their minds ticking over and then we go to Bloom's and show them that it is what you do with those facts. We tell them the hardest thing that you can do is take what you have learned and create something new out of it.

The teachers scaffolded the learning tasks so that each task required knowledge from the previous task. However, it was not just recall of facts; the children had to make decisions. The teachers wanted to develop the children's problem-solving abilities and develop critical thinking and reasoning. Children were required to justify their choices in terms

of the nutrient value and their intake of different categories of nutrients from meals they had eaten or had planned to eat that day. This was a challenging task, where it was necessary to differentiate some of the criteria and modify or extend according to individual capabilities.

The focus on Bloom's Taxonomy, in conjunction with the e5 Instructional Model, also came out in the language the teachers used in their own reflections. Clues to the teachers' different priorities were evidenced in their comments (Appendix T). The deep level of reflections from the teachers can be inferred from what they said (Griffin 2008). The main points from the teachers' quotes (emphasised by bold type in Appendix U) are threaded together in "collective understandings" to form a group summary of the main understandings that developed through the e5 inquiry. The PLT4 collective understandings demonstrate the success of the PLT inquiry in melding the group of teachers into a collaborative community of learners. The common understanding and language developed through the intense professional collaboration required in planning and implementing the Pantry Plunder Unit.

PLT4 Collective understandings

The emphasis that we have had on POLT has fed nicely and harmoniously into the e5 model. We planned the unit together by planning the tasks directly into the e5 document. We wanted the children to have a greater depth of understanding. This meant that we had to look at planning more closely and query the depth and quality of the task. The evidence of the children's learning was used to inform the next stage of planning. It was important to start with what the children already knew and go from there. It is our responsibility as teachers to go from the theory and put it into the classroom in ways children can understand and build on their understanding.

This was new (the unit and e5 model), because teachers we were learning as we went along. Feedback and ideas from our colleagues on the approaches they had used were useful so we could elaborate on any areas we didn't think we'd done well. Substantive conversation was important for both the children and our PLT.

E5 is not sequential; you need to be able to do the weaving that we do when we teach. The back and forwards, the move from engage to elaborate to explain in perhaps the space of a few minutes depending on what a particular child or particular group needs. e5 is like stepping stones — you do keep backtracking and then jumping forwards. Different children progress at different rates, but there is still an expectation that they will learn and be able to reflect on their learning. At the end of that session you've got to cover the "Evaluate" part of e5. Children need to look deeply at what they've done and the feedback from their teachers. You have got to have that sharing, "what they now know compared to what they knew beforehand". This also provides evidence of where a child is on the VELS continuum.

The professional learning team e5 inquiry helped us look closely at what we were doing and query the depth of what we were doing. Coming to these meetings helped with reflecting more, going deeper into the answers. It made you look more closely at what you were doing and whether it was effective. *(Note: the collective understanding has been checked by the members of the PLT4 to confirm that it accurately reflected their views and understandings — minor corrections were made to grammar).*

Key understandings arising from the PLT e5 inquiry

A common focus, that is, to plan a unit of work trialling the e5 Instructional Model, provided the context and reason for collaboration. It assisted with building shared language and collegiality. The teachers decided that the e5 Instructional Model was a useful planning tool; that it helped with sequencing and structuring learning activities. However, they added that it was not enough on its own. The e5 Instructional Model needs to be used in conjunction with other tools (such as Bloom's Taxonomy) to promote cognitive challenge and academic rigour. Judy T reflected on how the different theories and models need to be used to support one another:

e5 is more about what's the teacher is doing. You need PoLT as well to really know what the children are doing and then use Bloom's Taxonomy to get the academic rigour (Judy T, interview 16 September 2010).

The e5 domains (Engage, Explore, Explain, Elaborate and Evaluate) act as reminders of sound teaching theory; so, for example, in the engage phase, teachers remember the importance of connecting and making the learning relevant to the children, as well as checking their prior knowledge and misconceptions they may have. Tom T explained, "we find out what the kids know and then we just teach from there". He went on to clarify the importance of making the learning relevant to the children's lives:

I think "authentic" is the word at the moment, but I think it is important, and I think that children today demand almost a relevance to what they are doing or a link in some way to their lives. And if you can provide or articulate that link you've got them on-board straight away (Tom T, interview 17 September 2010).

Tom's reflection acknowledges the how vital it is for teachers to plan curriculum to connect to the child's lifeworld. To capture the interest of children and engage them in their learning, they have to see the learning as relevant to themselves.

Formative assessment took place regularly. Evidence of student learning for each of the planned tasks formed an essential part of the inquiry, as demonstrated by Tom's clarification:

We worked out which children had the required knowledge and which children didn't, so we either had to go to explain or elaborate for the next session, to make it the most demanding task that we possibly could.

The teachers' discursive reflections evaluated how effective instructional practices were. Tom's following comment reflects elements of Brunner's theory of cognitive development and learning, when he acknowledges the part prior learning experiences had on the students' ability to respond to the academically demanding tasks:

I think that the work that they have produced was a very high standard for Year 6, and I think that has a lot to do with it being three years of building on their knowledge, not just eight weeks of their building on knowledge (Tom T, interview 17 September 2010).

The formation of PLTs assists with the generation of a "safe" shared platform, where collegiality was the norm and members felt comfortable with sharing their ideas. Multiple viewpoints and ideas from the different members of the PLT were valuable for the structuring of enhanced learning activities; ensuring student learning was supported in a carefully sequenced scaffold. This sharing of ideas about alternative ways to support student learning, particularly when a teacher had concerns about whether their teaching practice was effective, was identified as a valuable outcome of the PLT meetings.

One of the main understandings that arose from the PLT inquiry was that reflecting on learning is essential; it is both an evaluative tool and a learning tool.

In the e5 part of evaluate children look deeply at what they've done and they get feedback from their teachers. I think the reflection is really important and it is too easy to leave off (Lyn T, interview 22 October 2010).

Although the reflective process was identified as key to the teachers' and the children's learning, it was also important to have a common language to promote mutual understanding. The e5 model provided the common language for teachers to engage in these reflections, for example:

[W]e need to talk about... and it's in Elaborate, then we have the same language that we are using with each other (Tom T, interview 17 September 2010).

It is imperative that schools set aside time for groups of teachers with a common context and motivation to plan and reflect together in PLTs. The collaborative and collegiate nature of PLTs can provide the supportive setting from which to carry out the essential discursive conversations to reflexively examine teaching practices and pedagogy, leading to improvement in instruction, and consequently, the children's learning. Quality, effective classroom teaching requires a complex synthesis of learning theories and

curriculum content facilitated in ways that make the learning engaging, relevant and achievable for all students in a rich, caring and respectful environment.

The evidence from the teachers planning for the Pantry Plunder Unit, the basis for the e5 inquiry, is explored in Parts 9 and 10, where the student outcomes will be discussed in light of the teachers' planning. The importance of the kitchen and garden as contexts for teaching and learning is discussed in Chapter 8.

Chapter 8: Context, content and characteristics of kitchen- and garden-based learning

Introduction

Chapter 8 discusses the significance of context, content and characteristics of learning based in the kitchen and garden. This section explores the increased educational opportunities offered by experiential, contextualised learning. The stories and themes that emerged from the Grade 4 kitchen garden case study discussed in Chapter 5 are examined in this part. The analysis of the children's narratives generated through the focus group interviews found four repeating themes that encapsulate the significance the kitchen garden had for the children. The themes also served to illuminate the curriculum content of the learning. These four key themes were:

- 1. Relationships;*
- 2. life skills;*
- 3. health and nutrition; and*
- 4. the environment.*

The themes overlap, and in doing so, show the synergistic nature of learning in the kitchen garden.

The context, content and characteristics the Grade 5 and 6 nutritional unit "Pantry Plunder" (Chapter 6) are also examined in this part through the stories and themes that arose through the children's reflective discourse. The key themes that emerged from the nutritional unit were: relationships, life skills, and health and nutrition. The analysis of the case study reaffirmed the importance of placing learning in a real-world context and clarified the nature of the learning stimulated by the Pantry Plunder Unit.

This section compares the contexts, content and the characteristics of the KGBL in the Grade 4 kitchen garden and the Grade 5 and 6 Pantry Plunder Unit and responds to the first research question:

1. Do the kitchen garden activities engage the children, generate stories of learning and growth and promote an appreciation of nature?

Our garden

There was a relaxed air about working in the garden. Many of the exciting discoveries and connections made between things were prompted by the demand, “come and look at this”, or “wonderings” about what was happening or “why a plant looked sick” as children worked in the garden. Sometimes the teacher would use the *wondering* as an impromptu lesson, or on occasion, turn the question back to the questioner and ask, “What do you think?” Some children might be hard at work, busy pulling out old plants and then digging the soil over, ready for a new crop. Others might be collecting snails or tasting the young beans. It was a rich sensory experience; whole body learning using all the senses.

The children in Grade 4 had a special bond with the kitchen garden; they “owned” it. Their sense of ownership was demonstrated by how many of them drifted towards the garden at recess, just wanting to “check up” on the seedlings they had planted or to see whether the tomatoes were ripening quickly enough to be used on the pizza they were going to bake at the end of the week. Yard duty teachers were often beckoned excitedly over to witness the growth of the giant zucchini or the way the snow pea was developing from the flower. When parents came to help on kitchen garden day, they were proudly given the guided tour interspersed with comments drawing their attention to vegetables, “I planted those lettuces”.

Seeing the enthusiasm with which the children in Grade 4 looked forwards to kitchen garden days, I had the intuitive belief that these types of programs offered something distinctive to the children. It was this belief that stimulated my desire to find out more. This understanding, while tacit, has now been realised and is explored in the thesis. At the core was my most important question, “What was it about the program that stimulated engagement and ownership?”

Researcher’s journal 2009

Real-world context: learning in the kitchen garden

The context of the garden or the kitchen was real, and helped the children make sense of their observations. The importance of the student-centred learning experience, as opposed to teacher-directed tasks, was confirmed (Chapter 2). Young children have an inherent interest in nature (Maxey 1999; Tandy 1999; Sobel 2002), and as Judy T noted, “they’re all interested in food”. Consequently, units of work based on the garden and cooking have the advantage of being immediately relevant and engaging to the child. When the classes came together to share the food created in the cooking session it was common to overhear “They’re really good”, as one of the children encouraged other classmates to try the salad or muffins they’d had a part in making. The children were proud of their creations and wanted affirmation that they had done a good job.

This study convincingly indicates the relevance of purposeful learning to this group of young children. Reville (2012) explains the concept of purposeful learning as being when “students choose to pursue a course of study because they find it of interest and because the course goals and objectives have meaning and purpose for them and for their role as learners” (2012 p. 13). Motivation is the key to purposeful learning. Teachers, while making the experience of the kitchen garden more authentic, can and should build on the centrality of the learner to the learning encounters.

Student-centred learning is highly significant in the research. Starting a program with something that is relevant to the child’s *lifeworld*, where there is already connection between the child and the learning context, is a strong base for extending their learning. Putting learning into a context that is relevant and important to the child is the key to engaging and motivating them, and a prerequisite for children’s ownership. Authentic learning is contextualised learning, and is by definition student centred.

The experiential gardening and cooking program stimulated engagement. As discussed in Chapter 2, there is an increasingly substantial body of literature demonstrating that engagement is multifaceted and closely entwined with real-world context, children’s ownership of learning and promotion of intrinsic motivation (Fredricks et al. 2004). As the children worked in the garden they observed changes. The changes inspired questions and wonderings, prompting the desire to find out. It also centred the learning on the child.

Dewey and Montessori were some of the first educational leaders to recognise the potential of school gardens to engage children and provide a familiar context to extend and enrich the learning encounter. The groundswell in research into school gardens has found wide-ranging benefits, including increased knowledge of nutrition and increased likelihood of eating fruit and vegetables, increased understanding and appreciation of diversity (Alexander et al. 1995; Bell & Dymont 2006; Brink & Yost 2004; Brymer et al. 2010; Chawla 1998; Chawla & Flanders Cushing 2007; Dewey 1994; Froebel 1826; Montessori 1964; Moore 1995; Thorp 2005; Wells & Lekies 2006; White 2004).

It is fundamental for student learning to have a real context for the learning, because the relevance stimulates engagement and establishes connections to the child's *lifeworld*. This makes the learning personally meaningful to the child. Lessons in the garden that were experienced as unstructured actually encouraged personal connections to nature and social relationships to form. The children established rapport with one another just from being in the garden or cooking together. The context of the garden or the kitchen was real and helped the children make sense of and offer plausible explanations for their observations. The nature of the tasks promoted a discourse of inquiry, whether it was to draw attention to some fascinating observation, negotiate a solution, come to a decision or work to a common goal. The learning tasks and activities in the kitchen and garden encouraged children to become involved and required that they made choices, promoting ownership. These contrasts to many situations within the confines of the classroom walls, where individual "quiet" work is often encouraged, limiting the occasions for socially and shared negotiated meanings to be established (Silberman 1970).

Collaboration and developing relationships

In the VELS Grade 4 planning document (Appendix R) interpersonal skills were identified as one of the areas the curriculum needed to cover, that could be achieved through the agency of the kitchen garden. Intuitively, teachers realised that getting children to work alongside one another in the outdoor garden setting or in teams to prepare and sit down to a shared meal would present opportunities for these interpersonal skills to develop. However, there was very little explicit detail as to how or why this would be achieved, or what strategies could be used to develop and optimise these skills. The exception to this was when the teachers set up one of the cooking and food-sharing

sessions to have a focus on manners and “having a polite conversation” (see Chapter 5). Students were challenged to sit with students they did not know well and use topics they had prepared earlier to initiate a conversation. This was a strategy that was specifically mentioned in one of the focus group interviews with the children as being “helpful”. The sharing of food, discussion of the flavours, what was good (or not) and how things were made gave the children a shared experience and common topic of conversation. The children identified making the effort to converse or, as Ella said, “have a nice conversation” (Chapter 5) was a worthwhile skill that could be practised. Young children find the practice of explicit friendship-building strategies within a supportive environment a positive and valuable base to build on and extrapolate to other situations (Zins & Elias 2007). The communal and social act of preparing and sharing food contrasted with the normal lunchtime routine where lunch was eaten quickly, amongst workbooks (so that you could run out and play with your friends).

Children highlighted the importance they placed on positive relationships, and feeling connected to others. Collaborating on a recipe was valued as a common, shared experience with opportunities to discuss, negotiate and experiment with flavours. Positive social experiences were closely intertwined with the activities as children negotiated choices based on their own connections with one another. The social nature of the activities added to the experience and contributed to the children’s engagement. This agrees with Zins and Elias’ (2007) research, which found that a supportive, inclusive school environment assists students with the development of their self-confidence, autonomy and efficacy.

Learning went beyond the classroom; it was taken home. The Grade 4 children appreciated the development of a common interest, as well as skills and knowledge they could share with significant people, including their parents or carers. Gardening and cooking were tasks often done at home alongside parents; the knowledge, skills and understanding the children had developed meant that the transfer of knowledge was not unidirectional. The children’s parents were no longer put in the position of director or “more knowledgeable other”¹³ (MKO) as the students informed their parents of the nature

¹³ Vygotski 1978.

of the work. The children also identified that they were often the instigator of some new project, such as a herb or vegetable garden, a worm farm to recycle scraps; or they presented an idea for a family meal based on their new learning. The opportunity for the children to share their understanding transformed the traditional familial power balance and enriched the relationships, indicating a higher degree of self-confidence and self-efficacy.

Alexander, North and Hendren's (1995) findings about how experiential garden programs promote horticultural knowledge and also provide opportunities for children to learn about "themselves and their relationships with their peers" carried beyond the school in this study. Children from Grade 4 reported positive bonding experiences while gardening or cooking with their parents in all the Grade 4 focus group interviews. These positive reports were also collaborated by parent comments and supported in written reflections in the kitchen garden journals. The Evaluation of the *Stephanie Alexander Kitchen Garden National Program Evaluation: Final Report*, found that 72.5% parents in their study stated children had become better at helping with kitchen jobs (Yeatman et al. 2013). However, at least for several children in this study, it seemed to go beyond just increased willingness to help at home. The practical application of the student's cooking and gardening knowledge at home changed the traditional parent-child power relationship. This was demonstrated in the relationship between Ryan and his father, discussed in Chapter 5. In this relationship there was a power shift brought about by Ryan having ownership of knowledge about looking after the vegetable garden, and this changed his relationship with his father. This shift in the power balance meant that the shared gardening was less about being *told what to do*, less of being in a "master" and "apprentice" relationship and more significant, because it became about sharing and creating common understandings based on the garden and the familial cooking or gardening encounter. Creating and maintaining the vegetable garden became a shared activity, rather than a chore.

Children valuing shared quality time with their parents, where they could demonstrate their emergent skills and new learning, was a common theme across all of the focus groups — both in the garden and the kitchen. Whether gardening or cooking, there was real time to engage in quality talk, valued time to share rich experiences and discuss

different ways of undertaking meal preparation. Having your effort in preparing a meal appreciated was emotionally rewarding as one of the grade 4 children commented:

I made the spinach and ricotta cannelloni for the whole family and even my sister said that they were great... and she doesn't like vegetables (Grade 4 focus group).

This quote demonstrates pride in making a meal for the whole family and the sense of achievement that was generated by doing something that was valued by the significant people in his life. It also indicates affirmation of his worth when even a difficult-to-please member of his family valued his efforts. Fred, another ten-year old boy, commented that the Kitchen Garden program was useful in many ways, adding that now he knew how to cook, instead of his Mum having to do all the work — now he could cook for her. He appeared to challenge the masculine stereotype of men using cooking to demonstrate knowledge and expertise and instead used preparing meals to express a nurturing, caring attitude (Cairns et al. 2010; Szabo 2013). The children more frequently mentioned cooking as a task to do at home with their mothers than their fathers. This appeared to be a comment on how the roles in their homes were divided or who the primary carer was. In the classroom children carried out cooking or dishwashing tasks irrespective of gender.

Relationship building was a skill and form of knowledge, which developed as a consequence of the kitchen and garden being the context of their learning. The increased understanding of relationships and how people work collectively bringing different skills, culture and interests to these everyday tasks of growing, preparing, cooking and sharing food was a central theme that emerged in both case studies, but in the Pantry Plunder case study, this theme was taken in different directions by the children in Grades 5 and 6.

The Grade 5 children developed a broader cultural knowledge and the appreciation of how this enriches our lives. They also showed a deepening understanding of the intricacy of relationships. The children identified that many of their favourite meals originated in other countries. Lauren explained: “we found recipes that we wanted and then we had to find out what countries they came from”. Understanding the contribution of other cultures was evident in their prepared foods and in how they set their tables to display their meals. They also learned skills of negotiation; for example, how to work to a point of consensus when there were alternative solutions.

In Grade 6 the emphasis was on “teamwork”, and this led, as the data shows, to a greater understanding of other people: “it helped with knowing their skills” as Jay said (see Chapter 6). An appreciation of how diverse skills can be utilised in communities, as well as how differing perspectives can and must be negotiated to work collaboratively towards a common goal, were also key themes in the Grade 6 cohort. The attributions of cultural knowledge, negotiated and shared learning, collaboration and consensus building, are necessary skills for a meaningful, engaged and purposeful life. The garden and the kitchen both provided occasion to build collaborative and purposeful cultural learning for the community of the students.

The emphasis on cooperation, as illustrated in the preceding sections, is vital to educational engagements. The fundamental skill of cooperation is noted as one of the four key pillars of education in the UNESCO International Commission on Education for the 21st Century. It is their estimation that essential education involves “learning to live together” (Delors 1996). The emphasis on cooperative group work, and the open inquiry where they were required to produce a healthy meal, demanded the children in this study developed their solutions to challenges they faced in their learning in a democratic way. This democratic, shared approach to decision making fostered discussion and required them to manage disagreement, divergence and dissimilarities constructively. The importance the children placed on developing relationships in the Grade 4 kitchen garden experience, and learning about collaboration, negotiation and one another’s strengths in the Grade 5 and 6 nutritional unit, indicates that there was an important social element to the learning.

Real-world context

Cooking at home, or helping with the preparation of food, was an opportunity for the children to demonstrate their cooking skills and to show off their confidence. There was a shift in how gardening and preparing meals were perceived. As discussed in Chapter 5, rather than just another chore, they were recognised as important life skills, which are immediately relevant to the children because they can see the real-life context for the learning. The appreciation that they were developing life skills was mentioned in all the focus group interviews by the class members, particularly in reference to preparing and

cooking meals, “and when you’re older of course you will have to cook” (see Table 5.1 in Chapter 5).

The understanding that gardening and cooking was worthwhile and relevant was generally implicit rather than explicit. It was reflected in the change of attitude noticed by parents where previously, gardening and helping with cooking were regarded as “drudgery”. The two activities of cooking and gardening were now seen as an opportunity for the children to both showcase their skills in a practical way and to demonstrate their caring by putting in the time and effort to make a meal to share.

The research acknowledges that gardening and cooking were tasks often done at home alongside parents, and this thesis identifies the generalisation of their knowledge, skills and understanding. In the cooking of a delicious meal or doing a good job in the garden, busy parents provided positive feedback of these values as being immediately apparent to them. “Joe eats more veggies and has a greater appreciation of cooking and what it takes to make a healthy, tasty meal” (Appendix I: Parent notes (Grade 4), child’s name changed). Their appreciation reinforces the child’s perception that they are doing something worthwhile. The transfer of knowledge acquired in the kitchen and in the garden was apparent, and the children self-identified their cooking and gardening skills as significant. Rosie, a Grade 5 student, explained the knowledge transfer when reflecting on cooking in the Grade 4 Kitchen Garden Unit in the previous year:

[E]veryone sort of learns something each time they cook because everyone learns a new recipe, so then they can cook it home for their family, and their family also learns how to do it (Grade 5, focus group interview September 2010).

The children regarded the skills as important ones that would be useful to them in their *adult* world, their *real* world and most essentially, beyond their school life. Some of these skills are ultimately focused on the professional roles of cook and gardener in the adult world. While the theme of life skills fits in the authentic learning framework (Chapter 2), it is noteworthy that there is also transference “of learning to work as professionals”¹⁴ which is central to the work of the KGBL. Many of the skills developed in the KGBL

¹⁴ Authentic learning characteristic

units are skills and understandings relevant to cooking, gardening and health nutrition careers. Several of the children indicated they were actively practising and developing skills in cooking at home, and that they were now considering becoming a chef as potential career (Mark, Assistant Principal, interview 2010).

Children and parents commented on how the kitchen garden stimulated shared tasks and projects in the home context (Chapter 5). These children were often the instigator of some new projects in their homes, such as a herb garden, a worm farm or even advancing their own ideas for a family meal. They initiated tasks that were no longer seen as “boring” chores. The skills and knowledge the children had developed were incorporated into their *lifeworld*. This study shows how the kitchen and garden became opportunity for the children to share their understanding, change the power balance and increase connectedness, while it also served to enrich their relationships with one another, their families, the school and the environment.

Health, nutrition and hygiene

One of the major benefits of kitchen gardens has been reported as increasing the students’ knowledge about a healthy diet, and the willingness to try a broader range of fruit and vegetables was confirmed by this research (Canaris 1995; Libman 2007; Morris et al. 2001; Ratcliffe 2007). The willingness to at least taste new foods was reported in all three Grade 4 focus groups, and is in evidence in the following statement from one of the Grade 4 children:

Mum is liking it [the Kitchen Garden Unit] a lot, because I’m eating more things... Well, I really didn’t like some foods, but now I like a lot of them... but I didn’t try them before (Grade 4 Focus group B, interview 16 December 2009).

Some children were extremely resistant to trying new foods, as noted in this comment by Len about a classmate:

[R]emember him at the start of the year, way too fussy to eat heaps of veggies and now he is giving it a go and he is eating it well [sic] (Grade 4 Focus group A, interview 16 December 09).

When children had been involved in the care and nurturing from seed through to maturity there was more interest in trying the food. Children who had previously avoided broad beans were keen to try the broad bean dip, made from the beans harvested from the plants they had originally looked after and monitored in their science experiments. In addition, when the children had control over the creation of a new recipe, as in when they created dips, they were particularly enthusiastic, and remembered it as one of the highlights of the year. It demonstrated how important autonomy and decision-making could be in generating ownership of learning.

There were some complaints from several of the children about the lack of meat in the meals they produced; however, they understood the cooking was about using the crops and produce from their own garden. The complaint was more about what they were familiar with and their understanding of what made a “complete” meal.

The children were conscious of the importance of good hygiene practice. The comment from Ian (Chapter 5, Table 5.1) on how even though he intended to use a spoon and not touch the food (that he’d probably forget), he had better wash his hands, shows both his understanding of hygiene and also his self-awareness that his good intentions probably wouldn’t last. Hygiene was obviously of particular concern to Ellie (see Table 5.1). Although she appeared confident that her classmates washed their hands, she didn’t trust the hygiene habits of the children in other classes. When she wasn’t there to observe it, she was less sure. When asked if they wanted to sample the cooking, teachers also commonly exhibited this same concern about hygiene.

The key to improving children’s diets was getting them prepared to be more adventurous and experiment with additional and unfamiliar tastes. Parent notes highlight how improved willingness to try new foods was supported by an increased awareness and knowledge about health. “Fantastic! [My child] eats more veggies and has a greater appreciation of cooking and what it takes to make a healthy, tasty meal.” (quote from Appendix I: Parent notes (Grade 4)). Children also comprehended the necessity for budgeting, with several comments in the kitchen garden journals indicating surprise at how they could produce a meal at a fraction of the cost of a take-away meal: “and it only cost \$22.00 for muffins for the three classes!” (Grade 4 kitchen garden journal entry, 28 October 2009). The recognition that with planning it was possible to produce quick,

inexpensive, healthy meals was also an important element identified by Judy T (Chapter 5), when she expressed concern over today's modern lifestyle where many children were missing out on a home-cooked meal eaten with the family.

These were layers of understanding that built up through multiple experiences through the growing, harvesting, preparation and sharing of food in the Grade 4 kitchen garden. The World Education Forum 2000 identifies many benefits of providing "effective school health, hygiene and nutrition programs", and points out the synergistic nature of these programs resulting in improved educational outcomes (UNICEF et al. 2001).

This study illustrates and confirms that the learning that arose from the Grade 5 and 6 nutritional unit was also incorporated into the *lifeworld* of the children. Children in the twenty-first century are constantly exposed to advertising promoting fast food with dubious nutritional value and need to acquire a greater understanding of the characteristics of a healthy meal. The participants in the study developed expertise so they could read, compare and understand nutritional information. They reported making healthier choices using this information and noted "you can read the labels to judge whether it is good for you or not" while becoming more sceptical about advertising claims noting, for example, "this has made me much more aware of the ways they [advertisers] influence us" (Chapter 6).

Children need to find the knowledge useful to incorporate it into their *lifeworld*. This was seen in the example of the herb and plant knowledge — where the children could and did name and describe the uses of the plants over a year after working in the kitchen garden. The planting, tending and cooking with the herbs built up layers of experience with the plants and produced additional evidence of authentic learning. It was real learning; it was learning that was remembered and recalled because of its authenticity and relevance to the learning community.

Nature, science, the environment and ecoliteracy

The theme of nature or science was evident when the children learned about the plants and animals in the garden. These themes are relevant to the second research question:

Do the Kitchen Garden Unit and the Pantry Plunder Unit provide the opportunity to participate in authentic learning?

Knowledge about what plants need to survive, how different plants grow, and even being able to identify the different herbs, is authentic learning relevant to the children's lives. There were occasions when knowledge about food chains, including the relationship between producers, herbivores and carnivores, was called on. This knowledge and understanding came about through the children's observations and discussions, through immersion in the garden and also their schoolwork, which built on the authentic context of the garden.

Using Bloom's Taxonomy, the knowledge and understanding demonstrated when children recalled the names of plants would be classified as lower order thinking. However, some children took this basic knowledge much further (Anderson & Krathwohl 2001). The environment emerged as a separate theme in one of the Grade 4 focus group interviews. In the other two the "interconnectedness" of the environment and sustainability was emphasised, demonstrating the emergent understanding of the children around the complex links between the actions of individuals, and the sustainability and health of the environment. Both local and far-reaching global consequences were implied in their developing sense of ecoliteracy.

The question of whether "an appreciation of nature or ecoliteracy" was developed through the agency of the kitchen garden is best answered by the children's reflections. The children's reflections, both verbal and written, are for me the data that highlights the important things they have learned and the connections they've made.

There was evidence of the formation of abstract concepts and generalisations, as some children linked the creation of the kitchen garden with the dual outcomes of providing healthy food and helping the environment. As the student Leesa, a ten-year-old explained:

Vegetable plants are (like) trees and trees help the environment because they make more oxygen... so it is helping us in two ways because vegetables are also very healthy so... keeping us healthy and also making sure that we have plenty of oxygen (Leesa, Grade 4 focus group interview).

Ecoliteracy is the understanding of the interconnectedness of the web of life and an appreciation of our role in it (Orr 2004). Fritjof Capra, the eminent Austrian-American physicist encourages his adherents to take a holistic approach to knowledge and knowledge creation when he defines ecoliteracy as “the understanding of the principles of organisation that ecosystems have developed to sustain the *web of life*” (my italics), and gives the example of “one species’ waste being another species food” (1999). Leesa’s explanation shows she is starting to make these holistic links and developing this depth understanding of the interconnectedness of animals and plants in the ecosystem and how they work together to sustain life, identified by both Orr and Capra as being essential for the development of ecoliteracy.

Concern for the environment, and the realisation that we each have a part to play in looking after the environment, came through as a theme in the Grade 4 focus group interviews (Chapter 5, Table 5.1). Simon’s narrative demonstrates this in his explanation of how having a garden assists the environment:

Well, it is good for the environment because normally when you want to get some fresh vegetables a lot of people would drive down to the supermarket... pick it up... put it in a plastic bag which is bad for the environment... drive home again which is bad for the environment as well... whereas if you have a garden out the back you can just walk out the back door and pick something and walk back inside again. You know that it is fresh and not overdue [sic] (Simon, Focus group C interview).

Having broken the information into parts to explore understandings and relationships, Simon then explains the interconnectedness and the *web of* all our actions, our health and the environment. He goes on to create a contemporary understanding about how our actions affect the environment, aligned with the teaching of Orr and Capra. Simon’s insight demonstrates Bloom’s higher-order thinking and shows an emergent sense of ecoliteracy.

Several of the children demonstrate understanding that the way they live, their actions and the environment are conjoined and systematically link up. Ian (Table 5.1) explained how growing food plants connect two different areas: healthy eating and the production of oxygen, resulting in a healthier environment. The comment by Liz mirrored this when she said; “The kitchen garden is helping our generation learn more about keeping the earth alive”. Liz indicated a quality of reflection on our role and place in nature’s interconnecting web — and perhaps the beginning of her own “custodian” attitude

towards nature (Rule & Zhbanova 2014; Strang 2009). Immersion, as illustrated throughout this work, is entering in to a rich sensory, natural world. The familiarity and knowledge built up in the kitchen garden assists the children to extrapolate their understanding to the complex interrelationships of ecosystems, or as Liz perceptively identified, to keep the “Earth alive”.

Some of the children were particularly drawn to the garden, and liked sitting there during breaks, just quietly chatting or checking out the progress of their plants. Getting in amongst the taller plants like the broad beans to do the weeding was a popular task; the children loved being surrounded by the *jungle*. Other children, like Leesa, were particularly drawn to the bugs and spiders found in the garden, and would observe them, completely fascinated for long periods of time. The children’s change in attitude towards the worms and the snails were also examples of occurrences where the children’s relationship with *nature*, their affinity with and understanding of the garden ecosystem, were re-formed as they developed over time. The experiential learning activities, the acts of growing, tending, harvesting, and preparing healthy, nutritious foods appears to have been transformative for this group of children and helped them connect to nature.

Ecoliteracy is more complex than a mere “liking” of nature. It involves higher-order thinking where children establish cause and effect, and link the different processes they observe in more intricate and specifically interconnected ways. Ecoliteracy is where they start to think of the ecosystem as a complex networking of systems. Comments about nature and the environment were introduced in all the focus groups; however, the evidence for developing ecoliteracy came predominantly from two of the three focus group interviews. Why the understandings about the way all natural systems interconnect were only discussed in two focus groups is difficult to say. It may be that the children in two of the classes had developed a stronger environmental ethic and deeper appreciation due to unique and personalised layers of understanding built up in the classroom activities and discussions. It may have been stimulated by the environmental ethic of one or two specific children, by the group of children, or their teachers. It may even have been a common understanding across Grade 4. In the focus group interviews children searched for ideas from their own experiences to add to the discussion once the environment had been introduced as an appropriate topic for conversation. Each idea

building on the discussion and providing examples of how it was personally relevant to the child, as shown in the following excerpt:

Ian: Bbecause even vegetable plants are trees and trees help the environment because they make more oxygen... so it is helping us in two ways because vegetables are also very healthy so... keeping us healthy and also making sure that we have plenty of oxygen.

Interviewer: Simon, do you have anything you want to add to that?

Simon: Well... it is good for the environment because normally when you want to get some fresh vegetables a lot of people would drive down to the supermarket... pick it up... put it in a plastic bag which is bad for the environment... drive home again which is bad for the environment as well... whereas if you have a garden out the back you can just walk out the back door and pick something and walk back inside again. You know that it is fresh and not overdue (sic).

Mandy: “Yes... and it’s better for the environment when we all garden.”

(Focus group interview C, December 2009.)

Education is often espoused as the way to bring about a change to a more sustainable way of life (Dyer 2007). The discussion above demonstrates one way this can occur. The students’ environmental concerns, as well as how the children actively construct knowledge and build on one another’s ideas collaboratively rather than passively receiving information, are shown in this situation. The children personalised the knowledge. They have the perception that their actions are important and affect their own health and the health of the environment. As children progressed from simple knowledge about different plants and animals, they gradually created more and more complex connections. Some of the children took this further, linking themselves and their actions to survival and the interconnectedness of their health, environmental health and species diversity, into a developing understanding or “ecoliteracy”. Figure 8.1 clarifies how these key understandings appear to go through stages.

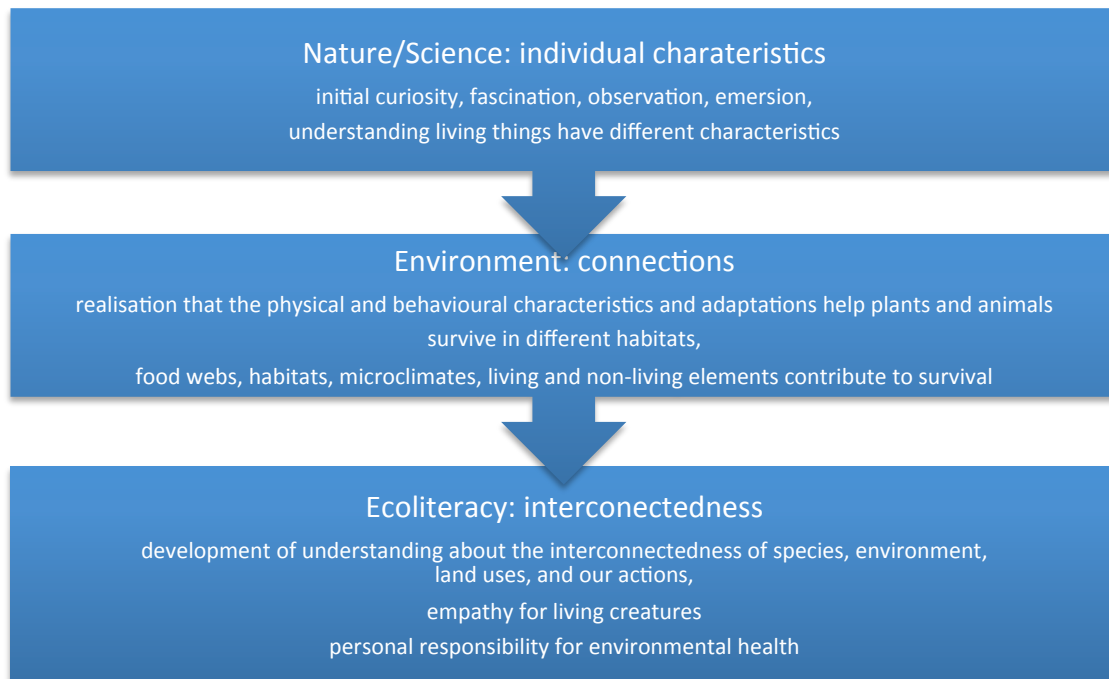


Figure 8.1: Developing ecoliteracy

The children started to understand the interconnectedness of differing processes and progressed in their individual and collective understanding from the initial “interest” in and “fascination” with individual plants and creatures to a more intricate and complex understanding of the interdependence of all species and the environment. Whether the kitchen garden can act as an agent for promoting understanding about the interconnectedness of natural systems and sustainability requires more focused exploration in additional research. It is unclear whether the opportunity to discuss their impact on the environment in the focus group interview assisted the children to make understandings already held explicit, or whether the discussion actually prompted new connections, creating and extending their understanding. However, whether the values and understandings were prompted or supported by the agency of the teacher, or if the children’s values were established at home, or a combination of these influences occurred, is worthy of consideration in this study. What is clear is the value of discourse around the concept of ecoliteracy and the environment. Hearing other children’s views in the focus group interviews assisted the group members to articulate their personal stories and contribute to the creation of a common understanding.

Personal learning

Personal learning linked all the other themes together. It is highlighted in the reflective comments interspersed in these discussion parts. Although primarily a data collection tool, the focus group interviews were also occasions demonstrating rich learning. The opportunity to talk about their experiences and reflect on their learning generated perceptive statements of personal learning and illustrated a deeper understanding of relationships and personal feelings. Social and emotional learning were important by-products produced by the collaborative tasks and the social nature of working alongside their teammates.

A noteworthy example of how focus group interviews could be used by teachers to capitalise on the collaborative nature of the discourse is the example above, where the children discussed the interdependence of everything in nature, linking cause and effect. The importance of the social aspect was unswervingly demonstrated in the focus group interviews, where the children's reflective discourse assisted the whole group to make connections between their personal learning experiences and the understandings of the group. HOT was in evidence in the students' comments connecting their personal actions to the health of the environment (Chapter 5). Each child contributed to the group's understanding, building up connections to the point where children articulated understandings about the complex interrelationships of the environment and their lives, qualifying for the term "ecoliteracy" (Capra 2007; Orr 2004). Using Bloom's Revised Taxonomy (Anderson & Krathwohl 2001), the learning demonstrated by the children ranged from the most basic remembering or recall of factual knowledge; for example, being able to name different plants, to increasingly sophisticated higher-order thinking skills (HOTS).

Opportunities to engage in HOTS were frequent. When the children created new recipes, (see Chapter 5), some analysed and evaluated their creations carefully, checking for taste, texture and appearance, and then adjusted the ingredients accordingly. Many students identified this experience as one of their cooking highlights, and this confirmed the significance of the teachers' handing over control and giving the decision making back to the collective of the class and the individual child. This was, after all, a student-centred

activity enabling a variety of outcomes according to the different tastes and unique abilities of each child; the element of choice immediately gave the children ownership.

Numerous context-based learning opportunities have been illustrated, and these, whether they be self-directed or structured by the teacher, have the *lifeworld* of the child at the core of the process. The lack of dedicated planning time for the Kitchen Garden Unit identified by the Grade 4 teachers didn't seem to matter. The real nature of the "garden" or the "kitchen" helped the children make sense of their observations and offer plausible explanations. Each of the settings provides experiential learning opportunities enabling the key knowledge or learning outcomes associated with the specific context of the setting to be supported. The relevance and overlap with the children's *lifeworld* establishes the initial connection for the children. The children have prior knowledge, along with understandings that they can use their learning as a knowledge base to expand from. This prior knowledge and experience assists with making their tacit knowledge explicit, and assists with assimilating new knowledge into their schema.

The familiarity with the garden built up over many months, together with the relaxed approach to work in the kitchen garden, invited observations and wonderings from the children about the plants and creatures living in the garden habitat. When the main tasks the children undertook in the Grade 4 Kitchen Garden Unit and the Grade 5 and 6 Pantry Plunder nutritional unit are compared using the authentic learning lens (Tables 5.4 and 6.2), a main difference was the many opportunities for the Grade 4 children to work and play in the garden. This helped build up a connection with the garden. An interest in the plants and animals they came into contact with, and in some cases a deeper understanding of their place in nature and the interconnectedness of natural systems, evolved over time, as the familiarity with the garden evolved. Children cared about the plants and animals as they came to know them. This building of understanding, and empathy with the creatures in the garden, were in evidence when the children were observed carefully rescuing worms instead of chopping them in half. It was in evidence also when the snails that had been carefully collected from the plants were incorporated into imaginative games. The snails had been given names and fed. They obviously had to be "rehoused" rather than destroyed. The time to play, observe and relate to nature had a pivotal role in developing this connection to all living things. Learning through play, a widely accepted pedagogy in

the early years of schooling (Murdoch & Wilson 2008; Saracho 2011; Stegelin 2005; White & Sharp 2007) appeared to be a significant factor in establishing empathy.

The kitchen and garden intersect and are inclusive of each other. Different cultural knowledge based around food, ingredients and ways of cooking and gardening can be celebrated, rather than used as a divide in these two learning spaces. The argument in Zins et al. (2004) for education programs to be “holistic”, enabling children to learn key social and emotional skills and strategies that they will require for success in life, is applicable here. Both teachers and children identified “relationship building” as one of the key benefits that evolved through the contextualised cooperative work in the kitchen garden. The Grade 4 children demonstrated and appreciated how the kitchen and garden both provided a location for the development of their own common interests, skills and knowledge. This knowledge could and was shared with the important people in their lives. This was due, in part, to the changing of the nature of the role the children saw themselves adopting, but also because of the teacher who, after devising the general tasks, often allowed the children to perform the set task in an autonomous manner, so that they were on occasion left to “self-regulate”. This self-regulatory process is at the heart of autonomous learning and the holistic model of delivery. Experiences in the kitchen garden appear to act as a bridge connecting school and the lived, real-world experiences of the children in a holistic manner.

These connections are not limited to relevance of learning; parents coming into the school to help also strengthened connections between the children’s life at school and home-life. Parents were valued for their contribution of time and knowledge. The connections also established relationships with teachers and the friends of their children. Their role was extended beyond “mum or dad” and they were also seen in the light of expert cook, gardener and helper. The understanding was two-way, because the parents could see what the children were capable of. The KGBL provides the context for an engaging, interactive and inclusive educational program, and builds connections between the school, home and community.

The context of the kitchen and the garden are relevant to children’s *lifeworld*, and generated interest, curiosity and “wonderings” when the children had the opportunity to build up knowledge and understanding of the contexts over time. This relevance assists

with building engagement and ownership (Chawla 1998; 1999; Chawla & Flanders Cushing 2007; Wells & Lekies 2006; White 2004). The children noticed when something was different in the garden, and this generated observations, discussions and new learning. In the context of the kitchen and producing healthy meals to eat, the children's attitudes changed from wanting to do all the interesting tasks themselves, to a more team-based approach, where the goal was to get the task done, together, on time. The tasks undertaken in the inclusive environment of the garden, and in the preparing and sharing of food, provided common experiences, experiences essentially social in nature. These social experiences were essential for the construction of understandings and learning (Chawla 1998), and provided the basis for establishing understanding and empathy. The experiences were, as noted earlier, holistic. They provided a supportive environment to practise social and emotional skill advancement leading to better relationships and improved self-confidence. Alongside this personal confidence, their interest in nature and their connection to living things was also nourished. The study illustrates the nature of how this group of children became familiar with the garden and its inhabitants and built up layers of understanding through their individual and collective multiple visits to the garden for work and play. These classes will always know the relationship between the real world of the garden and the produce they need for a sustainable future. This lifelong knowing of the synergistic relationships in the KGBL and the nutritional program are fundamental and vital to the study and its findings.

Working and playing in the garden as a community is noted as an important characteristic of the KGBL, where the informal learning opportunities encouraged both social and productive occasions and developed the capacity to be alongside other children. The less structured agenda allowed the children time to observe and absorb the rich sensory nature of their garden, and time to play and relate to one another in their co-created environment. Sharing observations and their "wonderings" meant understandings were co-constructed and the importance or intrinsic interest of the phenomena was confirmed in their shared significant relationships. Friendship and cooperative skills were practised in the non-competitive context of the garden and the kitchen, a unique aspect of this teaching situation. This is contextualised learning that was progressed earlier in this part as transferrable skills and knowledge.

Work in the kitchen garden was integrated in the Grade 4 approach; the garden context both dictated the content and assisted children to make sense of the new knowledge. They built on their existing understandings; they could see the reason and relevance of the learning. Integrated curriculum can become a reality in the context of the kitchen garden. It is more than Lauritzen & Jaegar's (1997) "linking different disciplines in meaningful and [in] authentic ways", because there is no point in separating the learning into discipline "boxes". The knowledge, skills and processes are taken from whatever discipline is useful, the real context providing relevance for the learning of the knowledge, skill or process.

Likewise, Pantry Plunder utilised the knowledge, skills and processes from a range of disciplines. Knowledge of multiplication, addition and how to work out fractions and percentages were mathematical skills needed to work out the RDI of selected recipes, as well as the quantities of ingredients required. Building up a knowledge base about the main food groups and what nutrients they supply, as well as the health and the nutrition needs of a young person, were essential understandings for successful completion of the "invention test" task of creating a healthy balanced meal. The use of digital technology for research and for reporting and communicating were interwoven through the task. The use of digital technology is also characteristic of working as a professional would, "in the real world", and are skills that are essential in the 21st century or the digital age. The learning in these contextualised units of work, were always multidisciplinary or integrated and interdisciplinary in nature.

This study exemplifies how the learning content is directly related to the authentic real-world context. If the context is changed, so is the "content" of the learning. The garden and the kitchen were not contrived or a pretence. They were real and used for a genuine purpose. The context provides the link to the child's *lifeworld* and the motive or reason for knowing. A strong reminder of this is the example of children knowing how to plant seedlings to give them the best chance of survival, or the students' wonderment and understanding that comes about when the participants in the study observed the developing immature pea pod emerging from the flower and realised the connection between the fertilised flower and the food we eat. In a similar way, the question asked in the nutritional unit "What does a healthy meal look like?" although contrived in the sense

that it was deliberately vague to stimulate dialogue and allow various solutions, was relevant to the children, and they could see the application to their “real world”.

When starting from the point of the garden or the kitchen as the context for learning, the learning is essentially interdisciplinary. Disciplines are useful as tools for classification of specific knowledge and ways of “doing” things. Planting, maintaining and harvesting produce in the kitchen garden provides multiple opportunities for children to build up social and emotional skills while working alongside their classmates. The immersion in the rich sensory environment offers a common experience and way of connecting to one another and nature, which are experienced by each child in a unique manner. These multiple opportunities build the essential connections needed to evolve in to ecoliterate and environmentally aware citizens. Louv and other researchers (as follows) are concerned these connections are failing to develop in our youth, the majority living in urban cities devoid of nature (Bucklin-Sporer and Pringle 2010; Kellert 1997; Louv 2008; Smith 2002; 2007). Social negotiation of meaning in the garden resulted deeper understandings about the living ecosystem. Empathy for the creatures built over multiple visits to the ever-changing garden, assisting the development of a different way of knowing.

When you know the other way to listen, you can hear wildflower seeds burst open, you can hear the rocks murmuring, and the hills singing, and it seems like the most natural thing in the world (Baylor & Parnall 1978 back cover).

Children actively sought out the garden and often chose it as a quiet place to talk or reflect during recess, demonstrating the “positive affinity with nature” (Chawla 1998). The present research also found that the garden was a social experience for the children. The very nature of the kitchen and garden promoted social and emotional learning. In the nutritional unit the scaffolding of tasks and the deliberate introduction of challenging criteria requiring discourse and negotiation leading to the deeper understanding around team work and the interplay of individual and group responsibility is noteworthy. The core skills and understandings about relationships, teamwork, appreciation of diverse perceptions of nature and ecoliteracy, along with the skills to negotiate a solution from many differing points of view, were influential benefits that developed in the school.

The kitchen and the garden both provided spaces from which multiple ways of being could be envisaged and implemented. The learning opportunities requiring working

cooperatively in a team were maximised because the inquiry-based learning or the “poorly defined problem” demanded a process of democratic problem solving. This real-world problem solving promotes belief in children of their own capabilities and generates “a sense of their own agency” (Smith 2007).

The social and emotional learning changed from tacit understanding (Polanyi 1967) to become explicit and vocalised knowledge as the children reflected on their learning and experiences (Nonaka & Toyama 2003; Smith 2001). The synergistic action of experiential learning in a common context, followed by the written reflections in the portfolios, journals or class blogs, and the verbal reflections and dialectic process of meaning making in the focus group interviews, assisted with the metamorphosis from tacit knowledge to explicit “new knowledge” (Nonaka & Toyama 2003).

Summary of kitchen- and garden-based learning

This section articulates the value of learning from real contexts. The skills and knowledge achieved through the learning experiences in the kitchen and garden enable the teaching of curriculum content, but also deeper, more profound learning on hard-to-measure aspects such as positive relationship building and self-confidence — aspects that have direct application to the child’s lifeworld. The real-world contexts of the kitchen and garden enable children to connect their learning to their prior experiences. Chapter 8 illustrates how the kitchen- and garden-based learning experiences provide opportunities for authentic learning. This research contends that separating disciplines becomes artificial in the kitchen garden; the context, the seasons and needs of the kitchen garden are paramount and dictate the knowledge and skills relevant to a particular task. When designing a kitchen garden (Appendix V) one may need to measure up the space, check the orientation, analyse the soil, decide on the plants that are suitable for the climate and taste, record ideas and artistic representation of this planning, discuss and come to a consensus with fellow collaborators and then put the plan into action. It does not make sense to segment the activities into mathematics, geography, botany, literacy and art. Rather, it is the interconnected knowledge that is needed to make sense of the whole.

The kitchen garden provides the context for the teacher’s agenda, incorporating the knowledge across the academic disciplines. It also provides rich opportunities to develop personal and interpersonal skills with opportunities for collaboration on various inquiries

relevant to the garden. These processes contribute rich learning opportunities and academic rigour. What is really valuable about this approach is that the children can see the significance and reasons for what they are doing; there is a real purpose. These contexts are often combined: the growing, harvesting and then preparing, cooking and sharing food are shown to go naturally together. Even when offered separately, cooking and garden-based learning programs share many key characteristics, learning goals and outcomes. Valuing the children's experience and knowledge of their local context ultimately enhances learning. Children are exposed to different ideas, diverse values, cultures and ways of "knowing", thus increasing their understanding that there is not just one correct way; things are complex, diverse and interconnected.

Developing useful *life skills* is one such outcome. The children employ knowledge that is useful in general living; for example, how to prepare and cook a balanced meal from raw ingredients. They are steeped in practices that address how they can tend a plot of vegetables and herbs so that these products can be used to increase the nutritional value of their meals and add flavour to the food they prepare. These are skills and knowledge constructs that have lifelong value.

In both of the units of work the kitchen- and garden-based learning created the environment that supported the production of profound learning. The kitchen- and garden-based settings provide rich occasions for contextualised learning. The garden in particular provided the frequent experiences required for building up ecoliteracy. It was at times integrated and interdisciplinary; it always provided a *space* to promote social collaboration and the production of new shared knowledge. It was through shared understanding in a real-world context that profound learning occurred, and this was above all the key benefit of establishing and teaching in the kitchen garden.

Chapter 9: The children's learning

Introduction

This section continues with the analysis of the children's learning that was revealed through their reflective discourse in the focus group interviews reported in Parts 5 and 6. The context, content and characteristics of kitchen- and garden-based learning in the preceding section shaped the children's learning experiences. This section focuses on the key characteristics that optimise authentic learning: the real-world context that assists with connecting the curriculum to children's lives; and the development of the skills, as well as the use of the tools, processes and knowledge to work as professionals, and the elements of cognitive challenge enabling the development of HOTS. Ownership of learning, the development of a collaborative learning community and the integration of authentic assessment are also addressed. The authentic learning framework constructed from these key characteristics was informed and at the heart of the research findings on the children's learning.

The second research question was used to guide this layer of research:

Do the Kitchen Garden and the Pantry Plunder Units provide opportunities to participate in authentic learning?

Definition of authentic learning

Defining *authentic learning* was found to be problematic, because there are many different interpretations of both *authentic* and *learning*. Based on the literature examined in Chapter 2, the authentic learning criteria reported in research were explored and the key characteristics that provided the basis for the working model of the authentic framework emerged. The key characteristics overlap. Different elements of *authenticity* could be placed under more than one key characteristic (see Appendix B Authentic learning taxonomy). Rather than a weakness of the model, it showed that authentic, contextualised learning is integrated.

The elements identified by research required for learning to be considered authentic were grouped into key characteristics:

1. real-world context;
2. working as professionals do;
3. higher-order thinking;
4. ownership;
5. collaborative community; and
6. authentic assessment — worthwhile and integrated.

(Based on the literature review, see Chapter 2.)

A real context promotes learning (Chapter 8). The contexts provide the reason and stimulus for learning. The context provides the connection to the child's *lifeworld*. Previous experiences and prior knowledge established in the home garden and kitchen provides a frame of reference that can assist in making the learning meaningful (Mezirow 1997). Mezirow defines the term “frames of reference” as the “associations, concepts, values, feelings, conditioned responses” informing the lifeworld. An authentic learning approach is student centred, and caters for individual differences.

Ownership of learning is both a prerequisite and a consequence of authentic learning. They appear to develop alongside each other. When learning is student centred, students have input into their learning; they pursue “personally meaningful goals” (McCombs & Whistler 1997). They have choices available and decisions to make, enabling ownership of learning to develop.

The herb inquiry

The gardening activity where the children were shown how to pick herbs so that the plant was tip pruned to stimulate growth kindled the interest and curiosity of the group of boys (see Chapter 5, Vignettes—Ownership: The Herb Investigation). As the herbs were tip pruned the herbs released incredibly pungent aromas. The group chose to investigate the strength of the different aromas in their lunchtime and formed a *collaborative community* of learners with a common “desire to find out”. The initial wondering about the scents initiated an inquiry that was used as a springboard for teaching and learning. In the herb inquiry they were generating *real data*—discussing how to measure something that had a subjective component to it; deciding on whether the smell was pleasant or not, and then

ranking the herb. These tasks involved *higher-order thinking* skills. They needed to *articulate and define the problem*, and come to a common understanding of what they were trying to do. They were not following a set procedure. They discussed and decided on the “way to go”. They generated data by creating a ranking system for the different scents. They analysed the data — this required that the data be sorted, collated and the *different perspectives* of the group evaluated. They *worked as professionals* do by using technology for research, taking digital photos and also using technology in the design, editing and production of the final product (with many trips to the garden to verify their research and observations). The *authentic product* was in the form of an information poster on a medicinal or culinary herb of their choice.

The student-instigated herb investigation demonstrated the children’s curiosity and fascination with nature, and had many of the characteristics of authentic learning (see Appendix W). There was the *real-world context* of the herb garden. Maintaining the herbs so that the plants became bushy and compact was a genuine task. There was an inquiry or *ill-defined problem* that required clarification and discussion: how do you put a numerical value on something so subjective as the aromas from the herbs? The task required collaboration and substantive discussion to come to a consensus to develop the inquiry and generate the data. There was also another type of learning going on, where by careful observation children developed the ability to distinguish between the different herbs, using all of their senses — not just sight.

I found it really good to know my herbs because well usually... because we have a veggie garden at home... Mum would usually tell me to go and get some coriander or some parsley and so before I’d go which one is this? And I wouldn’t be able to find it without Mum coming out there and actually telling me (Ian, Grade 4 Focus group C interview).

This more *in-depth* knowledge came about with familiarity and “knowing” the herbs. For example, the coriander and flat-leafed parsley mentioned by Ian are visually similar. They have a comparable leaf shape and growing habit. They are difficult to tell apart unless you are familiar with the different odours or tastes of the herbs.

A sense of empowerment and ownership of their learning developed from the student-led inquiry. The expression of amazement and the enthusiasm to a passing teacher (“isn’t the smell of the herbs strong”) indicated connecting with nature, but also the desire to share this wonderful discovery. The immersion in the experiential learning prompted the

observation of the plants' characteristics, including crushing and smelling the aromatic plants. The bouncing ideas off one another, and then the structured collaborative investigation that followed, had an important social perspective. Creating a way of classifying and ranking herbs demanded negotiation, so the children could discuss their different opinions constructively. The learning was not transferred from the top down; instead there was a cyclical exchange of information and overlapping understandings. As in Capra's learning community, "the focus is on learning and everyone in the system is both teacher and a learner" (Capra 1999). The overlap of ideas offered a connection, reinforcing each child's interpretation, and the additional offering built on and extended their understandings. Learning occurred when the children interacted together and jointly created meaning and understanding (Bakhtin 1986; Nonaka & Toyama 2003). This was a rewarding, rich *authentic* task, building on the initial enchantment and wonderings of the children investigating the strength of the scents from the herbs. Engagement was indicated by the children's motivation and focus on the task. The children directed and had ownership of their learning. They generated new knowledge as they engaged in discourse and decided how to rank the herbs.

The children were allowed to use anything from the kitchen garden in their Grade 5 and 6 Pantry Plunder Unit with the condition that they could identify it. Their teachers were surprised at how competent the children were at identifying the herbs and vegetables, as well as understanding how they could be used.

Well, they [the Grade 6 children] were able to tell us everything that was in the garden and were able to say that is such and such and we are going to use that, or they're chives and we're not going to use those because we've used them before and we don't like them or they won't go with... whatever they were going to prepare (Grade 6 teacher interview, December 2010).

This comment showed that the knowledge gained through the experiential tasks (the herb inquiry and the cooking and gardening two years previously) had been incorporated into their understanding of the way herbs worked to enhance flavours. This was deep learning that came from experience, and had become part of their *lifeworld*.

Reflecting on learning

Judy T thought that when the children were asked in class to reflect on their learning, there was evidence of interpersonal learning:

They would often reflect on how their group worked together. They did that quite well. They would say things such as we didn't quite get finished when we should have because we were arguing about who was going to chop up, or they might reflect that they didn't get the preparation done in time so they were late getting the food into the oven, and so were late feeding everyone. Most of the reflections were more in the area of interpersonal learning... probably because it was a group task rather than their own personal learning (teacher interview, December 2009).

When the children were asked to reflect on their learning in their kitchen garden journals as well as personal likes and dislikes, as Judy T indicated in the comment above, they tended to reflect on their teamwork. In the focus group interviews they reflected on their own personal learning and how the comments the other children made related to themselves. While responding to prompt questions the children also almost unconsciously ordered their thoughts, leap-frogged ideas and made connections. They began to understand and make greater meaning of their experiences. The act of participating in the focus group interviews and "debriefing" about what they had learned were important learning experiences in themselves. The children did not count them as work, as indicated by Mandy, when she asked at the conclusion of the interview "This is fun. Can we stay?" The children had been explaining, analysing, prioritising and making connections between the different things they had learned, but because this involved talking and communicating with one another, rather than answering written questions, it did not fall into their concept of *work*. As a group they had been communicating ideas, agreeing on some things, but also allowing and appreciating individual differences or preferences. The children found that having the time to reflect on and express their ideas gave them a better understanding of what they had learned, the progress they had made and the value of their learning. Contributing to research, being active participants and having their opinions sought, made them feel special; made them feel empowered. Robyn Ewing analysed the value of reflection in the learning process:

Reflection is about creating time and opportunity to step back from some of these events, ideas and feelings and to spend time considering them, what we learned from them and exploring possible alternatives and the consequences of these alternatives (Ewing 2010 p. 187).

The focus group interviews were the main way of eliciting the student "voice" and one of the core data sources. However, the focus group interviews also encouraged children to make the tacit explicit, and contributed to the children's learning by encouraging them to connect and extend ideas to themselves and their personal *lifeworld*. The goal of

discourse is to critically evaluate alternative interpretations, arguments, ideas and points of view (Mezirow 1977). Discussing the kitchen garden with their peers in the focus group interviews produced a rich source of data. Although the themes were sometimes repeated in written comments in the children's garden journals, or reflected in anecdotal stories, as Judy T identified, the written reflections were generally around teamwork. The opportunity to elaborate and make connections between the comments of one person and their own situation in the focus group interviews extended their thinking. The verbal discourse elicited comments about how the discussion related to them personally. As Mezirow (1997) identifies, "we learn together by analyzing the related experiences of others to arrive at a common understanding" (1997). When one child connected their learning in the kitchen garden, or the cooking that they had done in class with ways they were using this at home, it stimulated everyone, and lots of other examples were given and connections were made to personal examples.

John Dewy (1938) stated, "we do not learn from experience... we learn from reflecting on experience". He defined reflective thought as "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends" (p. 118). Although more than eighty years separate the work of Ewing and Dewey, both emphasise that reflection is essential for learning. By encouraging reflection, the focus group interviews were also a learning activity in their own right. This follows the constructivist philosophy that believes knowledge is constructed in a social context (Crotty 1998). Mezirow (1997) explains:

The key idea is to help the learners to actively engage the concepts presented in the context of their own lives and collectively critically assess the justification of new knowledge (p. 10).

The focus group interview appeared to act as a supportive arena where children were encouraged to make connections and transfer their knowledge to new situations.

This study confirmed the findings of previous research on the importance of consulting children to investigate their learning experiences from their perspective (Barratt Hacking et al. 2007; Christensen & James 2008; Rickinson 1999). Children are social actors and should be positioned as the "central informants of their own lifeworlds" (Christensen & James 2008). The focus group interviews were a way of generating and collecting data

enabling the voices of the children to be heard and, as Christensen and James emphasise, provided insight into the significance of the KGBL to the participants, enabling a clear insight into their learning (2008). It was also a very supportive way of generating the data as the children expanded one another's ideas. A written questionnaire would have been regarded as a test or at the very least, extra work. Ownership and the value of their learning was confirmed by having their opinions sought, and also when the opinions were supported by similar observations from their peers. The conversations in the focus group interviews illustrate the social nature of knowledge construction, and they enabled the children to have a voice in this research. The focus group interviews were an empowering learning process for both myself as teacher and researcher, and the children.

The following excerpt from my researcher's journal reflecting on the focus group interview as a method for collecting and generating data, illustrates how the focus group interviews were more than a form of data collection.

In the focus group interviews the children spoke about a wider range of views and ways the kitchen garden had affected them, compared with their written work. Written work was obviously directed by the teacher —perhaps with a literacy focus, asking questions, giving paragraph suggestions or topic areas that might be responded to. With the spoken interviews, inflection, tone and expression all have a part to play. Children interact with one another, sometimes disputing, often adding to what one another are saying. The children were respectful of each other's opinions and the discourse between them demonstrated the Kitchen Garden Project had an effect on their lives. The interviews also surprised me, in that I didn't realise the extent or the effect of the kitchen garden in the children's home life...

Overall, I found the interviews a positive experience for both the children and me, and one I would like to extend and use as a teaching tool. The children stated at the end of the interview time, "That was fun". They appeared to appreciate the time to talk and reflect together on their learning. The act of reflecting helped make the implicit, explicit. By the children leap-frogging ideas I could see how discussing their learning in a group, as a social activity, actually helped to build and consolidate the learning. I could actually see the constructivist approach working in front of me as the children developed common understandings. The focus group interview was more than a data collection tool, and I believe it was the views expressed in the focus group interviews about wishing they could continue with the kitchen garden that empowered the children, and stimulated their request to Judy T to continue on with the kitchen garden in Grade 5 (researcher's journal, December 2009).

The focus group interviews supported a reflectively discursive process, enabling the children to articulate the changing of the nature of the roles the children saw themselves playing. Being encouraged to talk and reflect on their experiences was regarded as fun, and in some cases, making the tacit explicit was empowering, such as when the

discussion in the Grade 4 focus groups centred on what they thought were the benefits of a KGBL program. That is, that they were learning skills relevant to real life. The wistful observation from one of the children that they wished the kitchen garden could continue on to the next year, led to unanimous agreement. It appeared this conversation might have led the students to make a request to their teachers about continuing the kitchen garden in Grade 5. The discursive, reflective process of the focus group interviews assisted the children's thoughts to crystallise, enabling them to articulate what they had personally learned through the Grade 4 Kitchen Garden Unit.

Learning in the Pantry Plunder Unit

The Grades 5 and 6 Pantry Plunder Unit aimed to extend the health and nutrition learning of the Grade 4 children, and like the Kitchen Garden Unit, placed the nutritional learning in a context relevant to the children. By responding to the children's request to continue on with the kitchen garden, the teachers were also conferring ownership of the learning. Tom T acknowledged the importance of connecting learning to children's lives: "children today demand a relevance to what they are doing or a link to their lives" (Teacher interview, 17 September 2010). Building on their learning from the Grade 4 kitchen garden harnessed the engagement of the children and utilised a unique and relevant context. In contrast to the flexibility of the Grade 4 kitchen garden, the nutritional unit was highly planned and structured, with an emphasis on using Bloom's Taxonomy and the e5 Instructional Model. The children identified the benefits of *hands-on learning* and acknowledged how even though some of the work was challenging, it was also fun and "stuck in your brain" (Chapter 6, Grade 6 Focus group).

The Pantry Plunder Unit fulfilled Herrington and Oliver's (2000) authentic learning criteria of "a sustained investigation with a diversity of outcomes". There was an investigation that built up over several months and culminated in the finalé, where the children showcased their healthy meals and were judged against five categories. The "invention test" was the prepared healthy meal where all the prior research and learning tasks culminated in a *performance of understanding* (Newmann et al. 1996; Wiggins 1993; 1998). When the Grade 5 and 6 "inventions" were compared the *diversity of outcomes* became obvious. The Grade 6 children showcased the information and work that had gone into their final selection for the healthy meal (Figures 9.1 and 9.2). The presentation of the tablecloth on which the food was served was a key component of the

task. It involved thought about the overall design and careful consideration of the information that would be useful to display. Teamwork, negotiation and collaboration were underlying skills required for successful completion. Tom T explained that it was also a way of pointing out to parents all of the work and research that had gone into producing the healthy meals. He did not want the parents to think that the children had just prepared a healthy lunch. Tom T wanted to showcase the deeper layers of research that had gone into informing their choices and the complexity of the task, particularly in reference to working out the RDI of the ingredients. The use of the competition was a deliberate strategy used by the Grade 6 teachers to increase the demands and intricacy of the task, as explained by Lyn T:

We spoke about what were going to be the indicators of success. That it had to be a healthy meal. We spoke about things like the aesthetics: the texture of it, the taste, the nutrition and the plating up of it. The sheet that the judges used for the judging, the children used it as a guideline so they knew how they were going to be judged (Lyn T, Grade 6 teacher, interview 22 October 2010).



Figure 9.1: Grade 6 invention test

It wasn't until the final day where the meals were going to be judged that the competitive element came to the fore as Lyn noted:

You could see them hovering over their preparation, trying to do something a little bit different to the other groups to try to score some extra points. The competition aspect really didn't sneak in until they were preparing their food. Up until then it was just another task! (Grade 6 teacher interview, 2010).



Figure 9.2: Grade 6 invention test

The tablecloth in Figure 9.1 had the nutritional information about the ingredients and percentage of RDI the meal provided incorporated attractively into the design. Figure 9.2 also has this information, but not integrated into the design of the tablecloth. These nutritional charts were used as prompts for the judges and also for the children answering the judges' questions.

Tom T explained how the children's reflection identified that they should have allocated a person in the group to research the presentation of the food. They criticised the wraps they made and reflected that if they had practised and researched this they would have found a neater way of presenting the food (Figure 9.1).

They talked about how they scored poorly for presentation because they did not spend enough time, as they were preparing on the day, talking about what the finished plate should look like. So some wraps were a little looser than others. Just those sorts of things! And one child said that [they] thought that [they] were going to dice the zucchini instead of having longer slices. So that was really good (that they reflected and identified specific problems). For a kid, you would say that was a fantastic effort, but the children acknowledged that they hadn't specifically identified that trialling presentation was a job that someone had to be allocated to do. "Go and practise rolling wraps"... and some groups did... and in the reflections about the strength of their group work, that comes through. The children [who] recognised how well they allocated jobs or which jobs they thought needed to be done made a difference to the final score in the invention test (Tom T, Grade 6 teacher interview, 17 September 2010).

In the above quote, Tom T identified some of the key understandings that the children recognised through reflection on their learning. The identification of research and preparation tasks involved in the creation of the meal for judging was a lot more complex than immediately apparent. A significant contributing factor to the success of groups that scored well was trialling and experimenting with their chosen ingredients. It is noteworthy that it was through the reflections that this key difference was made explicit; highlighting how essential reflection is for the learning process.

The meals created by the Grade 5 children showed a different focus. Although a healthy meal was prepared, the children turned the experience into a celebration and added drinks (perhaps not so healthy), and they had menus and placemats. Rather than a deliberate attempt to showcase their knowledge about nutrition, they celebrated the culture that had inspired the food and made the experience of sharing a meal more like a *special occasion* restaurant experience, a celebration of sharing. Swirls of sauce displayed around the outer edge of the plate in the “Spice is nice” meal showed care and attention to the presentation of the meal, as did the sprinkling of chopped chives and longer pieces of the herb artistically garnishing the soup in “French is best”.



Figure 9. 3: Grade 5 invention test “French is best”



Figure 9.4: Grade 5 invention test “Spice is nice”

The children were proud of their creations. They expected to answer questions from the judges on their meals; unlike the Grade Six children it was not identified as a task for which they should specifically prepare. This indicated that the teachers had different priorities. Grade 6 teachers were focused on the academic rigour and nutritional knowledge the children gained from the task. They also wanted to *showcase* the children’s learning. This priority was made evident in the following quote from Tom T:

We didn’t want them to just have a plate of food. We wanted them to have their knowledge on display so that the judges could ask questions and any parents that were there understand the complexity and depth of the task, of what the kids had to do (Grade 6 teacher interview, 17 September 2010).

Newmann and Wehlage (1993) consider that to be worthwhile, the project needed to emphasise high intellectual standards and include the “construction of knowledge, through disciplined inquiry and produce discourse, performances or artefacts that have value beyond success at school” (p. 8). The Grade 6 teachers showed this same prioritising of academic rigour. Mark spoke about how, in his role judging the Grade 6 Pantry Plunder invention test, he was “astounded that their knowledge... their learning was so strong. They were talking about DNA synthesis. I asked why that was so important and one of these kids started blurting out all this information”. Mark explained how surprised he was because the information was volunteered from a child he would not

have predicted as being capable of answering the question. “He kept on interrupting, putting in more information... he obviously had a fascination with this area.” Initially the judges started by asking about RDI. Once it was obvious that all the children understood and could explain the RDI of their menus, the judges asked more challenging questions. Mark described his experience judging the Grade 6 invention test:

The moment that I walked up, they explained the RDI. Once I got it from two groups I thought, I am not even going to ask that question. I would say RDI and they would start... I would just say stop! I already know that stuff. I just want to know if you knew it. What I am interested to find out is why I would need this food or why I would need that. Why are vitamins A, B and C necessary? Why can't I get them from other sources? Why have you included them? What part of the food pyramid do they fit into? The kids hadn't listed or necessarily put the information onto their tablecloths, but had said that's in the protein and that has a lot of fibre and so I would say, well, why do we need fibre? Someone would know that it was going to help with the digestive process, so everyone in the group became an expert in some way shape or form. It was just amazing the amount of information! (Mark AP, interview).

Being able to have a conversation with the judges about the nutrient value of the various components that made up their meals was a rich and intellectually challenging task, and exemplifies Newmann and associates' definition of worthwhile learning. The children needed to have deep knowledge and understanding to be able to answer whatever questions the judges asked.

The Grade 5 children had expectations that were influenced by their kitchen garden experiences the previous year. They had asked to continue the kitchen garden and to them, this meant cooking and preparing a meal. Judy T had been directly involved with the Grade 4 kitchen garden the previous year, and had been a key voice promoting the Grade 5 and 6 nutritional unit. This was at least partly in response to the children's request to continue on with the Kitchen Garden in Grade 5. Reflecting on how the Pantry Plunder Unit came about, Judy T explained:

The theme that we decided to work on was body systems, so we were working on digestion and nutrition. I suggested, with the success of last year's Grade 4 kitchen garden, the kids would love to take that further. Last year where we chose the recipes... it was fairly directed. This year I thought we could take it a step further and do less cooking, but do a greater lead-up to the cooking. So they would have to work on some things that were harder for them when they were younger, like getting the timing right when they were cooking. Last year... towards the end of the year, they were talking about things... like choosing their own recipes and I thought this was an opportunity for them to choose their own, to really own the recipe and experiment a bit (Judy T, interview 16 September 2010).

The Grade 5 teachers and children's understanding that the Pantry Plunder Unit was developed as a response to the request to continue on with the kitchen garden, set up expectations about the nature of the unit from the beginning, and accounts for some of the differences seen in the students' creations. Judy's comment about wanting the children to *own* the recipe is fundamental to understanding her underlying pedagogies. They are firmly based in student-centred learning and ownership.

The discussion in this section highlights the differences between the case studies, and also the different student outcomes within the case study on the Grade 5 and 6 nutritional unit. It is important not to forget the many similarities between the two case studies. The authentic learning characteristics of the two units of work are identified in Chapter 8. When the aims of the units of work, and outcomes identified by the children, their teachers and the parents were placed in the authentic learning framework (Chapter 5, Table 5.4 and Chapter 6, Table 6.5) these core components were accentuated. Any model for authentic learning needs to acknowledge and cater for the different priorities, pedagogies and practices teachers give primacy, in the implementation of contextualised KGBL. A flexible, student-centred model developed from the authentic learning framework emphasising the essential core components that need to be present for authentic learning follows in Figure 9.5. The model is flexible, and the different priorities of the Grade 5 and 6 teachers are reflected in each of the key characteristics within the student-centred authentic learning model (Appendices X & Y).

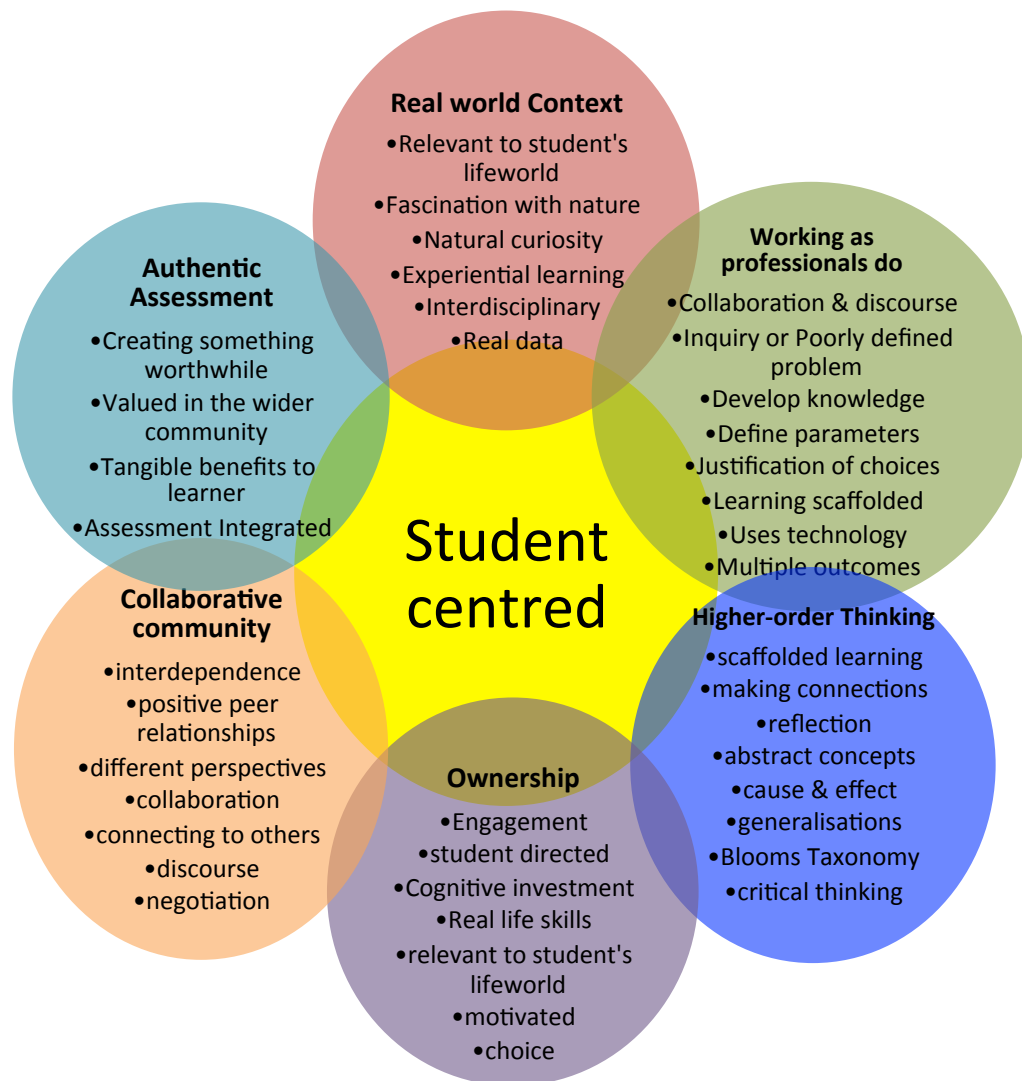


Figure 9. 5: Student-centred authentic learning model

The models were not based on numerical figures — they are a visual representation based on the teacher’s indication of their relative ranking of the core characteristics of authentic learning. Inclusion of the six core authentic learning elements was essential for extending gardening or cooking activities beyond being merely “fun” activities.

Summary

This chapter established that the Pantry Plunder Unit satisfied the six previously identified criteria (Chapter 2) for a unit of work to be considered ‘authentic’. The children valued the real world context and could see the unit’s relevance to their own lives. The collaborative inquiry format demanded that the children negotiate and justify their decisions. It was also adaptable, allowing the students to find their own pathway and create different solutions. Reflective comments from the teachers evaluating their own

priorities demonstrated that the six authentic learning criteria were present in the inquiry. They also demonstrated that authentic criteria are flexible. Different teachers had their own interpretation of how to best implement the learning activities they had planned together. Various criteria were given different emphasis. This was reflected in the teachers' ranking of the importance of the authentic learning criteria. These differences are further explored in Chapter 10: Teachers' work, which analyses the pedagogy, practices and planning that impacts the teacher's work and consequently, the student outcomes.

Chapter 10: Teachers' work

Introduction

Chapters 8 and 9 established the similarities between the two cases; the interconnected relationship between the kitchen- and garden-based contexts, and the nature of the children's learning. The two-contextualised student-centred KGBL units illustrated how the children's learning fitted into the authentic learning framework. The contexts of the kitchen and the garden promoted transformative learning. They connected the lifeworlds of the children to schoolwork, integrating the formal and informal curriculum, and acted to encourage individual motivation, social interaction, social connectedness and collaboration. As identified in Chapters 8 and 9, although the context (and hence the learning outcomes) of the two units had some differences, *the core components of authentic learning* applied to both.

Chapter 10 considers the PLT's planning for the Pantry Plunder nutritional unit using the e5 Instructional Model and addresses the question that directs this layer of the research:

Does the e5 Instructional Model support the pedagogy, planning and practices, required for implementation of student-centred, authentic learning?

The pedagogy, planning and practices of the teachers' work is discussed, as well as how these informed, and created the space and conditions for student-centred authentic learning to take place. The effectiveness of the professional learning team in creating a collaborative environment and whether this translated into effective teacher planning and classroom practices was evaluated; together with the role of the e5 PLT in promoting the discursive reflexive processes. This section concludes with a new model based on Nonaka and Toyama's SECI model, which explains knowledge construction informed by the e5 Instructional Model used by the teachers to scaffold learning and facilitate metacognition.

The discursive platforms critical for transforming tacit knowledge into authentic learning are given prominence. These discursive platforms or *arenas* rely on the teachers' deliberate planning to engineer the conditions enabling the children's construction of knowledge. The e5 Instructional Model guided the teachers' planning, assisting in the

sequencing of learning tasks, the linking of the discursive arenas and setting up the conditions for children to practise reflective thinking.

When the student data was analysed key differences emerged between the teachers' approaches to planning the Grade 4 Kitchen Garden and the Pantry Plunder units. Activities in the garden could not always adhere to a carefully sequenced plan or strict timetable. The Grade 4 teachers used the kitchen garden as the stimulus or context for the children's learning. The tasks and activities were dictated by the seasons and the needs of the garden. These provided the weekly inspiration for the kitchen garden sessions, rather than VELS. The social aspects of the cooking and gardening contexts encouraged personal and interpersonal learning in a way many traditional classroom lessons did not. This does not mean the garden was just a *fun add on or extra activity* — many of the VELS outcomes were addressed. The VELS audit reassured teachers that the work in the kitchen and garden covered a lot of the VELS outcomes in an interdisciplinary, holistic, integrated way. This was a completely different approach to planning mathematics or literacy, where lessons were frequently planned to target specific curriculum outcomes or learning needs. Discipline-based learning in the kitchen and garden was loosely within the curriculum framework as defined by VELS; for example, learning based around measurement when cooking or creating a garden plan to scale were concrete examples of using mathematics (Appendix R: Grade 4 kitchen garden VELS audit Level 3 Curriculum). The VELS audit allowed the teachers to plan sessions in the kitchen garden with confidence that they were addressing the VELS and could justify the time spent gardening or cooking.

While the children tended to the garden they were free to make decisions and choices for themselves. Likewise, the cooking sessions that required children to make choices and decisions, were the sessions that they self-identified as being the most satisfying. Activities where children had choice also built ownership. Unstructured time in the garden allowed imaginative play and appeared most effective in establishing a connection to the garden and empathy towards its inhabitants. These were significant unintended consequences of the teachers' more relaxed approach to planning the kitchen garden sessions.

Different pedagogical approaches

As the children participating in the Grade 4 kitchen garden rotated through the gardening, cooking and theory sessions with various teachers, they were exposed to a variety of teaching styles and pedagogical frameworks. In the following year this group of students participated in the Pantry Plunder nutritional unit. The Grade 6 children had also been involved in the kitchen garden when they were in Grade 4, over eighteen months before. With the exception of participation in the Grade 4 focus group interviews, they were exposed to similar, but not identical, experiences in the program. Unlike Judy T, the Grade 6 teachers' expectations of what the Pantry Plunder nutritional unit would involve were not infused with understandings established through prior involvement in the kitchen garden. Different pedagogical approaches to teaching acted to compound these differences and are evident in the teachers' reflections on the children's work. Judy T highlighted the importance of engaging the children as well as giving them control and ownership of the cooking decisions:

And looking back, we probably had a different thing in mind to the Grade 6 teachers. They kept it simple as a lunch box idea, whereas we wanted to extend the kids' cooking ideas and make it more interesting for them. And preparing a lunchbox would not have made it as interesting for them. We let them choose what they liked as long as it was nutritious (teacher interview, 16 September 2010).

Judy had read the transcripts of the children's interviews completed the previous year and was aware of the children's suggestions for improving the cooking component of the Grade 4 Kitchen Garden Unit by increasing the variety of ingredients and cooking techniques.

Tom T reflected on the differences between the Grades 5 and 6 products in the invention test:

It is interesting that the Year 5s and the Year 6s [teachers] started from the same point; all the way through the unit, it was the same. In all the conversations we were saying things that made me think we were doing things exactly the same. Yet there is a big difference at the end; a big difference of what was asked of the children (Grade 6 teacher interview, 17 September 2010).

Although the PLT4 teachers planned together, the outcomes achieved in the invention test, as evidenced in the meals the children produced for judging, were very different (Chapter 9, Figures 9.1–9.4). The Grade 6 teachers were particularly concerned with

academic rigour, and deliberately introduced factors in the PLT4 planning to make the learning tasks in the Pantry Plunder Unit problematic. The elements of the “poorly defined problem”, such as narrowing down the list of ingredients, the limited budget and the necessity for the children to negotiate solutions within their groups, assisted in making the task one that required negotiation and discourse. “Students were required to define the tasks and sub-tasks that were needed to complete the activity” (Herrington & Oliver 2003). It also increased the level of complexity (Herrington & Oliver 2003; Lombardi 2007; McKenzie et al. 2002).

The PLT4 decided that to make buying the ingredients for the cooking day manageable, the number of ingredients would need to be limited. The Grade 5 teachers interpreted this as ingredients that would be commonly found in a home pantry. Provided the ingredients fitted into the healthy food pyramid and fell within the budget, the children were able to use them. The criterion of “limited list of ingredients” was approached in a significantly different way in the Grade 6 classes. Tom T explained:

To begin one of the sessions the groups got onto Coles online and started looking for foods and ingredients. First to make sure that it was available and then to check that it was at a cost that fitted in to the budget, and the idea of that was that each of the groups came up with some foods in different categories. We had 13 groups and they put up on the board what they would like to have. So there were 13 different types of grains. After that the kids got to vote, so we narrowed it down to 4 or 5 different types of grains. We did that with each of the different categories (Tom T, Grade 6 teacher interview, 17 September 2010).

Although this was a democratic approach, it advantaged the groups that were organised and worked collaboratively together. In one of the Grade 6 focus group interviews the children reflected on the teachers’ formation of the groups. Jay suggested: “I reckon they should have figured out who the experts were and mixed the groups up because there could have been some groups with no idea!” Student reflection and deeper thinking had identified that placing the children with little prior knowledge in a group together was problematic, and suggested perhaps they would have benefitted from being incorporated into other groups where their teammates could have assisted and modelled what was required. His concern for other students’ learning is another indication that a collaborative class community had formed.

Different experiences and expectations of the students also contributed to the different interpretations of what the task involved. The Grade 5 students believed that they had the

most challenging task, because their meals involved more ingredients and actual cooking. They rejected the Grade 6 interpretation of the task dismissively: “It was sandwiches, wasn’t it?” The Grade 6 students summed up the Grade 5 efforts as “all about cooking” and contrasted it by adding “and we had to do a lot more research”.

The different approaches in the Grade levels were not discussed beforehand in the PLT — they came about through fundamental pedagogical differences. In the PLT discussion covered the wisdom of ensuring that shopping for ingredients for the challenge was not too difficult. The Grade 6 teachers aimed to increase the complexity of the task as well as increase student discourse and negotiation by limiting the ingredients available for use in each food category. The Grade 5 teachers wished to facilitate the children’s choices and ownership of the task so, rather than limit the ingredients, they added the proviso that the ingredients should reasonably be expected to be found in a home pantry.

The authentic nature of the activity allowed multiple solutions, as the diversity of meals produced by the children demonstrated, satisfying Herrington and Oliver’s criterion “authentic activities allow competing solutions and diversity of outcome” (Herrington & Oliver, 2000). However, the similarities between the Grade 5 meals, and the similarities between the Grade 6 meals demonstrate that it was more than just different choices by the children’s collaborative groups. It highlighted once again that if a similar outcome is desired, the discussion and modelling on “what this will look like in our classes” needed to take place in the PLT meetings. As Tom T noted, he thought they were all doing the same thing. The individual teachers’ pedagogies on the nature of knowledge and learning, as well as their teaching practice and their understandings about the best way to structure the learning task for their group of students, all influenced the student outcomes (Pushkin 2001).

The children’s reflections

Educators have promoted reflection on cognitively challenging tasks as a way to enable connections to be made, assisting the consolidation of learning (Dewey 1916; Ewing 2010; Herrington & Oliver 2003; Lombardi 2007). To consolidate the learning that had occurred through the invention test task, teachers in the PLT4 had identified the need for the children to reflect on what they’d found difficult, what worked well and what they could have improved.

Tom T deliberated on the importance of asking the children to reflect on their learning:

When we use the inquiry process it is important to cover the “Evaluate” part of e5. It is essential that children look deeply at what they’ve done and the feedback from their teachers. At the end of that session you’ve got to have that sharing, you’ve got to find out what they now know compared to what they knew beforehand (teacher interview, 17 September 2010).

He looked at the reflections as illustrative evidence and a way of pinpointing the children’s growth in learning. The Grade 6 children’s reflections in the class blogs at the end of the unit and the Grade 5 reflections in their portfolios provided summative evidence of their learning. Reflective journals that document thinking and progress (such as the Grade 4 students kitchen garden journals) can be used as a formative assessment to track “skill development, understanding of key concepts and the ability to think critically” (Laur 2013, p. 239). Laur described how she believed the requirement to stop and think about their learning assisted students to process the information and was “a powerful way in which... to determine student growth and understanding” (2013 p. 239). They provided valuable information so the teacher could differentiate learning tasks, scaffold lessons, shape learning goals and evaluate thinking. The reflections could also be used as a summative assessment because they provided evidence of students’ understanding, enabling judgements to be made against learning standards.

Higher-order thinking

The teachers also questioned students to gauge children’s understanding — a form of formative assessment. Judy T described how the PLT explicitly crafted the questions: “We wrote down what our guiding questions would be, to make the children justify their choices as we went around to each group”. Previous professional development on PoLT influenced this deeper level of questioning,¹⁵ where one of the identified goals was to promote substantive discussion of ideas in the classroom (PoLT component 4.2). Requiring children to justify their choices was one example of scaffolding critical thinking. One of the children described how they used logic to convince the other members of the group to include a fruit-based dessert in their menu instead of more ingredients in the main meal:

¹⁵ Principles of Learning and Teaching.

We sort of convinced them by working out that the added ingredients in the main meal would make it over 10 dollars, but if we did a dessert it would be under (Grade 6 Focus group).

The Grade 6 teachers explicitly taught strategies to achieve a higher performance. They valued academic rigour highly and planned each task to maximise the learning within the task. This was also a PoLT focus, and relates to Component 4.5: The teacher uses strategies to develop investigating and problem solving skills. With the reflection task, the language was modelled and the learning task carefully scaffolded. The Grade 6 teachers suggested that the groups reflect on the category that the judges scored most highly and the category where they received the lowest marks (Appendix Q: Invention test). The children were asked to identify five or six factors that they believed contributed to their results and illustrate how important each of these factors were in a pie graph. Although decisions needed to be made to narrow down and then select the categories of behaviour or skills that helped or hindered the collaborative group work,¹⁶ the teachers dictated the procedure and the format of the reflection. According to PoLT Component 4.5, the teachers support students to develop representational tools and assist students to develop higher-order thinking skills such as interpretation, analysis and application. Savery and Duffey (1995) criticise this approach: “Rather than being a stimulus for problem solving and self-directed learning the problem serves merely as an example” (pp. 5-6). Some children used the reflection model as a “recipe”, as criticised by Savery and Duffey, while other children used the format for their reflections, and were able to personalise the reflection (“they reflected and identified specific problems”), and adapted the model to fit their experience (Tom T, interview 17 September 2010).

The importance of modelling alternatives and scaffolding learning is acknowledged in the Explain and Elaborate domains of the e5 model; teachers need to “explicitly teach relevant knowledge, concepts and skills” and they “progressively build the students’ ability to transfer and generalise their learning” (DEECD 2009b p. 21). While the teachers used the e5 Instructional Model to plan the nutritional unit, they also drew on their previous work with PoLT to inform their practice. Tom explained how they complement each other: “PoLT describes what the children do, e5 describes what the

¹⁶ Authentic learning characteristic: the ill-defined problem requiring choices and decisions.

teacher does” (teacher interview, 17 September 2010). Mark also identified that to teach effectively, the e5 model needed to be used in conjunction with PoLT:

e5... looks at what the teacher does, but it doesn't look at the effectiveness of what the teacher does in relationship to what the children get out of it... e5 helps plan out the process of explore, et cetera, but how are we going to judge if it is successful?... and PoLT says this is what it will look like if it is successful and this is what it will look like if it is not. So we need both. While you might stand there and deliver the most outstanding lesson, you need to have the end result in mind. If you don't have that in mind you don't know where you are leading the kids (Mark, AP, interview).

In conjunction with the e5 model, to get the academic rigour, PoLT and Bloom's Taxonomy were also used as overlays to focus on maximising the learning potential of each task, “making sure that we have got the depth in each task” (Tom T, Grade 6 interview, 17 September 2010). Basic knowledge and processes were taken further, particularly with the Grade 6 teachers, where developing critical analysis skills in the children was a priority. Lyn T relayed how she had attempted to explain higher-order thinking to her grade:

These are the skills you need to have... the collaboration, the communication... all the 21st century skills that you need to have. And then there are the habits of the mind... are we really asking you to strive for accuracy, or we are asking you to apply past knowledge? And there is Bloom's, so why am I concentrating so heavily on content... You should be challenging me! The lowest level of thinking is just facts... so you see their minds ticking over and then we go to Bloom's and show them that it is what you do with those facts. So the hardest thing that you can do is take what you have learned and create something new out of it (Lyn T, Grade 6 interview, 22 October 2010).

Although ultimately it was not a problem in this situation that there were differences in student outcomes, it does highlight how the teacher's pedagogy and philosophies inculcate their approaches and practices. The varying interpretations of the tasks and understanding of the best way to implement them resulted in different priorities and outcomes for the students. The differences emphasise how it is often what is not discussed, the things taken for granted — the philosophies, pedagogies and practices of the teachers — that need to be made explicit if particular student outcomes are desired. Articulating their tacit knowledge, making it explicit to both themselves and others, is a significant challenge teachers have in sharing their practice (DE&T 2003).

Scaffolding of tasks

In 2009 the recently introduced e5 Instructional Model was the focus of a professional development day for the whole school (DEECD 2009b). Each PLT was asked to develop

a new unit of work for their grades using the model. The development of the Pantry Plunder Unit as the focus of the PLT4 e5 inquiry meant that the teachers had the rare opportunity plan cooperatively across Grade 5 and 6 levels. Every second week the time normally allocated to a staff meeting was designated for the PLT e5 Instructional Model inquiry. Generally, teachers planned individually or during the one hour per week allocated for planning in their year level.

As described in Chapter 7, the teachers' careful structuring of tasks, using a combination of the e5 Instructional Model and Bloom's Taxonomy enabled the children to create a variety of solutions to the complex multi-step problem of producing a nutritionally balanced meal for a set budget. The teachers found the e5 Instructional Model was useful in planning the sequence of tasks, to make sure that one task built on the previous. Lyn explained "e5 helps you tease it out into more manageable steps" (Lyn T, interview). Maximising the academic learning around health and nutrition required scaffolding of the learning tasks. Teachers recognised the need to be prepared to adapt and modify challenging learning tasks to suit the children's individual needs. The joint planning meant that when a problem was identified, teachers would "discuss it and get ideas from each other" (Appendix U: Evaluation of the PLT4 e5 inquiry using the seven principles of highly effective professional learning). They had the benefit of colleagues' ideas and suggestions for modifying the task or their teaching practice. Normally, this would not take place unless a teacher specifically requested advice from a colleague. The discursive reflections examining personal practice within the PLT made this advice easier to seek by providing the collaborative platform where the teachers had both the opportunity and a common focus. The teachers trusted one another, confident that what they were saying would not be taken out of context.

The e5 domains were regarded as sequential for the purpose of planning and scaffolding the learning tasks. However, in practice, all the teachers identified that they needed to weave in and out of the different e5 domains within each task, depending on the individual needs of the children and whether they required prompts around exploring, explaining or elaborating. In hindsight, this was probably partly due to a video viewed as part of a professional development introduction to the e5 Instructional Model, where Alan Luke explained the value of weaving in and out of the domains in response to student needs.

Mark, the Assistant Principal, explained how he saw the e5 Model being put into practice:

It is one thing to talk about evaluation at the end of the unit, but that is only one of the times that evaluation occurs. You will also be doing evaluation throughout the lesson. If you realise that the kids aren't getting this or that they already at this point and I need to reevaluate, you have to have an end result in mind. Not just for the lesson or the week's work, but you're going to need to be able to jump to and say, "Well I am now going to jump to lesson two or three in relation to my engagement or explore because these kids already have this background". So that evaluation process is going to be dropping in all the time. So to see it as an instructional model in relation to start with engage and finish with evaluation is not realistic.

Lyn T pointed out the importance of translating the e5 Instructional Model into a form relevant to the children's learning:

It is our responsibility as a teacher to go from the theory and put it into the classroom in ways children can understand and then build on these understandings (teacher interview, 22 October 2010).

Level 1 profile statement in the Explore domain of the e5 Instructional Model states:

"The teacher selects resources relevant to the inquiry and presents examples of information in an organised format" (DEECD 2009b). This is particularly relevant to the PLT planning. The tasks and the information organisers (Appendix K to P) the children used were the same; however, the final products children presented for evaluation differed. This was not intentional. One of the main reasons for the difference in the final products was that the teachers in the PLT4 had not discussed what they expected the final product to look like. This occurred several times: with the invention test, with the best breakfast and in the presentation of the final reflections, which indicates how important it is for teachers to collectively identify the parameters of the final product or outcome of the lesson.

In planning sessions, teachers had identified and discussed the learning intention: that they wanted the children to produce a healthy meal, and to reflect on their strengths and weaknesses when working in their teams to create the meal. There was obviously planning and collaboration between the Grade 5 teachers on the implementation of these aims. The Grade 5 healthy meal presentations for the invention test were impossible to separate in terms of the children's different classes. Likewise, the team teaching and collaboration between the Grade 6 teachers produced similar results across their two

grades, but the differences in the final products between Grade 5 and 6 were notable (Chapter 6).

For the best breakfast task the Grade 5 children drew their product, whereas the Grade 6 children constructed a model. Ruby T explained that she would have liked the Grade 5 children to construct a mock-up of their product, but they hadn't thought of it. Likewise, with the reflection task, there was obviously a difference in the way the task was put into practice in the teachers' classrooms (Chapter 7). Mark, AP, pointed out that "you need to be clear about where you are leading the children". This is pertinent to the differences in the final products the Grade 5 and 6 children produced. If the PLT had taken the discussion a step further and specified, "This is what we expect a high quality product/performance will look like",¹⁷ there would not have been the unintentional differences. The differences were due to the different approaches taken by the Grade 5 and 6 teachers to the learning content. Teaching practice and the implementation of the curriculum on a day-to-day basis was discussed in more detail between the teachers of the same grade levels. They also had adjoining classrooms so they could model to one another and on occasion team-teach. While some teachers expressed surprise at the differences, others came to the conclusion that there were different priorities. It is significant that it wasn't until the end of the unit of work that the teachers realised how different the final products produced by Grade 5 and Grade 6 looked.

Differences in student outcomes

The contexts and the curriculum content of the Grade 4 Kitchen Garden Unit and the Grade 5 and 6 Pantry Plunder Unit overlapped, because they both aimed to inform about nutrition and the production of healthy meals. The broad similarities are demonstrated by the themes that emerged through analysis of the children's learning in Parts 5 and 6. Themes on relationships, life skills as well as health and nutrition were common to both units. The theme incorporating elements of nature, environment and ecoliteracy, not unexpectedly, only emerged in the Grade 4 Kitchen Garden Unit, because the Pantry Plunder Unit did not have a strong outdoor learning component.

¹⁷ PoLT component.

Both of the units of work had the six key characteristics of authentic learning (Table 5.4 and Table 6.5). As suggested by Newmann & Wehlage, (1993) some learning contexts are more *authentic* than others, and often have different emphasis, depending on the context of the learning and the weighting individual teachers give to them in their teaching practices (see student-centred authentic learning models Appendices X and Y). The Grade 4 students *owned* their learning in the kitchen garden, and this continued to be a high priority for this cohort in Grade 5. In contrast, HOTS were a stronger characteristic of the Grade 6 group, reflecting the priority placed on academic rigour by their teachers.

The PLT4 e5 Instructional Model inquiry

The e5 inquiry served as a focus for the PLT at several different levels. Bringing teachers together with a common goal and context prepared the conditions for the establishment of a collaborative learning community. The shared experiences and common goal established the platform to participate in discussions where the “teacher conversations” could contribute to knowledge and understanding. Mark, reflecting on the e5 inquiry summed it up: “[the] whole point behind it was... that we had a common focus... that we had common language”. The professional development inquiry on developing a unit of work using the model helped with constructing the shared language, the language specific to the e5 Instructional Model. The planning day also helped establish the conditions for a supportive community of practice where teachers were willing to share ideas and problems.

The teachers appreciated the extended time to plan purposely and collaboratively together. The multiple experiences and different ways of approaching the tasks were valued by the teachers: “It was good seeing different ways of doing things.” For example, when Ruby T (the Grade 5 teacher) was introduced to the idea of creating the assessment rubric for the breakfast cereal task *with* the children instead of *for* the children, she immediately incorporated it into her teaching practice. In her discussion in the PLT planning meeting Ruby identified that looking more deeply at the purpose of evaluation changed her teaching practice. She could see co-creating the criteria rubric was so much richer for the children. The discussion around the criteria produced a greater understanding of what the task required (Chapter 7).

Opportunities to engage in reflective discourse and debrief about their experiences assisted the teachers in the PLT to make their own connections and understandings about how the e5 Instructional Model could find a place in their classroom and improve their own practice. It was the supportive, collaborative nature of the teachers' planning, the sharing of different ways of doing things, ways to increase academic rigour or support struggling students that were highlighted by the teachers as being particularly valuable (Chapter 7).

The current emphasis in education on evidence-based student outcomes was given pre-eminence in the PLTs. Teachers were asked to bring examples of student work as evidence of student outcomes and achievement. The discussions in the professional learning teams were useful and beneficial, because the ideas, experience and practices of a group of teachers developed strong directions and sequences of learning. The teachers valued planning together in the PLT4 mainly for the opportunities it presented for reflective discourse and the development of a supportive collaborative professional learning team.

The e5 Instructional Model was useful for planning the Pantry Plunder nutritional unit. As the PLT identified, it gave participants a common language to use and assisted in the structuring of tasks in a logical way, assisting to build depth of knowledge. It was not only the task, but also the journey the children took to get to the outcome that was important. Planning can ameliorate some of the personal differences in regard to structuring and implementing the curriculum. However, the different ways teachers put the collaboratively planned tasks into practice in their own classrooms demonstrated that it is often what is *not* discussed when teachers talk to one another — their underlying understandings, values and pedagogies, and the assumptions they make — that will introduce unintended differences and affect student outcomes.

Differences in the student outcomes between the Grade 5 children and the Grade 6 children were reflected on by several of the teachers, but it was not a specific focus of the PLT inquiry (Chapter 8). As Tom T reflected, “in all the conversations we were saying things that made me think we were doing things exactly the same. Yet there is a big difference at the end, of what was asked of the children”. It is noteworthy that even with collaborative planning, the differences in the way the teachers interpreted the tasks and

structured them in the classroom produced vastly different outcomes (Appendix T: Contrast of Grade 5 & 6 teaching approaches). This was illustrated by the reflective task, where the children were to identify the skills that assisted or hindered their team in completion of the “invention test”. Grade 5 treated the reflection as a celebration of learning and as a summative evaluation. The decision making on how to present their learning was left up to the individual, signifying the importance of ownership of learning. In contrast, it was approached as a highly structured learning task in the two Grade 6 classes.

Although all the core components of authentic learning are present in both student-centred learning models (Appendices X & Y), the role of the teacher in shaping the learning cannot be ignored. The implication is that teachers must be clear about what is important. Unless the expectations of what the final product will look like and the specific learning that the teachers want to come out of the task is discussed in depth, there will be unintended differences in the learning outcomes.

Teachers need to go deeper and explore alternative approaches and different ways of getting the task done. The way something is done or introduced and the process of getting from A to B, affects the learning outcomes that occur. It is not just a successful achievement of the learning task, but also the processes, skills and discourse that has led up to the completion of the task. Teachers’ understandings about pedagogy and the way children learn underlie and inform their teaching practice. Opportunities for reflective discourse and collaborative planning can only improve teaching practice and broaden perspectives about what is achievable. Discussion about learning outcomes, and the evidence that will demonstrate achievement of the outcomes, also needs to be explicit.

Lyn questioned, “What are the messages that we as teachers are giving about our priorities?” (teacher interview, 22 October 2010). The different priorities will colour and direct the authentic learning tasks, resulting in diverse student outcomes. There will always be differences in the pedagogy and practices of the teachers. However, as Pushkin counsels, there is the need for teachers to examine these differences:

[E]ducators are urged to be transformative intellectuals whose teaching should be a reflective metacognitive practice. But in order to become a transformative intellectual, an educator needs to come to terms with his or her own beliefs about education, the profession of education (teaching), and the nature of knowledge (Pushkin 2001).

Lyn alluded to these differences in her question on priorities; a perceptive question that would have been good to examine further in the PLT. This was a missed opportunity. Why were the student outcomes so different? Were these differences undesirable, and what were the underlying pedagogies or practices that caused the unintended differences? Which was the “best” way of implementing the tasks? Donald Schon (1983) believes that teachers should make the time to reflect on the curriculum decisions that influenced the outcomes, and whether there were more effective options. The PLT identified the differences, but did not have the really crucial, reflexive discourse to examine why these differences occurred and evaluate the effectiveness of alternative versions.

Authentic learning is not as simple as ensuring that the learning of every task or opportunity is as academically rigorous as possible — the approach the Grade 6 teachers took. It is likely that the Grade 4 children’s unstructured time in the kitchen garden allowed them the freedom to play and develop relationships with one another and connect to nature in a way not possible in a highly structured teaching sequence. Also of value was the primacy the Grade 5 teachers gave to engagement and choice as it engendered ownership. What can be concluded from these examples is the need for teachers to understand and question their underlying pedagogies. They should be able to say “this is the way I will structure the learning experience because...” and make their tacit understanding of the processes they set up to lead to the desired learning outcomes for the students explicit.

The goal of discourse is to critically evaluate alternative interpretations, arguments, ideas and points of view to arrive at a common understanding (Mezirow 1997). Given that the PLT planning meetings for the nutritional unit were built up by shared reflective discourse and experiences, providing the “basis for one to interpret information to create meanings”, it would have been useful to examine the differences in teacher approaches and underlying pedagogy (Vygotsky 1986). This was the crucial missing step in the PLT4 e5 Instructional Model inquiry. The teachers did not sit down at the end of the unit with all the different student outcomes, with all the student evidence, interrogate the differences and evaluate the effectiveness of the PLT inquiry.

Converting tacit understanding to explicit knowledge

One of the reasons for the differences in the student outcomes suggested by Tom's comment "in all the conversations we were saying things that made me think we were doing things exactly the same" is that the teacher's tacit knowledge was not made explicit.

Jerome Bruner's reminder that there is more to being a physicist than merely learning about physics, and Polanyi's (1967) often-quoted phrase that "we can know more than we can tell", acknowledge the importance of tacit knowledge. Nonaka's (1991) SECI knowledge creation model draws on a constructivist epistemology, and was designed to explain and enable the utilisation of the embedded knowledge within business organisations. It has been used in the educational sector to help explain knowledge creation in online virtual learning communities and blended learning models (Battistoni et al. undated; Yeh et al. 2011). The SECI model could also be used in mainstream educational settings and may help to explicate knowledge formed in social contexts.

The SECI process explains by sharing contexts and experiences, individuals develop tacit knowledge. The *individuals* may have different mental models and perspectives, but the shared context, or "ba", forms a base from which to accumulate tacit knowledge, to relate, and develop empathy. "Ba" is defined as "a shared context in motion, in which knowledge is shared, created, and utilized" (Nonaka 1991; Nonaka & Konno 1998; Nonaka & Toyama 2003). In the school context, instead of the term "ba", the terms discursive platform, or arena, are used.

Nonaka's knowledge creation theory explains how the tension caused by the complexity and contradictions between the various understandings people have developed, through their personal frames of reference and experiences can provide the conditions for the creation of new knowledge (Nonaka & Toyama 2003). Teachers' tacit knowledge needs to be interrogated as part of the dialectic process. Discourse and reflection on the differences is an essential step in synthesising new knowledge in the externalisation phase. Figure 10.1 interprets the SECI model and modifies the four phases to reflect the characteristics of how these are experienced within the school (Nonaka 1991; Nonaka & Toyama 2003; Von Krogh et al. 2000). Immersion in the planning and teaching of the nutritional unit and the PLT4 inquiry created a collaborative community of learning, and the conditions for a discursive platform where these phases could be accomplished.

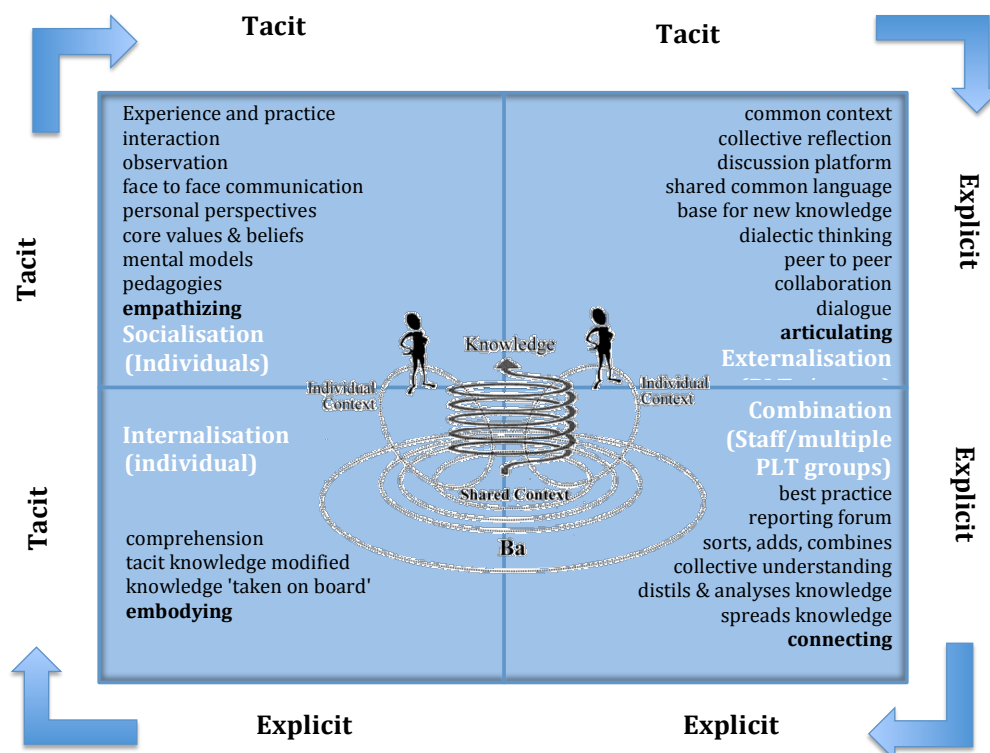


Figure 10.1: SECI Process: Knowledge creation in the school (adapted from Von Krogh et al. 2000)

In the SECI knowledge creation model there are four interacting phases (Nonaka 1991; Nonaka & Toyama 2003; Von Krogh et al. 2000):

1. *Tacit to tacit* — learning by doing, establishing a common context, experience, experimenting or observing — the *socialisation* phase;
2. *Tacit to explicit* — the discourse, understanding created by shared context, articulating the tacit and making it explicit — the *externalisation* phase;
3. *Explicit to explicit* — the sorting, adding and refining of the understandings, analysing and distilling the best practice, the stage where knowledge is clarified and published — the *combination* phase; and
4. *Explicit to tacit* — the individual taking on board the explicit knowledge in the combination phase and incorporating it into their own schema, thus augmenting their tacit knowledge — the *internalisation* phase.

The phases are conceived as a broadening spiral of knowledge where the phases are repeated at ascending levels.

The SECI knowledge creation model (Von Krogh et al. 2000), acknowledges that contextualised, individual experiential learning is a key component in the socialisation phase where individuals develop their tacit knowledge. It goes beyond Kolb's (1984) experiential learning model by changing the focus from individual learning to collective community knowledge in the externalisation and combination phases. The model helps explain the importance of a shared context where the social construction of knowledge can occur, as was evidenced in the research.

This model should also be applied to the children's knowledge construction. While the role of the teacher is to facilitate rich, experiential learning in a common context to generate *purposeful learning* experiences, children must ultimately connect and build on their tacit knowledge.

As discussed in Chapter 8, it is essential to utilise a context relevant to a child's *lifeworld* to stimulate learning. With careful planning and construction of learning arenas teachers can introduce learning tasks to enrich children's learning, deliberately introducing cognitive challenges to extend learning. This planning for cognitive challenge was a feature of the PLT e5 inquiry in the development of the Pantry Plunder Unit. One of the main aims of the PLT was to foster the children's ability to critically reflect on their learning. According to Mezirow (1997):

Education that fosters critically reflective thought, imaginative problem posing, and discourse is learner centered, participatory, and interactive, and it involves group deliberation and problem solving (p. 10).

The provision of collaborative, shared arenas in which to build reflective understandings are essential *stages in knowledge construction* (I deliberately use the term "stage" as both an arena and part of a sequence). Empathy built up through the *socialisation* phase assists in the decoding of shared experiences, and in making the tacit explicit (see Figure 10.1). In the externalisation phase the teacher's main role is to create a safe platform for children to share experiences and engage in reflective discourse. The various nuances and personal perspectives of the individuals should add to and enrich the group understandings in the *externalisation* phase. Discourse and dialectic thinking, where the

individuals build on one another's ideas, should assist with producing a shared language as well as have the potential for construction of new knowledge. For example, in the Pantry Plunder Unit individual children reflected on their own learning using the language and understanding developed by the group. Several children demonstrated that they had *internalised* this new explicit knowledge and would use this way of sorting and prioritising success criteria for collaborative group work again. If the collective group knowledge, refined and disseminated in the combination phase, is internalised by individuals, it may become incorporated into the individual's frames of reference that make up their lifeworld (Mezirow 1997).

Utilising Nonaki's four-stage SECI model that explains knowledge creation in organisations, a new five-stage model Figure 10.2 was developed to explain the knowledge construction stages in a school situation and how teachers can use the e5 Instructional Model to plan for these five stages. The processes embedded in the e5 model: Engage, Explore, Explain, Elaborate and Evaluate are where teachers plan the strategies they will use to advance their students from one arena to the next. They set up and facilitate the conditions conducive for reflective thinking.

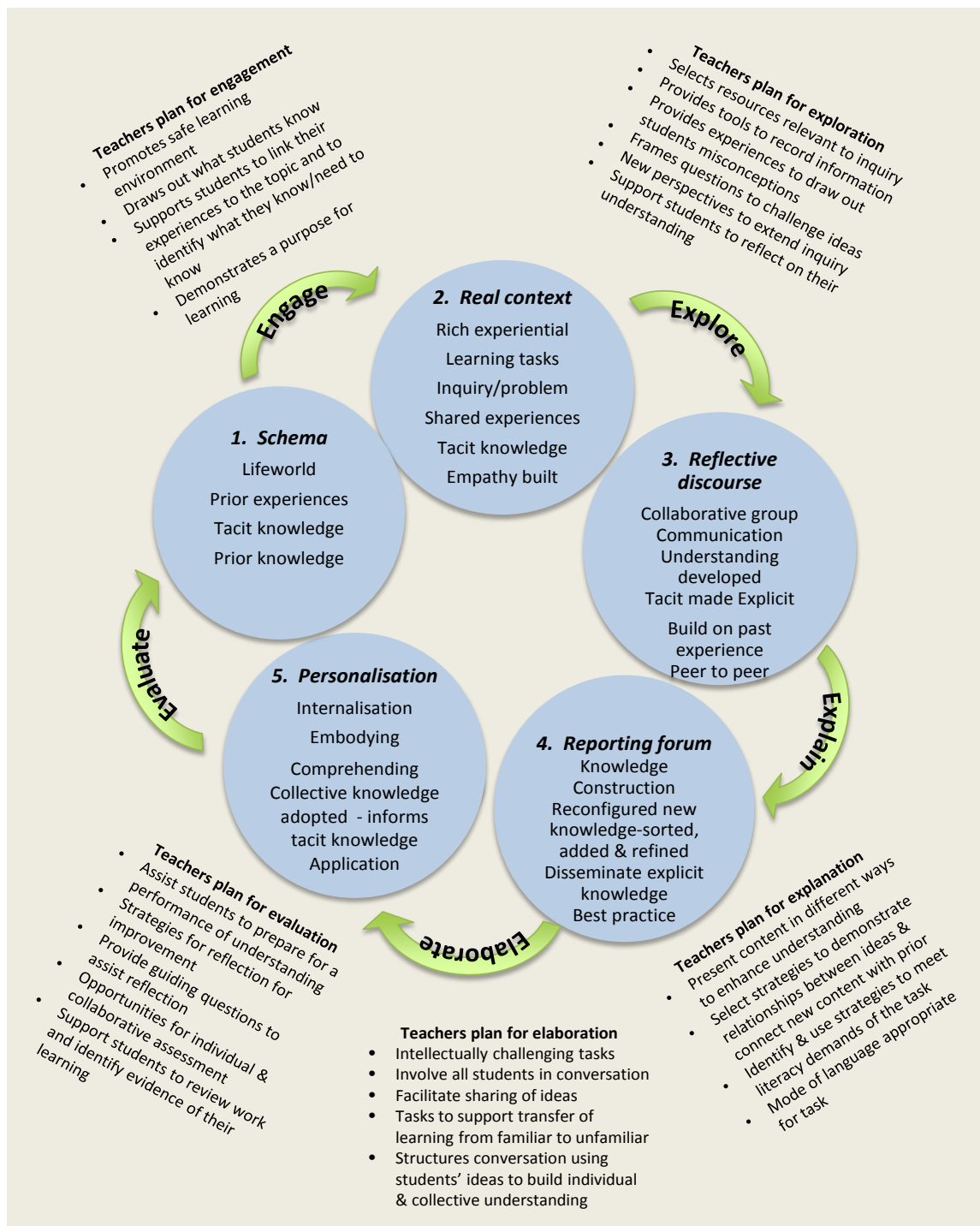


Figure 10.2: Planning — facilitating children's metacognition

Planning — facilitating children's metacognition

1. **Schema** refers to the lifeworld and prior knowledge, which form part of an individuals' schema; it is what individuals bring with them to their school learning experience; it is a combination of tacit and explicit knowledge (emphasis on the individual). In the **engage** phase the teacher needs to create the experiential learning tasks to connect the prior understandings (the child's schema, arena 1) to the context for the learning (real-world context, arena 2). The aims are to connect to lifeworld experiences so that children can see the relevance of the learning to themselves. The Grades 5 and 6 teachers aimed to take advantage of the students' interest in food preparation established through the Grade 4 Kitchen Garden Unit. They set the students the Pantry Plunder challenge of providing a healthy and nutritiously balanced lunch for four people for under \$10. The inquiry into providing a healthy nutritional meal engaged the children. It connected their prior learning from their lifeworld and previous experience in the Grade 4 Kitchen Garden Unit with the Grade 5 and 6 academic learning on health and nutrition.

2. **Real context** assists in connection to prior experiences or lifeworld and also creates shared context where similar shared experiences enable empathy and understanding. Although individuals have different schemas, the experiential learning helps build a common base from which to establish meaning (emphasis on individuals within a group establishing connections through shared experiences, arena 2). The teacher sets up the tasks requiring children to **explore** and build on past experiences. These shared experiences draw on tacit knowledge, and build tacit knowledge. They also provide a common base for the collaborative groups to build communication and relationships, assisting in transforming the tacit knowledge of the individual to explicit group knowledge (reflective discourse, arena 3). Building shared experience; engagement and ownership of learning are the authentic learning criteria most relevant to this arena.

3. **Reflective discourse** and communication in a supportive collaborative group allows individuals in a similar context to build on one another's understandings. This facilitates the transformation of tacit knowledge to explicit, shared understandings. This is the arena where tacit understandings may be made explicit and new knowledge constructed (emphasis on individuals communicating and participating in the construction of group knowledge). By introducing the inquiry or poorly defined problem the teacher requires the children to **explain** their understandings. Children need to use

higher-order thinking strategies to sort, prioritise and refine their knowledge (the reporting forum, arena 4). Authentic learning criteria: collaborative groups, working as a professional and HOTS, including clarification, synthesis and justification, are particularly relevant in this arena.

4. Reporting forum for the collaborative groups where the knowledge from each group is refined sorted and synthesised into a common understanding. Best practice or explicit knowledge may be disseminated (emphasis on collaborative groups coming together as a larger forum to refine understandings and come to a consensus of new knowledge or best practice). The explicit understandings developed in this reporting forum need to be understood and internalised so that they can be applied to other situations —**elaborate**. It is where the explicit group understandings are “taken on board”. This was demonstrated when the children could answer the judges’ nutritional questions (see Chapter 6).

5. Personalisation, where the best practice/explicit knowledge can be internalised and taken on board. Understandings inform frames of reference in the personal schema, continuing the knowledge cycle. The teachers created the task requiring children to self-**evaluate**, and to reflect on their learning and the collaborative skills or steps that assisted in the completion of the Pantry Plunder inquiry. This enabled the teachers’ evaluation of the children’s learning. However, it also consolidated the learning and assisted in connecting the learning to the schema of the child. The experiences are internalised and are incorporated into the lifeworld. Children who had reported changes in their eating habits and those who could identify herbs more than eighteen months after completing the Kitchen Garden Unit demonstrated this. In this case the model can be conceived as a spiral of knowledge construction because the knowledge created is personalised and informs the individuals’ schema, ready for another ascending revolution of knowledge construction.

Focus groups

Focus group interviews were one of the main data sources used to find out what the children in the kitchen- and garden-based programs had learned. By generating reflective discourse, the focus group interviews assisted the tacit understandings to become explicit. The discursive nature of the focus groups assisted in the provision of a reflective,

collaborative, safe, shared arena. They generated richer personal reflections on learning when compared with personal reflections in the garden journals, reinforcing how knowledge is socially constructed. The children's frames of reference, experiential learning experiences and reflective discourse all contributed to the synthesis of explicit group knowledge. The efficacy of using focus group or small group interviews as a tool to encourage the conversion of tacit knowledge to explicit knowledge construction in an educational setting, needs to be explored and could be the basis of further research.

The teachers' work

The role of the teacher in planning authentic learning needs to be highlighted as well as how reflective discourse can inform this process. Teaching is complex; it requires the teacher to set up the authentic learning experiences in a real context to maximise children's purposeful learning. It involves the teachers structuring learning experiences to build knowledge and understanding, while also building in choice and decision-making. Conditions demanding HOTS and reflective discourse in safe arenas are necessary steps to assist refinement of knowledge. Conditions that promote collaboration and ownership of learning require skilled facilitation by the teacher. Judy T reflected, "...one of the hardest things to recognise is how well you are using different pedagogies... there is more than content in a lesson, there are a lot of other skills" (Teacher interview 16th September 2010). Teachers not only plan the authentic learning tasks in a relevant context, but must also plan the processes and strategies they will use in their teaching practice to facilitate the learning arenas. The hermeneutic approach develops socially constructed collective understanding. One of the teachers' most important roles is to facilitate a *safe* learning arena where children feel comfortable with sharing different views (Ewing 2010). This assists the conversion of the child's tacit knowledge to explicit and enables explicit group knowledge to inform the individuals' tacit knowledge and schema.

Teachers also need this safe learning arena. They should have conversations about how they envisage the end product or the performance of understanding. Not because it is essential to all be exactly the same, but to generate the important discussions on priorities and reveal their often hidden beliefs about what is important and what they want the children to achieve. Teachers need to make their tacit beliefs about their pedagogies

explicit to avoid unintentional differences and develop a deeper understanding of their own curriculum practices, enabling informed decisions about best practice.

Synthesising planning

Setting the parameters for the inquiry is an essential first step in teachers' planning. Their planning must ensure that the inquiry has a real world context as well as having the potential to address prescribed curriculum content knowledge, skills and processes. When the learning context is connected to children's lifeworld and interests, the learning is relevant—it promotes engagement and utilises prior knowledge.

Effective teachers plan sequences and build the children's learning — each task contributing to the success of the next. Examination of the inputs/outputs model Figure 7.2 and the *Tasks planning: Pantry Plunder* document Table 7.1 (Chapter 7) show the use of the e5 Instructional Model was a successful tool for sequencing the tasks within the Pantry Plunder unit. The steps or tasks within the inquiry connect the curriculum outcomes with the real world inquiry. The e5 domains of engage, explore, explain, elaborate and evaluate direct the teachers' planning and the goals of the associated learning arena.

Teachers planned the health and nutritional inquiry to include collaborative group work. This is a deliberate strategy to encourage discussion and negotiation. Collaborative groups need to incorporate group members with a range of skills and different views requiring consideration. It is more than just sharing out the work. The discussion, the justification and the processes and strategies used to come to group decisions contribute to the efficacy of the group and the ability of the group to work together on the inquiry to create new knowledge and understandings.

Discursive reflection within a group that has engaged in similar experiences aids the social construction of new knowledge. It reinforces the significance of the learning to the members of the group, confirming that it is worthwhile (McDowell 1995; Kruger et al. 2001). Dewey, Bruner, Freire and Schon to name a few eminent thinkers, have emphasised the essential nature of reflection for achieving true, or authentic learning, and this research confirms its relevance. The emphasis on reflective discourse within the

collaborative groups enabled children to develop analytical, higher-order thinking skills leading to the construction of their group knowledge.

By setting up discursive arenas, the teacher assists the transformation from individual tacit understandings to explicit collective understanding. Explicit new knowledge is refined into best practice when the groups reconvene to refine and synthesis the group understandings. When the individual incorporates the new knowledge into their schema one revolution of the cycle is complete. Providing safe discursive arenas where children can reflect on their learning assists with connecting and extending their mental schema to incorporate the new understandings. This is a fundamental step in the learning process, enabling the tacit understandings developed through emersion in concrete experiences to become explicit. It enables the explicit, best practice understandings developed by the collaborative group to be incorporated into the child's schema. Discursive reflection within a socially supportive group is the key that enables the flow.

An authentic learning knowledge construction model (Figure 10.3) brings together the key the elements required to maximise learning in the kitchen and garden. This model is holistic and recognises the co-construction and building of knowledge. The student-centred authentic learning model from Chapter 9 is overlaid on the garden, symbolising the essential nature of learning in context (Chapter 8). The context is encircled by the core characteristics of authentic learning. Authentic learning is achieved when curriculum is purposely designed around the real world context; develops the skills and processes professionals would use in a similar inquiry; demands collaborative group work; requires higher order thinking skills and metacognitive investment to problem solve; and generates ownership of both the inquiry and the learning. Relevant integrated assessment also needs to be incorporated into the learning inquiry.

Central to the model are the five arenas of knowledge construction. These arenas of knowledge construction (blue circles) are planned and facilitated by the teachers, informed by the e5 Instructional Model (see Figure 10.2 and Appendix Z). The emergence of this new model evolved from the synthesis of the planning, practice and pedagogies of the teachers. The inter-related elements of teaching and learning cannot be isolated. Learning is shaped by the teachers' priorities (Hattie 2012). It is in their sense of interdependency that the learning and teaching is enriched for students and teachers alike.

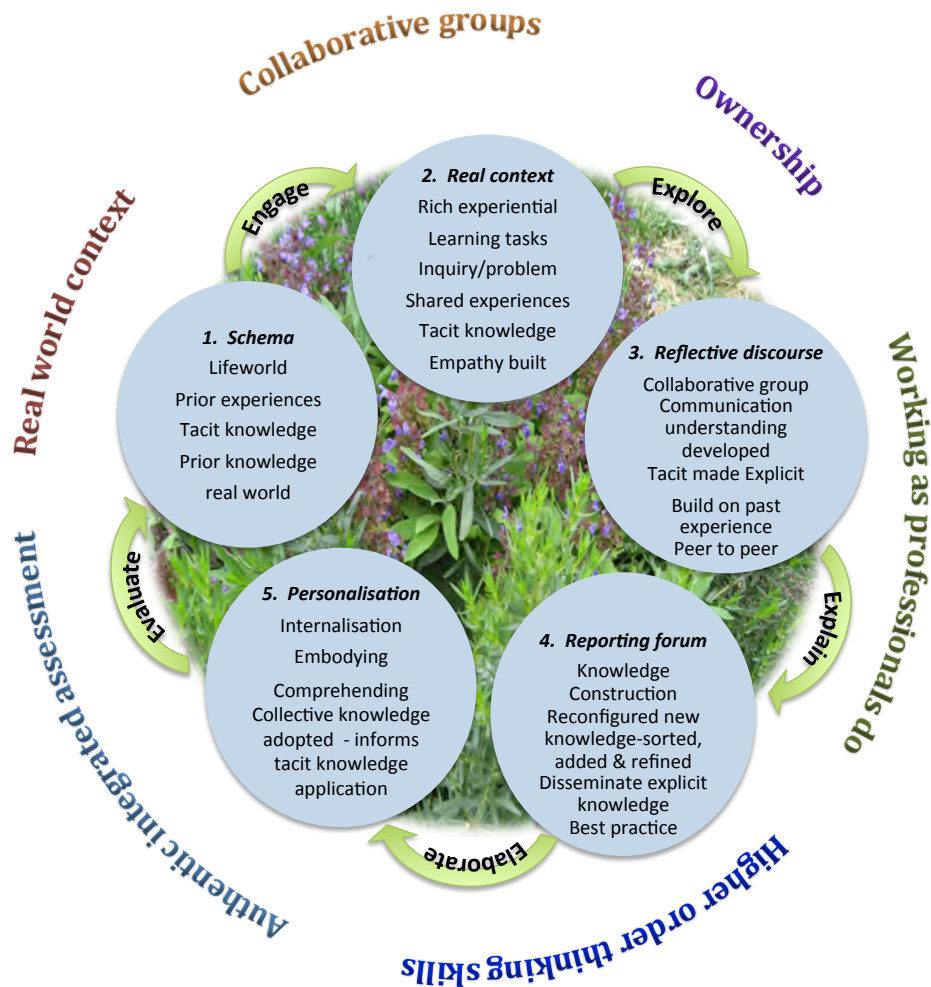


Figure 10.3: Authentic learning knowledge construction model

Planning was explored through two different levels of inquiry. There was the Pantry Plunder inquiry with the ill-defined problem setting the nutritional challenge for the Grades 5 and 6 children. Simultaneously there was the e5 instructional inquiry, the focus of the PLT, where the teachers jointly planned the children's inquiry. The teachers reflected on their use of the model and explored whether the structure embedded in the e5 model improved their teaching practice.

Synthesising practice

Use of the e5 Instructional Model as a focus for the professional learning inquiry was successful in generating a shared language and contributed to building a collaborative, community of learners for the PLT involved in this case study. By modelling the e5

terminology in their discussions about the learning tasks, the implementation of the tasks and reflections on what was working or not working in their classrooms the teachers came to a common understanding of the terminology used in the model. This terminology infiltrated the teachers' practice and appeared in their reflexive discourse. It informed teacher practice, "it made you stop and think about what you were doing as a teacher and whether the children were understanding the work (Lyn, Teacher interview, 22 October 2010). The e5 Instructional Model successfully laid the foundation for the unit of work. Each of the e5 domains: Engage, Explore, Explain, Elaborate and Evaluate, informed the teachers' planning and structured the learning by sequencing and scaffolding children's learning in a logical way that could be practiced in the classroom.

In the Pantry Plunder Unit, sophisticated teaching strategies were employed involving problems to be resolved, options to be evaluated and prioritised. Tasks required children to carry out research to establish a deep knowledge base; they required access to technology, real data and experts in the field. Teachers deliberately planned situations where decisions needed to be justified, demanding children use HOTS to articulate why they took the pathway they did. This encouraged children to take responsibility for their own learning and fostered ownership. These are skills required for success in the 21st century (Darling-Hammond & Richardson 2009). Distinctions between schoolwork and real-world learning are dissolved. Teachers become the facilitator of student inquiry and problem solving (Denzin & Lincoln 2011).

The authentic learning knowledge construction cycle is a model that brings together context, authentic learning characteristics and the five domains of the e5 Instructional Model. Each of the five learning arenas is a stage that teachers can incorporate into their practice to assist the transformation of knowledge. The authentic learning construction cycle has broader application beyond the kitchen- and garden-based learning. As an instructional model, it moves the students and teachers into transformative knowledge construction.

The PLT also went through the authentic learning knowledge construction cycle with their inquiry into the e5 Instructional Model, with the exception of the reporting forum. The PLT4 collective understandings were threaded together in this thesis; however, it would also have been valuable for the separate PLTs to combine and refine their

understandings into best practice. This highlights the lack of a platform for teachers to disseminate their knowledge of best practice. The PLT inquiry into the e5 Instructional Model has a forum within this thesis; however, there needs to be a formal reporting mechanism where teachers contribute to educational research.

Synthesising pedagogy

The contextualised space of the kitchen garden is the ideal place for teachers to engage children in authentic learning. It is a space where school-based learning is directly connected to the real world. Planning, practice and pedagogy intersect in complex ways enabling teachers to achieve more than just learning about plants or how to cook. Both the kitchen and garden provide effective learning contexts where experiential learning links the children's prior knowledge and the formal curricula. The interlinking contexts of the kitchen and the garden reverberate with familiar experiences from the children's *lifeworlds* and allow the child to make the connection between abstract theories and their experiences; learning becomes meaningful. Children's beliefs, knowledge, skills and concepts form frames of reference that influence what they notice about the world around them and how they understand it (Bransford et al. 2000). Teachers can take advantage of the frames of reference the children bring with them, and use them to build connections and extend knowledge.

The increase in number and popularity of school kitchen gardens demonstrates there is a demand for a learning space outside the constraints of the classroom. Spending time just being surrounded by nature promoted observations and wonderings to share with others. Children experience nature with all their senses in the garden. These repeated rich sensory experiences build up familiarity and knowledge, leading to greater understanding of the interconnected dynamic kitchen garden. This immersion is particularly important for today's urban children growing up surrounded by technology, cocooned from the natural world. Experiences where children are encouraged to play in and around nature assist with familiarising children with nature and instigate the incorporation of elements of nature into their games (Ginsburg 2007; Murdoch & Wilson 2008; Saracho 2011). Connecting children to nature is the first step towards ecoliteracy. Being in and surrounded by nature must be the first step in exploration of the natural world. It helps to establish connections to nature, and indeed reminds us that we are part of nature. This

research found that opportunities for play in the garden were important for children to develop empathy and connections to nature. It was not only being more knowledgeable about the science of how things grow. Developing empathy towards nature's creatures requires deeper engagement, shown when children rescued the worms or named the snails. The conditions for getting to know nature, to observe, become familiar and connect with nature had been met (Chawla 1998; Kellert 2002; Skelly & Bradley 2007).

In an outdoor learning environment such as a kitchen garden, the child can self-direct their learning and develop ownership of their learning. They have choices and decisions to make. Multiple visits and opportunities to work and play in the garden help children build up a complex understanding or schema about *their* garden. Children exhibited curiosity towards something new or different and made perceptive observations about changes. The repeated visits to the garden allowed the children to apply what they were learning to real tasks. The difference between the area of a rectangle and the perimeter is more meaningful when you are designing a garden bed, planting out a border or working out how much fertiliser to apply (Appendix V: Grade 4 kitchen garden plan). The children consolidated prior knowledge and extended their understandings. This assisted in making the new knowledge significant and relevant in the eyes of the child, and resulted in a more sophisticated and deeper *knowing*.

The students' self-exploration is key to building engagement, familiarity and connection to nature. The way a teacher balances their need to ensure the students attainment of curriculum goals alongside the students' self-directed learning experiences in the kitchen garden will have a bearing on the learning outcomes. When children are actively involved in experiential learning — individually sowing, planting and tending plants — they start to develop a caring attitude towards the plants. Not only do they learn about the basic requirements the plants need to grow, but importantly they also have put time and effort into nurturing the plants so they have a vested interest in their success.

Ownership of learning is shown when children take responsibility for their own learning. It is in evidence when they spend time on or initiate an inquiry into something they personally find interesting, rather than a teacher-directed learning experience. This occurred when the children conducted an experiment into the different strengths of the herb aromas in their playtime and when Grade 5 and 6 children experimented at home

with different flavour combinations. Agency involves the personal belief in oneself and the ability to have control over one's actions (Bandura 2006). The Grade 4 children were empowered to be active agents in their own learning when they requested to continue the Kitchen Garden Unit into Grade 5 and their suggestion was acted on.

Play-based, experiential and authentic learning are effective pedagogical approaches for kitchen- and garden-based learning. Together, these approaches provided the necessary experiences to link the children's schemas, build familiarity with the garden, and provide the real-world context for schoolwork. The Grade 4 children developed a greater understanding and appreciation of the interconnected natural world. Building knowledge and empathy towards other living creatures culminated in a narrative where children connected their actions and the health of the environment. Evidence for this is found in the children's stories of learning.

Other stories also emerged, such as those of more mature relationships with parents, where the increased knowledge about cooking and gardening changed the power balance; about collaboration, where exploring the different perspectives, skills and knowledge of group members built understanding and negotiation skills. There were stories about willingness to try different foods, and understanding the role food plays in our lives. The kitchen- and garden-based learning provided the context where the distinctions between school and real world learning were blurred.

Authentic learning incorporates: a real-world context and the opportunity for working as professionals, including the ability and means to research and develop a deep knowledge base; work that is cognitively challenging, requiring higher-order thinking, ownership of learning; a collaborative learning community and authentic integrated assessment. Kitchen- and garden-based learning has the potential for all the key characteristics of authentic learning. The Grade 5 and 6 nutritional unit added 21st century pedagogies to this mix. By deliberately adding a layer of inquiry into the contextualised learning, the teachers provided the opportunity to increase the higher-order thinking and academic rigour required from the children. They progressed the learning along the *authentic learning continuum* (Newmann & Wehlage 1993).

Opportunities for further research

This research has presented a case illustrating how the kitchen and the garden can be used to contextualise and transform learning in a primary school. The Authentic learning knowledge construction model was created through analysing the children and teachers' stories of learning through the two embedded case studies: the Grade 4 kitchen garden and the Grade 5 and 6 nutritional unit, Pantry Plunder. Emerging from this research are several questions that could be the basis for further investigation:

Does the Authentic learning knowledge construction model have an application beyond the kitchen and garden for student centred inquiries?

Is the Authentic learning knowledge construction model useful for directing other teacher professional learning teams' inquiries into planning, practice or pedagogy?

How can the learning that emerges from teacher PLT inquiries — the knowledge and synthesis of best practice, be distributed and/or feed into research?

How important were the focus group interviews for facilitating the “safe” discursive arenas required for the children's tacit understandings to be made explicit? If this is significant, what is the best way to utilise this in the classroom?

What is the best way ‘to measure’ authentic learning? Can student's authentic learning be standardised and placed on a scale?

Summary

The authentic learning knowledge construction spiral that the researcher presents in this Chapter explains how knowledge can be created in schools. Informed by social constructivist epistemology, the Authentic learning knowledge construction model highlights the importance of context to connect to prior understandings as well as build a common base to develop new understandings. It starts with the child's schema (or teachers), and in a full cycle returns when the new knowledge is personalised and taken

on board. Key authentic learning characteristics are incorporated to assist in developing the collaborative and higher-order thinking skills required in the 21st century workplace (Darling-Hammond & Richardson 2009). Reflective discourse plays an essential role in transforming the individual's tacit knowledge. This is applicable for both students and teachers. Tacit understandings built from experience or prior frames of reference, when discussed and elaborated, can be incorporated into socially constructed explicit group knowledge.

In an ideal situation, as knowledge builds and new knowledge is incorporated into the individual's schema, rather than a cycle as depicted in Figure 10.2, the model may be conceptualised as a spiral (Von Krogh et al. 2000). This was demonstrated when the children could recall and utilise knowledge generated through their herb inquiry and work in the kitchen garden more than a year later. The knowledge had become part of their mental schema and understanding about the world, meaning that the children could start their Pantry Plunder inquiry at a more informed level compared with children who had little exposure to gardening or cooking. This model relies on contextualised learning. Whether this model is a cycle or a spiral depends on the level of reflection, and whether the new socially constructed group knowledge is incorporated into the individual's schema. When this occurs the base level of understanding is raised for subsequent revolutions, creating a spiral of knowledge construction.

This new model applies to both teacher and student knowledge construction, and could be used to advance learning in professional learning team inquiries as well as student inquiries. The building of knowledge as a spiral can be conceptualised when the “best practice” group knowledge is taken on board and incorporated into an individual's schema. It then becomes part of the individual's tacit knowledge. For example, when teachers adopt new thinking and new techniques into their pedagogy, it builds their tacit knowledge and can be used in their teaching practice. It becomes part of their understanding about how children learn — often without explicit identification, as has been discussed. Each revolution of the spiral builds as the individual builds their knowledge. Teachers in the PLT4 valued the opportunity to synthesise the planning, practice and pedagogies relevant to contextualised learning in the kitchen and garden. The following section focuses on the findings that developed through this research.

Chapter 11: Authentic learning in the kitchen and garden: Synthesising planning, practice and pedagogy

Introduction

This research outlines the key components that need to be present to utilise kitchen gardens and create student-centred authentic learning experiences for primary school children. Teachers' work involves not just planning, sequencing and delivering curriculum. It is essential that teachers contextualise children's learning by providing experiential learning experiences relevant to the children's *lifeworlds* so that children become self-motivated and take ownership of their learning. The overarching objective of this research was to analyse the learning of primary school children that occurred through participation in the kitchen garden program and evaluate whether kitchen- and garden-based learning programs are worthwhile additions to the curriculum. The short answer to this is yes, kitchen – and garden-based learning programs are valuable additions to the school curriculum and more importantly can help make sense of and contextualise learning. The kitchen garden can start the process of familiarising children with a *little patch of nature*.

The value of learning in context has long been known, but is frequently pushed aside in the pressure to *cover* the work so students can perform well on standardised tests. The emphasis has changed from creating rich experiential learning experiences where students are central to their learning, to the actual evidence of learning. Although learning activities should be evaluated on how effective they are at supporting student learning, the student must remain the focus, must be central to the learning experiences, rather than the collection of evidence. When the collection of evidence or the comparative performance on a standardised test becomes paramount, shortcuts are taken and learning is decontextualised. Contextualised, meaningful authentic learning experiences in the kitchen and the garden put the focus back on student learning. They are a valuable addition to the school curriculum and depending on the schools', the teachers' and the

children's interests and priorities, experiential learning based around the kitchen garden can be moulded to assist the achievement of different objectives.

Synthesising planning, practice and pedagogy

This study contributes to our understanding of how kitchen gardens can be utilised by teachers to provide authentic student-centred curricula in primary schools to achieve educational objectives. Planning is the essential but often hidden pathway linking pedagogies, practice and outcomes on the learning journey.

Analysis of the literature (Chapter 2) identified key criteria regarded by researchers for authentic learning. This research has refined the core elements to six core criteria. To achieve *authentic learning* teachers should plan to include the following elements in the inquiry:

- Real world context;
- Collaborative group work;
- Ownership;
- Working as a professional;
- Higher-order thinking; and
- Integrated authentic assessment

To demonstrate their importance these essential elements form an interlocking ring around the real-world context, the kitchen garden in the Authentic learning knowledge construction model in Figure 10.3.

Student centred inquiry means that many choices are left to the student. The justification of decisions is an essential part of the learning process and also the key to commitment and ownership. Although the teacher cannot anticipate each individual learning path, they can offer direction towards milestones to be achieved along the way, and the objectives to be achieved. The e5 Instructional Model assisted the authentic learning journey by

directing the teachers' planning, and by mapping out the milestones. The five discursive arenas informed by the e5 instructional model, where the teachers planned discussion forums and deliberately introduced elements of the *ill-defined problem* into the inquiry, lead to the transformation of individual tacit knowledge into group understanding.

This research found that the e5 Instructional Model supports teachers' planning and facilitates children's attainment of educational standards using the kitchen garden. It has shown how one professional learning team planned effectively together using the e5 Instructional Model, contributing to one another's understandings by discursive reflection. It highlighted how teachers need to take this beyond collaborative planning and examine not only what they want to achieve but also examine any hidden messages about their values. As Hattie (2012) identified, learning is shaped by the teachers' priorities. Teachers need to decide on the "best practices" that will assist students to achieve the outcomes. Analysis of what was achieved as well as what was not effective, and any unintended learning outcomes, needs to be evaluated. In a similar way for the children to transform tacit understandings, deep analysis and discursive reflection in a supportive learning environment are the catalysts teachers require for transformation into reflective practitioners. These are the conversations that make the tacit explicit and promote best practice by transforming both pedagogical knowledge and teacher practice.

It is important that the accumulated wisdom and understandings of best practice are published. A requirement of schools to report understandings about best practice developed through their professional learning team inquiries will add to the evidence based research on effective practices that improve student outcomes, and build teacher professionalism. This reporting requirement would also segue teachers' research into academic forums (Cochran-Smith and Lytle, 1992; Darling-Hammond, 2006a).

School kitchen gardens provide a flexible, valuable resource that can be used to contextualise children's learning and connect children to the natural world. While a case study based on the experience at one primary school is limited, this case study contributes to the understanding of how kitchen gardens can be used in schools to support student learning, develop community connections, acquire useful life skills, and promote environmental awareness (Dyment & Reid 2005; Block et al. 2012; Brink & Yost 2004). Authentic learning, where children are enthusiastic, have ownership of their learning and

become flexible creative thinkers, should be the goal of education. Contextualising learning and connecting to the real world is a way of beginning this journey. Setting up collaborative inquiries where children engage in negotiation, decision-making and reflective discourse about their experiences and understandings facilitates the transformation of their tacit understandings to explicit learning.

All students involved in the kitchen garden and nutritional units of work gained knowledge and skills beyond the core curriculum and this learning was transformative for some children. The knowledge and understanding developed through involvement in the kitchen and garden wove new layers of connection into relationships. This research demonstrates that student inquiries centred in the kitchen and the garden can be academically rigorous, but also illustrates that teaching is not only about academic rigour. This research found that it is important to get the balance right and leave time for the enchantment of just *being* in nature. Learning about nature combined with unstructured time to relax, play and build up familiarity with nature, are all part of building connections resulting in a deeper appreciation of nature and our place in the natural world.

The time in the kitchen garden was time in the busy school day to develop friendships and relationships, the time to observe, connect, reflect and engage; important learning processes that can be skipped when the focus is on covering curriculum content. A new ingredient is added into the potent mix when you synthesise planning, practice and pedagogy in the kitchen garden: a certain kind of magic where relevance, enjoyment and education overlap. The kitchen garden can be the magical link that flexes and adapts to different needs and priorities of children and their teachers, contextualising and contributing to authentic learning.

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Appendices

Appendix A	Chapter 1	AusVELS-strands, domains and dimensions
Appendix B	Chapter 2	Authentic learning taxonomy
Appendix C	Chapter 3	Checklist for a case study report
Appendix D	Chapter 3	Interview guide for semi-structured student focus group interviews
Appendix E	Chapter 3	Interview guide for teacher interviews
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Appendix G	Chapter 5	Newspaper article on healthy eating
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Appendix I	Chapter 5	Parent notes (Grade 4)
Appendix J	Chapter 5	Authentic learning framework: the focus group interviews
Appendix K	Chapter 6	Mind map of nutritional knowledge Grade 5
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Appendix M	Chapter 6	Task 4 Grade 5 Food pyramid
Appendix N	Chapter 6	Personal lifestyle profile
Appendix O	Chapter 6	Best breakfast cereal analysis
Appendix P	Chapter 6	Best breakfast cereal ranking
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Appendix X	Chapter 9	Student-centred authentic learning model — Grade 5
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Appendix Z	Chapter 10	Evolution of the learning knowledge construction model

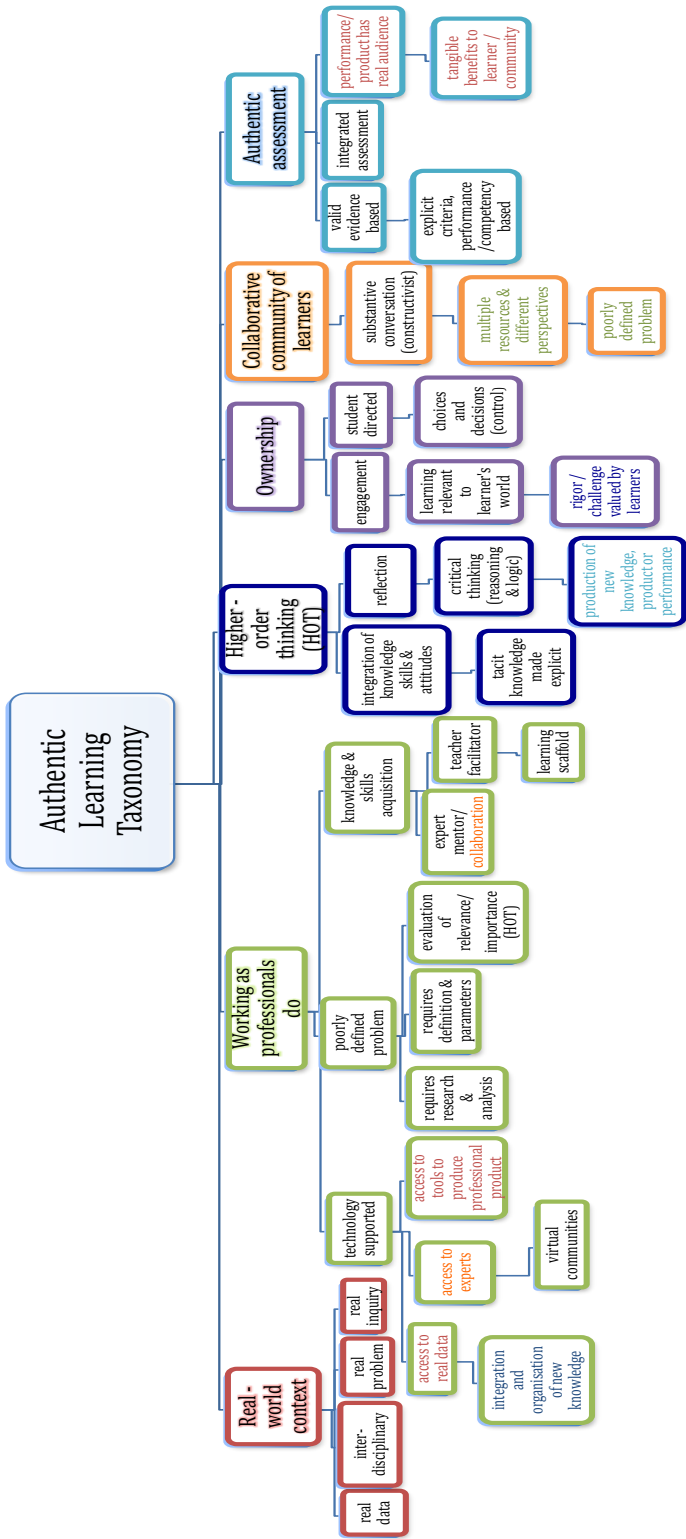
Appendix A: AusVELS-strands, domains and dimensions

PHYSICAL, PERSONAL & SOCIAL LEARNING	DISCIPLINE-BASED LEARNING	INTERDISCIPLINARY LEARNING
Civics and Citizenship Civic knowledge and understanding Community engagement	The Arts Creating and making Exploring and responding	Communication Listening, viewing and responding Presenting
Health and Physical Education Movement & physical activity Health knowledge & promotion	English ^{AC} Reading and viewing ^{AC} Writing ^{AC} Speaking and listening ^{AC}	Design, Creativity and Technology Investigating and designing Producing Analysing and evaluating
Interpersonal Development Building social relationships Working in teams	The Humanities Humanities knowledge and understanding Humanities skills	Information and Communications Technology ICT for visual thinking ICT for creating ICT for communicating
Personal Learning The individual learner Managing personal learning	The Humanities – Economics Economic knowledge and understanding Economic reasoning and interpretation	Thinking Processes Reasoning, processing & inquiry Creativity Reflection, evaluation and metacognition
	The Humanities – Geography Geographic knowledge and understanding Geographical skills	
	The Humanities – History ^{AC} Historical Knowledge and Understanding ^{AC} Historical Skills ^{AC}	
	Languages Communicating in a language other than English Intercultural knowledge and language awareness	
	Mathematics ^{AC} Number and Algebra ^{AC} Measurement and Geometry ^{AC} Statistics and Probability ^{AC}	
	Science ^{AC} Science Understanding ^{AC} Science as a Human Endeavour ^{AC} Science Inquiry Skills ^{AC}	

The domains and their dimensions are listed above. The domains that are drawn from the Australian Curriculum are marked by the symbol ^{AC}.

(source: <http://ausvels.vcaa.vic.edu.au/Overview/Strands-Domains-and-Dimensions>)

Appendix B: Authentic learning taxonomy



Colours indicate specific authentic learning characteristic. Where colours cross over, there is a significant overlap of characteristic (developed from Literature review. Chapter 2).

Appendix C: Checklist for a case study report

Checklist for a case study report

1. Is this report easy to read?
2. Does it fit together, each sentence contributing to the whole?
3. Does this report have a conceptual structure (i.e., themes or issues)?
4. Are its issues developed in a serious and scholarly way?
5. Is the case adequately defined?
6. Is there a sense of story to the presentation?
7. Is the reader provided with some vicarious experience?
8. Have quotations been used effectively?
9. Are headings, figures, artifacts, appendices and indexes effectively used?
10. Was it edited well, then again with a last minute polish?
11. Has the writer made sound assertions, neither over- or under-interpreting?
12. Has adequate attention been paid to various contexts?
13. Were sufficient raw data presented?
14. Were data sources well chosen and in sufficient number?
15. Do observations and interpretations appear to have been triangulated?
16. Is the role and point of view of the researcher nicely apparent?
17. Is the nature of the intended audience apparent?
18. Is empathy shown for all sides?
19. Are personal intentions examined?
20. Does it appear that individuals were put at risk?

Adapted from Stake, R.E. 1995, The art of case study research: 131.

Appendix D: Interview guide for semi-structured student focus group interviews

Grade 4 Kitchen Garden or the Grade 5 and 6 Pantry Plunder Unit

*Note questions are a guide

How would you describe the Kitchen Garden/Pantry Plunder project to a person from another school?

What sort of things did you learn in the Kitchen Garden/Pantry Plunder project?

What was the best thing?

Did you find anything challenging?

Is the learning that takes place in the kitchen garden different to “normal” classroom-based learning? How?

What is something you didn’t like about the Kitchen Garden Project?

Is there something else you would like to include in the Kitchen Garden Project?

Do you think this is a worthwhile project? (Why or why not?)

Has it changed the way you do anything, or your attitudes?

Has this project taught you anything about the environment/yourself? (What?)

Did you have any problems you needed to sort out? (How did you approach this?)

Is there anything else you would like to say about the Kitchen Garden/Pantry Plunder Unit?

Appendix E: Interview guide for teacher interviews

Grade 4 teachers: Kitchen Garden

Do you think the kitchen garden has been a worthwhile project?

What have been its strengths and weaknesses?

Did you find that you were able to address VELS outcomes by doing the kitchen garden work?

Do you think the children have shown any development in their learning through the kitchen project?

Can you give me any specific examples?

Did the Kitchen Garden Project engage all of the children?

Have you any examples of the kitchen garden stimulating wonderings?

What were the benefits or problems associated with using parent helpers with the cooking and gardening sessions?

What sort of reflections did the children have around the kitchen garden?

Were there any personal or interpersonal reflections?

The interview might then go on to discuss various examples from the children's focus group interviews.

*Note questions are a guide

Interview guide for teacher interviews (professional learning team 4)

PLT4 e5 Instructional Model inquiry; the Grade 5 & 6 Pantry Plunder Unit.

How does the e5 Instructional Model influence your planning in the PLT?

When you come to assessment, do you refer back to the VELs?

Do you find that inquiries such as Pantry Plunder cater for all of the children and the different levels they are at?

Does the learning qualify for the term “authentic”?

What do you think the children learned from doing the unit of work?

How were the criteria for judging the “invention test” decided?

Did you have any collaborative groups that had problems resolving conflicts? If so, how was this resolved or managed?

How do you approach the reflection task in your classroom?

What pedagogies informed your planning of the unit?

What were the key benefits of participating in the PLT e5 inquiry?

What were the drawbacks or challenges?

Has the e5 inquiry resulted in any changes to your teaching practice?

Has the e5 inquiry resulted in any changes to the way you (personally) plan?

*Note questions are a guide

Interview guide for assistant principal — professional development focus

Why is e5 being promoted over other models/pedagogies?

How do you see the e5 Instructional Model fitting in with PoLT, the school's previous professional development priority?

How do you think the e5 model will affect teaching collaboration?

Do you expect the e5 model will affect teaching practices? How?

Do you think e5 will help with becoming a more reflective teacher?

What is going to happen with the evidence that is collected from the PLT e5 inquiries?

How will you judge whether the PLT e5 inquiries have been successful?

*Note questions are a guide

Appendix F: Respectful protocols for group discussions

In order to have an open discussion, it is important to establish an atmosphere of trust and mutual respect in the classroom this will be essential for the Focus group interviews. One way to help create a “safe” environment, where all children are confident that they will not be put down, is to have students develop “rules for discussion”.

In order to create the rules for discussion, the teacher might first ask students if they want their classroom to be an environment where students feel free to express themselves and learn through discussion with the other. The teacher can suggest that there be a common understanding of the protocol for listening and speaking. The teacher can then ask the students to volunteer some principles for classroom discussion that they think all should follow. They could write every idea on a large piece of paper for all to see or, alternatively, small groups could brainstorm their ideas and then share with the class.

After the students have brainstormed for a short while, the teacher might then look to see if there are any principles that could be combined, and invite discussion or comment. The teacher might propose some principles if they do not come up naturally, such as the following:

- Listen to the person who is speaking.
- Only one person speaks at a time.
- Raise your hand to be recognised if you want to say something.
- No interruption when someone is speaking.
- When you disagree with someone, make sure that you make a difference between criticising someone’s idea and criticising the person.
- No laughing when a person is saying something (unless they are making a joke).

- Encourage everyone to participate

Students then agree by consensus that they intend to abide by this list. They are then responsible for applying the rules of this list to themselves and to other members of the class. If serious violations of the list occur, the teacher could negotiate with the students what the consequences of rule breaking should be.

This list should be written on a piece of paper and hung permanently in the classroom for the rest of the year, to be referred to as necessary. The “living document” may be added to or altered over the course of the year.

These rules for discussion will be used for the focus group interviews. If the classroom teacher has not already put in place similar rules, the researcher will do so before any interviews take place.

This protocol was adapted from a school document (author unknown).

Appendix G: Newspaper article on healthy eating

February 17, 2008

HEAL

HEALTHWISE

Is a sweet tooth born or made? **Paula Goodyer**

You might need to train your taste buds to like onions or vodka, but when your tongue tastes sweetness for the first time, it's love at first lick. While we might have to learn to like most flavours in food, sweetness is never a problem — we're all born with a liking for it, says Sydney neuroscientist Dr Amanda Sainsbury-Salis. The guess is that it's one of those survival mechanisms that guided our ancestors to the right kind of food, she says, explaining that sweetness was a clue that a food was ripe, was safe (bitter could mean toxic) and that it contained sugar that could be converted to glucose — important food for the brain.

But what determines whether a natural liking for sweet flavours develops into something more — a full blown sweet tooth — could depend on what you eat in childhood. Research in children suggests that the more we're exposed to sweet flavours, the more likely we are to prefer them, says Sainsbury-Salis, a senior research fellow with the Eating Disorders Research Group at Sydney's Garvan Institute for Medical Research. Eating a wide variety of foods with different flavours will make a penchant for sweetness less likely. It's an argument that backs up the advice to keep exposing children to a broad range of foods, and not giving up on offering certain foods — such as leafy greens — just because they're rejected once or twice.

This same approach helps if you're all grown-up and trying to tame a sweet tooth. "Expose yourself to a wide variety of good, minimally processed foods — and don't eat too much of any one food," is her advice.

"But if you're also trying to lose weight, be aware that restricting foods can often backfire and trigger off cravings for sweet foods," she points out. Some people are genetically programmed to resist weight loss better than others — and, for them, limiting the amount of food they eat can switch on what she calls the "craving chemicals" — brain chemicals such as neuropeptide Y, orexins and melanin.

"What's fascinating about these chemicals is that the more you eat sweet foods, the more of these chemicals you produce — and the more you crave sweet foods," she says. This may explain why some people who restrict

food end up bingeing on big helpings of sweet foods: it's nature's plan to make you eat more kilojoules and put back any weight you've lost.

"But if you're hungry and have a sweet craving, the best strategy is to satisfy the hunger first by eating a real meal with vegetables, lean meat or fish and complex carbs, for instance, then have the creme caramel afterwards — this will help prevent you from snacking on more and more sweet things."



PICTURE: DOMINIO POSTIGLIONE



FACT OF LIFE All the bacteria living inside you would fill a 1.9-litre jug.

Source: Scientific American sciam.com/article.cfm?id=strange-but-true-humans-carry-more-bacterial-cells-than-human-ones

Are you a sweet tooth? Discuss with your parents the diet you had as a baby and young child. What can you do to satisfy your cravings for sweet foods? Make a list of healthier choices to satisfy your cravings for sweet foods to eat. Can you train your taste buds to like a health food you currently dislike?

Appendix H: Annelid's Café menu

Annelida Café Menu

Entrée (to start with)

Shredded paper lightly tossed with a richly flavored soil and dressed with a delicate sprinkle of fresh water

Main courses

Morsels of soggy cardboard served with a side salad of vegetable peelings and celery tops

Rissoles of aged cow manure (sheep when available)

Casserole of assorted autumn leaves gently composted or shredded

Risotto of vegetable scraps

Dessert

Medley of seasonal fruit delicately sprinkled with crushed eggshells

All served with complimentary tealeaves, T-bag or coffee grinds

Off the menu

Bread and meat (they attract unwanted customers)

Citrus, onions, garlic and spices, as they give our patrons indigestion

All meals served in a beautifully humid setting with romantic filtered lighting

Appendix I: Parent notes (Grade 4)

Fantastic!
 eats more veges and
 has a greater appreciation of cooking
 and what it takes to make a healthy,
 tasty meal. Thank you!

I think this has been a fantastic program
 It has been amazing to see the children
 develop their interest in food and see them
 try foods they would normally not eat.
 and I have both cooked recipes from the
 program. Thank you to the teachers for
 organizing this each week.

loves kitchen garden. It's great
 to see her eating new things.
 I love the recipes too!!
 We have had quite a few meals
 at home after making them in
 kitchen garden!

I have noticed that [] is more willing to try
 foods at home. I think it is great for her to see
 her peers sitting down eating the same foods as herself.
 [] has cooked the apple & cinnamon muffins at
 home and the whole family enjoyed them. It's a great
 program for the children to learn many life skills.

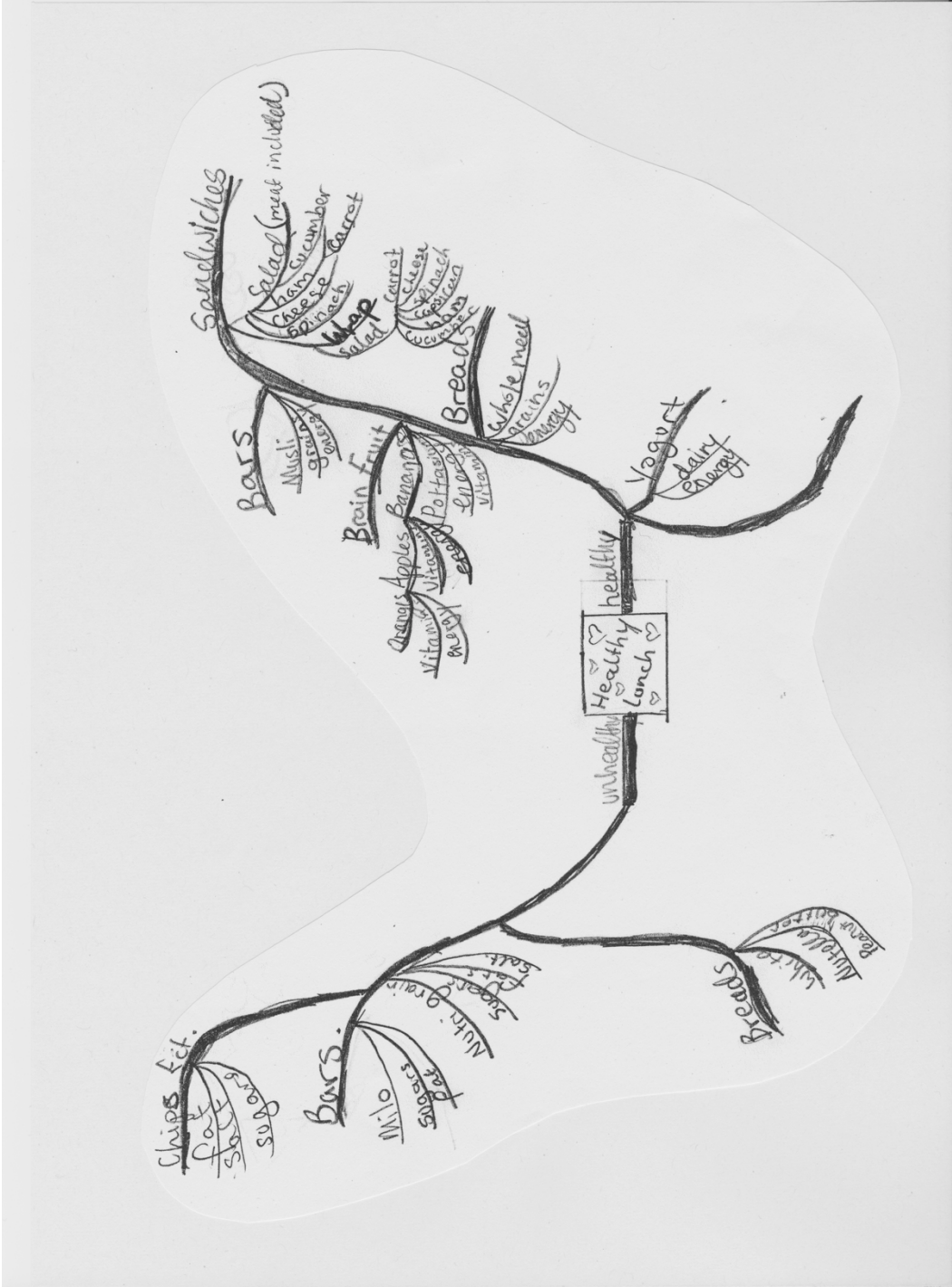
[] has really been enjoying the kitchen
 garden program - all 3 aspects. She has
 enjoyed cooking - tasting a variety of new
 recipes & has made several of the dishes at
 home.

*Children's names have been removed from the notes to de-identify them.

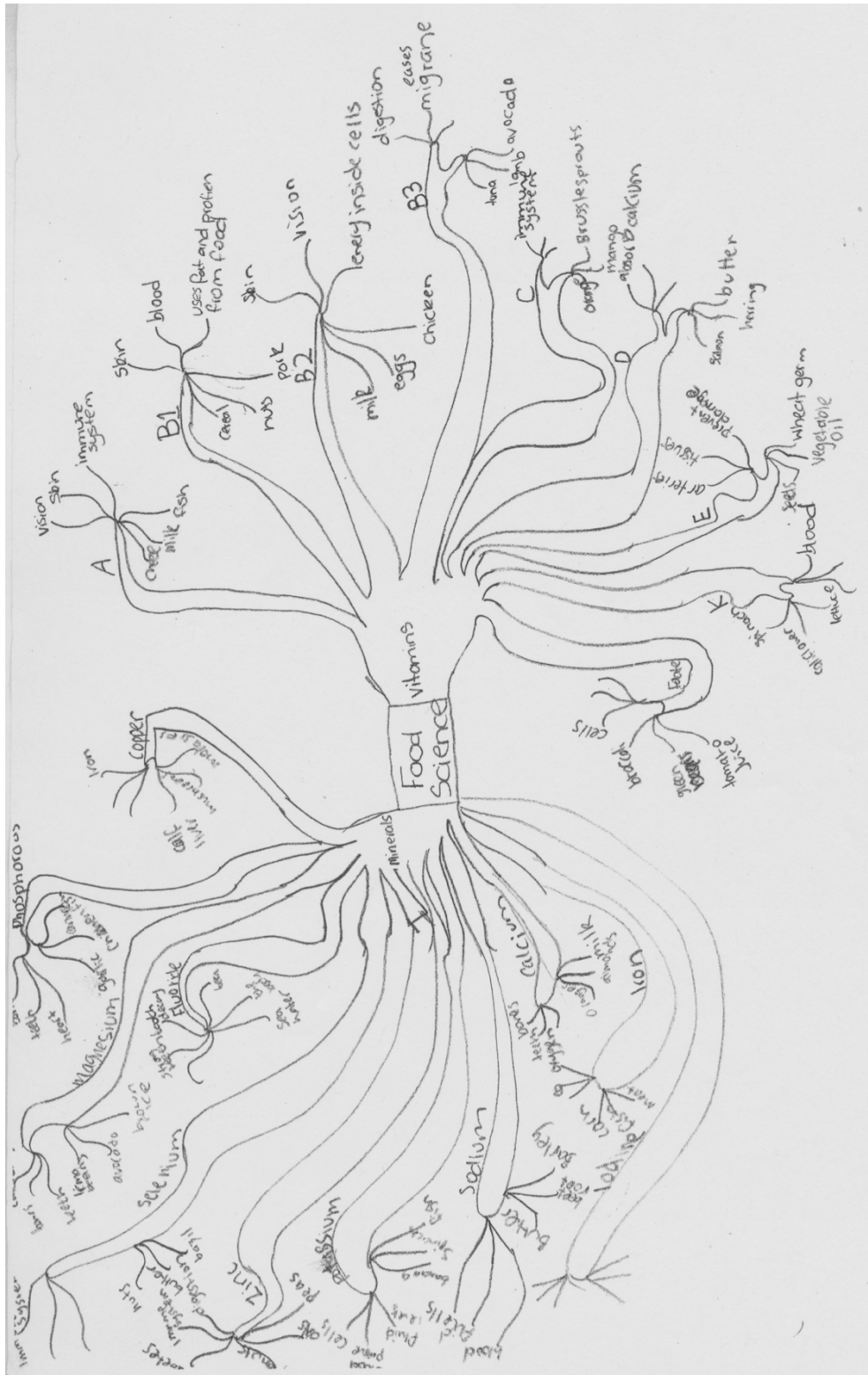
Appendix J: Authentic learning framework: the focus group interviews

Key characteristics of authentic learning	Explanation of task	The authentic learning characteristic demonstrated
Real context	All the students in the focus group interviews had volunteered to participate in the research on the kitchen garden and had signed a consent form that informed them about the aims of the research. The focus group interviews were a “real context”. The children’s views and perceptions about their experiences were data for research.	Real-world problem and real context: The research was on their experience of the Kitchen Garden Unit (the research was a real context) to help answer research questions. A real problem from the researcher’s point of view, but not specifically a real problem from the children’s perspective.
Working as professionals do — complexity, challenge & discourse	The focus groups started off with several prompt questions, but there was the freedom to go in different directions because the questions were based on what the children thought or had learned. Their reflections and the verbal connections they made were audio-recorded.	Poorly defined problem or open-ended inquiry / multiple resources, different perspectives: The focus group interviews had a lot of “leap-frogging” of ideas. There was substantive discussion with connections and clarifications made as the conversations progressed. The focus group interviews encouraged reflection on learning about gardening, cooking, environment and relationships. There was also the social “meaning making” that occurred through the interviews.
Collaborative group	The children’s ideas and personal experiences were the “multiple resources” demonstrating different perspectives. Photographs of the kitchen garden and prepared food, taken by the students throughout the year, were used to stimulate discussion in the focus group interviews. The focus group interviews were audio-recorded and later transcribed (technology).	Students need to articulate problem and/or their learning / knowledge and skills acquisition / collaborative community of learners: The discussions based on their experiences during the year of the Kitchen Garden Project where they agreed, elaborated or disagreed with one another was an example of a collaborative co-construction of understanding by the community of learners. They articulated what they had learned and how they perceived their experiences. HOT: The focus group interviews were also an integrated learning task where new relationships and connections were made. Tacit knowledge was made explicit.
Ownership	The focus group interviews generated data based on the children’s conversations and views.	Supported by technology — from the researchers’ point of view the interviews were audio-recorded and later transcribed into a Word document. The performance or product is directed to a real audience; it has value in the wider community and with the students. The <i>research product</i> may not have value with this particular group of students except from the point that it is their voices that will be heard and they appreciated their opinions were regarded as being important. The research is directed to a real audience that may value it and may have a deeper understanding about the type of learning that occur through similar Kitchen Garden Projects.
Higher-order thinking/ assessment <i>Assessment is integrated (For/As/Of Learning)</i>	The focus group interviews were an opportunity to discuss the learning that had occurred from the children’s perspective (formative and summative assessment). The interviews were a valuable learning tool; they were used to both evaluate learning and through the discussion. Many connections about learning and reflections about relationships were prompted. Without the interviews, these reflections may not have been made (assessment as learning).	

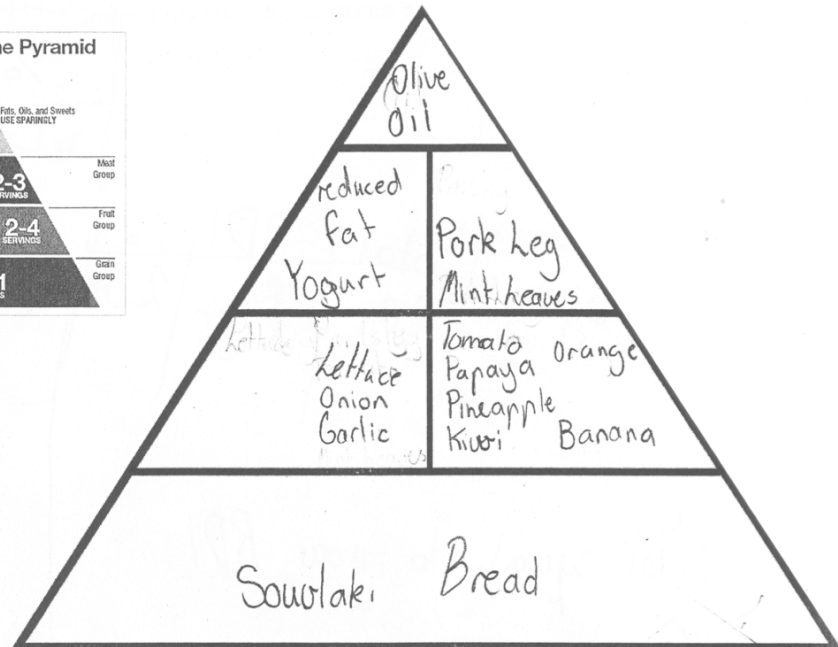
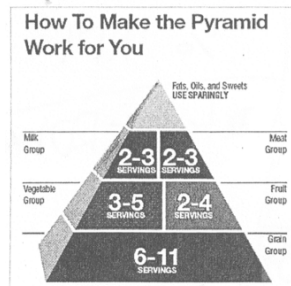
Appendix K: Mind map of nutritional knowledge



Appendix L: Mind map of nutritional knowledge



Appendix M: Task 4 Food pyramid



	1g, 248g, 1g, 191, 2g, 104g 108g, 745g, 327g, 12g, 316g	total	RDI	% RDI
Protein		18.03g	50g	36.06
Carbohydrate	6g, 817g, 10g, 1g, 24g, 2g, 3g, 10g, 7g, 250, 1g 090g, 330g, 063g, 4g, 306g 280g, 2g, 780g, 292g	65.04g	300g	21.68
Fibre	016g, 003g, 004g, 007g, 003g, 285g, 006, 000086, 00031, 00051, 0002, 00063	8.70g	25g	34.8
Sodium	4g, 276g, 039g, 013g, 1g, 004g, 024g, 336g, 092g, 6g, 064	311.606g	2.4g	12.98
Fats	3g, 542g, 030g, 17g, 1g, 2g, 6g, 4g, 1g, 221	11.811g	65g	18.26
Sugar		36.79g		

Vitamins / minerals...		Nutritional benefits...
E-111111	Riboflavin-11111	• Healthy Eyesight & Skin
B12-11	Zinc-111	• Helps growth and form of bones and teeth.
A-111111	Niacin-11111	• Helps DNA and cell formation
C-11111111	Magnesium-111111	• Produces of genetic materials and proteins.
Calcium-1111		
Iron-11111		
B6-11111111		
Phosphorus-11111		
Thiamin-111111		
Folate-111111		

Appendix N: Personal lifestyle profile

Breakfast

On most weekdays Jay has 2-3 slices of multigrain toast with peanut butter and margarine. He also has a drink with his breakfast, usually apple and mango juice but it sometimes varies between tropical and orange juice. On weekends he might have pancakes with no spreads.

Lunch

On most weekdays Jay's lunch includes a white bread sandwich with a variety of foods inside it including turkey breast, egg and lettuce, peanut butter, ham and cheese or chicken loaf. On weekends his lunch includes 3 toasted ham and cheese sandwiches. On Sundays after football he usually has hot chips and a drink of water.

Dinner

On weekdays Jay's dinner varies between roast with vegetables, lasagne, spaghetti or chicken and vegetables. On Friday night Jay's family usually invites friends over and has a barbeque including sausages, steaks, hamburgers and salad. On weekends Jay has nachos, tacos or homemade pizza.

Snack

On weekdays Jay's snacks include toast after school with peanut butter and margarine and a glass of milo. On weekends Jay usually snacks on chips, biscuits or makes himself a toasted sandwich with salami and cheese or ham and cheese.



Lifestyle Notes

Name: Jay

Age: 12

Height: 164 cm











Weight: 45.2

Jay is a grade six student. He plays Basketball on a Saturday and has one training session on a Monday for one hour. He plays football on a Sunday and has two training sessions on a Tuesday and Thursday for an hour and a half. Jay also accompanies his Mum on 5-8 km runs. Jay also walks his two dogs for around half an hour each night.

At school, Jay participated in cricket and just recently participated in a Cross Country fun run. He also participates in Football and Phys. Ed. He is happily involved in aerobic fitness and strategic games. On a day-to-day basis at recess and lunchtimes, he plays football. Jay was happy with his fun run results achieving the position of 4th.

Improvements: Although Jay has a very active lifestyle, he needs to make sure that he is getting enough vitamins and fibre in the form of fruit and vegetables and enough calcium for strong bones from dairy foods. He should also try to eat fish once a week and change the white bread sandwich to multigrain.

Appendix O: Best breakfast cereal analysis

Name of Cereal	Uncle Toby's Vita Brits	Uncle Toby's Traditional Oats	Kelloggs Sustain	Kelloggs Cornflakes	Sanitarium Weet-Bix	Kelloggs Sultana Bran	Kelloggs Special K	Kelloggs Mini wheats	Kelloggs Froot Loops	Kellogg's Nutri-grain
										
Energy	1510kj	1590kj	1570kj	1580kj	1490kj	1420kj	1570kj	1510kj	1640kj	1600kj
Protein	10.9g	12.8g	8.9g	7.8g	12.4g	9.5g	19.7g	11.3g	6.4g	21.9g
Carbohydrate	67.6g	56.7g	74.2g	83.6g	67g	63.6g	70.8g	68.1g	85.5g	69.4g
Dietary Fibre	11.9g	10.0g	6.4g	2.6g	11g	14.2g	2.5g	12.2g	2.4g	2.7g
Sugar	1.1g	1.0g	20.4g	7.9g	3.3g	22.7g	14.5g	8.8g	41.5g	32.0g
Total Fat	2.2g	8.8g	2.8g	0.2g	1.4g	1.7g	0.4g	1.6g	1.5g	0.6g
Total Vitamins and Minerals	762.09		498.62mg Folate 222	859.62mg Folate 333	498.62 Folate 222	1151.81 Folate 222	1384.92 Folate 333	736.18 Folate 125	497.22 Folate: 167	1070.13 Folate 167
List of Vitamins and Minerals	Sodium Potassium Zinc Folate Iron Magnesium B1 B2 niacin		Sodium potassium B1 B2 Niacin B6 C Iron Folate	Vitamins B1, B2 and C Sodium Potassium Folate Niacin Iron Zinc	Sodium Potassium Magnesium	Sodium potassium magnesium iron Niacin folate zinc B1 B2 B6	Sodium potassium B1 B2 Niacin B6 folate Calcium iron	Sodium Potassium Niacin B1 B2 Folate	Sodium potassium B1 B2 Niacin c folate Zinc Iron	Sodium potassium B1 B2 Niacin B6 C Calcium Folate iron

Appendix P: Best breakfast cereal ranking

Cereal Ranking

Top Three

Name of cereal	Reason
Sanitarium Weet-Bix	<ul style="list-style-type: none"> • High in fibre • Low in fat • Low in sugar • Low in sodium • High in carbohydrate
Kellogg's Mini-Weets	<ul style="list-style-type: none"> • A great source of fibre • Low in fats • High in energy • A little bit of sugar
Uncle Toby's Vita Brits	<ul style="list-style-type: none"> • Great source of fibre • Quite high in carbohydrate • Very low in sugar • Provides very little fat

Bottom Three

Name of cereal	Reason
Kellogg's Nutrigrain	<ul style="list-style-type: none"> • High in fat • High in sugar • Not much fibre • High in sodium
Kellogg's Cornflakes	<ul style="list-style-type: none"> • High in sugar • High in sodium • Not much fibre • High in fat
Kellogg's Coco Pops	<ul style="list-style-type: none"> • Very high in sugar • Quite high in sodium • Not much fibre • High in fat

Appendix Q: Invention test

Group Menu	Knowledge of nutrition Budget * note all groups under budget	Flavour combination Taste/smell	Presentation Texture & colour Preparation technique	Tablecloth design Name of dish	Customer service Eye contact Confidence Ability to converse	Total Score /25
1. Focaccia Frenzy	Vitamins Fibre, No-fat (5) (4)	(4) (4)	(3) (4)	(4) (4)	(4) (4)	20, 20
2. Awesome Pita Pockets	Low fat Protein (5) (4) (3)	(5) (4) (3)	(4) (4) (3)	(4) (4) (4)	(4) (4) (3)	16 22, 20
3. Funky Chicken Wrap	Good ingredients Variety (3) (5) (3) (4)	(4) (4) (3)(4)	(4) (4) (3) (4)	Nice symmetry (5) (5) (5) (5)	(4) (4)(2) (4)	16, 21 20 22
4. Funky Chicken Roll	Low fat Lots of veg. (4) (3)	(3) (3)	(2) (3)	(4) (5)	(4) (5)	17, 18
5. Juicy Chicken Salad Roll	Good nutrition Low fat, carbs, dairy, fructose High fibre (5) (5) (4)	(4) (5) (5)	(5) (4) (4)	(5) (5) (5)	(5) (4) (4)	22 24, 23
6. Delizioso Petto di Pollo Rotolo	Fibre Vitamins (4) (4) (3) (5)	(3) (4) (4)(3)	(3) (4) (4) (4)	Italian Flag incorrect! (4) (4) (5) (4)	(3) (4)(5) (4)	21, 20 17, 20
7. Evellopez La santé	Fibre Vitamins (4) (3) (4)	(3) (4) (3)	(4) (4) (3)	(4) (5) (3)	(5) (4) (4)	17 20, 20
8. Juicy Ham wrap with salad	Good knowledge of vitamins and Fibre (5) (5) (4)	(4) (3) (3)	(4) (3) (3)	(4) (3) (3)	(3) (2) (4)	17 20, 16
9. Trendy Tortillas with sweet & Sour salad	Protein intake (4) (4) (4)	(4) (4) (3)	(4) (4) (3)	(5) (5) (4)	(5) (4) (4)	18 22, 21
10. Chicken Wrap fingers	Fibre, low fat Calcium (5) (4)	(4) (4)	(5) (3)	(5) (5)	(5) (4)	24, 20
11. Scrumptious Bumptious Chicken wrap	Good for you Protein, calcium (5) (3)	(4) (4)	(4) (4)	(5) (4)	(3) (5)	21, 20
12. Hemo's salad wrap	Vegetarian, Dairy, Protein, fibre, healthy Carbohydrates, Easy to put together, RDI (4) (4) (4) (3)	(4) (4) (3)(3)	(3) (4) (3) (4)	(4) (4) (4) (4)	(4) (4) (3) (4)	!7, 18 19, 20
13. Chicken Tortillas	Protein, Fibre, Carbohydrates (5) (3) (5) (5)	(3) (4)(4) (3)	(3) (4) (3) (3)	(5) (4) (4) (4)	(3) (4) (4)(4)	20, 19 19, 18

Appendix R: Grade 4 kitchen garden VELS audit 2009

Grade 4 kitchen garden VELS audit level 3 Curriculum 2009.				
Strand	Domain	Dimension	Standards (Note* bold = can be achieved in the kitchen garden context)	Tasks and assessment across level unless specified
Physical, Personal and Social Learning	Health and Physical Education	<p>Movement and physical activity</p> <p>Health knowledge and promotion</p>	<p>At Level 3, students perform a broad range of complex motor skills. They demonstrate a wide variety of motor skills and apply them to basic, sport-specific situations. They create and perform coordinated movement sequences that contain a variety of motor skills and movement patterns. They participate regularly in physical activities for the purpose of improving skill and health, and identify and describe the components of health-related fitness. They begin to use basic games' tactics. They work with others to achieve goals in both cooperative and competitive sporting and games' situations, explain the concept of fair play, and respect the roles of officials. Students follow safety principles in games and activities.</p> <p>Students describe the stages of human development across the human lifespan. Students explain basic concepts of identity and use simple strategies to maintain and support their self-worth. They identify basic safety skills and strategies at home, school and in the community, and describe methods for recognising and avoiding harmful situations. They describe how physical and social components in the local environment contribute to wellbeing and identify how health services and products address the health needs and concerns of the local community. They identify healthy eating practices & explain physiological, social, cultural and economic reasons for food choices.</p>	<p>Digging, Weeding. Safe lifting, Bending and Stretching</p> <p>Alternating tasks so muscles have a rest</p> <p>Correct use of tools</p> <p>Health knowledge; be able to identify factors that assist their own well-being and learning</p> <p>Food, water, sleep, shelter, emotional well-being</p> <p>You can do it (what the different keys mean to themselves and how they can put them to work)</p> <p>Avoiding harmful situations/safety in the garden</p> <p>Complete allergy report and create class plan</p> <p>Explain healthy eating, identify the main food groups necessary for good health</p> <p>Prepare and taste foods from diff. cultures</p> <p>Create personal healthy food pyramid.</p>
	Interpersonal Development		<p>At Level 3, students demonstrate respect for others and exhibit appropriate behaviour for maintaining friendships with other people. They support each other by sharing ideas and materials, offering assistance, giving appropriate feedback and acknowledging individual differences. They work with others to reduce, avoid and resolve conflict</p> <p>At Level 3, students cooperate with others in teams for agreed purposes, taking roles and following guidelines established within the task. They describe and evaluate their own contribution and the team's progress towards the achievement of agreed goals.</p>	<p>Self and Peer assessment criteria rubric, six thinking hats and warm/cool feedback</p> <p>Demonstrate the ability to work in groups in various roles</p> <p>Can identify cooperative behaviour that encourages team-work Cooperate & share tasks in garden and cooking</p> <p>Reflections on what worked well and what their team or self could do better.</p> <p>You can do it "Getting Along, Organisation and Resilience"</p>

Strand	Domain	Dimension	Standards	Tasks and assessment across level unless specified
Physical, Personal and Social Learning	Personal Learning	<p>The individual learner</p> <p>Managing personal learning</p>	<p>Students describe the factors that affect learning and identify strategies that will enhance their own learning. With support, they identify their learning strengths and weaknesses and learning habits that improve learning outcomes. They seek teacher feedback to develop their content knowledge and understanding. They make and justify some decisions about their learning and, with support, set learning improvement goals. They contribute to the development of protocols that create a positive learning environment in the classroom.</p> <p>At Level 3, students set short-term, achievable goals in relation to specific tasks. They complete short tasks by planning and allocating appropriate time and resources. They undertake some multi-step, extended tasks independently. They comment on task progress and achievements. They manage their feelings in pursuit of goals and demonstrate a positive attitude towards their learning.</p>	<p>Identify and practice strategies to help encourage learning</p> <p>Brain food, water, brain gym etc.</p> <p>Reflect on their learning and identify strategies they use to problem solve</p> <p>Identify learning style and strengths/weaknesses – complete kitchen diary and reflections on learning</p> <p>Set personal learning targets and explain the steps required to achieve their goals</p> <p>Complete behavioural reflection sheets</p> <p>Self- assessment rubric section completed honestly</p> <p>Can identify and explain their personal contributions to team tasks</p> <p>You can do it “persistence” and “confidence”</p>
	Civics and Citizenship	<p>Civics knowledge and understanding</p> <p>Community engagement</p>	<p>At Level 3, students demonstrate understanding of the contribution of people from the many culturally diverse groups that make up the Australian community. They sequence and describe some key events in Australia’s democratic history. They describe symbols and emblems of national life in Australia and identify values related to symbols and national celebrations and commemorations. They describe the purpose of government, some familiar government services and the roles of some leaders and representatives. They explain the difference between rules and laws and describe the qualities of a good law. They explain why protection and care for the natural and built environment is important.</p> <p>At Level 3, students contribute to the development and support of class rules and participate in school celebrations and commemorations of important events. They describe some of the roles and purposes of groups in the community. They work with other students to identify a local issue and plan possible actions to achieve a desired outcome. They describe the benefits of action at the local level and the democratic aspects of the process. They participate in activities to protect and care for the natural and built environment.</p>	<p>Participate in the development of and can state and explain the reasons for class and safety rules in the kitchen and garden</p> <p>Can identify the contributions to our society that different cultural groups make e.g. diversity, music, foods Can suggest and justify some rules that would be necessary in a community</p> <p>Can explain/illustrate the concept of what is democratic at the local or classroom level (sharing tasks) Participate in raising awareness of a local issue e.g. litter, waste, degradation of the environment, provision of walking/ riding tracks, water saving strategies, Greenup-clean-up.</p> <p>Create colourful poster, song or information video to raise awareness.</p>

Strand	Domain	Dimension	Standards	Tasks and assessment across level unless specified
Discipline-based Learning	Mathematics	Number	<p>At Level 3, students use place value to determine the size and order of whole numbers to tens of thousands, decimals to hundredths. They round numbers up and down to the nearest unit, ten, hundred, or thousand. They develop fraction notation and compare simple common fractions such as $\frac{3}{4} > \frac{2}{3}$ using physical models.</p> <p>They skip count forwards and backwards, from various starting points using multiples of 2, 3, 4, 5, 10 and 100. They estimate the results of computations and recognise whether these are likely to be over-estimates or under-estimates. They compute with numbers up to 30 using all four operations. They provide automatic recall of multiplication facts up to 10×10. They devise and use written methods for: Whole number problems of addition and subtraction involving numbers up to 999 Multiplication by single digits (using recall of multiplication tables) and multiples and powers of ten (for example, 5×100, 5×70) Division by a single-digit divisor (based on inverse relations in multiplication tables) They devise and use algorithms for the addition and subtraction of numbers to two decimal places, including situations involving money. They add and subtract simple common fractions with the use of physical models.</p>	<p>See Numeracy planner plus the following: Mathematics assignments relevant to the Kitchen Garden</p> <p>FENCING THE KITCHEN GARDEN ASSIGNMENT addition, multiplication, length and money</p> <p>CLASS PARTY working out fractions, quantities, liquid amounts, total cost and individual cost (division) Number Working with money (budgeting) Adding and subtracting numbers to 2 decimal places Arrays-planting out seedlings Fractions (dividing circles and squares)</p>
		Space	<p>At Level 3, students recognise and describe the directions of lines as vertical, horizontal or diagonal. They recognise angles are the result of rotation of lines with a common end-point They recognise and describe polygons. Name common three-dimensional shapes such as spheres, prisms and pyramids. They identify edges, vertices and faces. They use two-dimensional nets, cross-sections and simple projections to represent simple three-dimensional shapes. They follow instructions to produce simple tessellations and puzzles such as tangrams. They locate and identify places on maps and diagrams. They give travel directions and describe positions using simple compass and grid references (for example, N for North)</p>	<p>Planting out garden beds in shapes and tessellating patterns Creating pyramids or prisms as plant supports</p>

Strand	Domain	Dimension	Standards	Tasks and assessment across level unless specified
Discipline-based Learning	Mathematics	<p>Measurement, chance and data</p> <p>Structure</p> <p>Working mathematically</p>	<p>At Level 3, students estimate and measure length, area, volume, capacity, mass and time using appropriate instruments. They recognise and use different units of measurement including informal (for example, paces), formal and standard metric measures in appropriate contexts. They read linear scales (for example, tape measures) and circular scales. (for example, bathroom scales) in measurement contexts. They read digital time displays and analogue clock at five-minute intervals They interpret timetables and calendars in relation to familiar events. They compare the likelihood of everyday events (for example, the chances of rain and snow).</p> <p>They describe the fairness of events in qualitative terms. They plan and conduct chance experiments and display the results using a column or bar graph</p> <p>At Level 3, students recognise that the sharing of a collection into equal</p> <p>They use number properties in combination to facilitate computations. They multiply using the distributive property of multiplication over addition.</p> <p>They use lists, Venn diagrams and grids to show the possible combinations of two attributes. They recognise samples as subsets of the population under consideration.</p> <p>They construct number sentences with missing numbers and solve them.</p> <p>At Level 3, students apply number skills to everyday contexts such as shopping, with appropriate rounding to the nearest five cents.</p> <p>They recognise the mathematical structure of problems and use appropriate strategies. To find solutions e.g. which shapes can be easily used to show fractions, computations, number patterns? Measurement (the relationship between size and capacity of a container. Students use calculators to explore number patterns check the accuracy of estimations. They use a variety of computer software to create diagrams, shapes, and tessellations, to organise & present data.</p>	<p>Measurement skills</p> <p>Length (plant spacing, height etc.)</p> <p>Area (planting areas)</p> <p>Capacity (mixing fertiliser)</p> <p>Mass</p> <p>Time</p> <p>Mapping</p> <p>Location</p> <p>Direction (north/south) for sunlight/height of plants</p> <p>Drawing accurate garden plan</p> <p>Pizza combinations task -what pizzas to make to satisfy everybody and fractions of each required</p> <p>Create shopping lists, price recipes, budget</p> <p>Work out costs and profits</p> <p>Create garden plan to feed family of four</p>

Strand	Domain	Dimension	Standards	Tasks and assessment across level unless specified
Discipline-based Learning	English	Reading	<p>At Level 3, students read and respond to an increasing range of imaginative and informative texts with some unfamiliar ideas and information, vocabulary and textual features. They interpret the main ideas and purpose of texts. They make inferences from imaginative text about plot and setting and about characters' qualities, motives and actions. They infer meaning from material presented in informative texts. They identify how language is used to represent information, characters, people, places and events in different ways including identification of some simple symbolic meanings and stereotypes. They use several strategies to locate, select and record key information from texts. At Level 3, students write texts containing several logically ordered paragraphs that express opinions and include ideas and information about familiar topics. They write narratives, which include characters, setting, and plot. They order information and sequence events using some detail or illustrative evidence, and they express a point of view providing some information and supporting detail. They combine verbal and visual elements in the texts they produce. They meet the needs of audiences by including appropriate background information. They write a variety of simple and compound sentences and use verb tenses correctly. They use punctuation to support meaning, including exclamation marks and quotation marks, and accurately use full stops, commas and question marks. They use vocabulary appropriate to context and spell most one- and two-syllable words with regular spelling patterns, and frequently used words, which have less regular spelling patterns. They use sound and visual patterns when attempting to spell unfamiliar words.</p>	<p>Read different text types e.g.. Newspapers, novels, fiction, informational and procedural.</p> <p>Identify main ideas and summarise</p> <p>Comprehension- difference between literal and inferential</p> <p>Different strategies to find and record info. from texts.</p> <p>Discuss and infer book characters motives and actions</p> <p>Read and identify various text types; narratives, recounts, reports, transactional texts, poems, procedural writing, Discuss author's purpose and intended audience. Children will be assessed against reading age/level tests.</p> <p>Write a range of imaginative and informative text</p> <p>Including narratives, reports, expositions and recounts.</p> <p>Demonstrate understanding of the conventions and purpose of different text types.</p>
		Writing	<p>At Level 3, students vary their speaking and listening for a small range of contexts purposes and audiences. They project their voice adequately for an audience, use appropriate spoken language features, and modify spoken texts to clarify meaning and information. They listen attentively to spoken texts, including factual texts, and identify the topic, retell information accurately, ask clarifying questions, volunteer information and justify opinions.</p>	<p>Use a variety of sentences, simple and compound; sequence and order information logically.</p> <p>Improve sentence structure, grammar and meaning.</p> <p>Experiment with increasing range of punctuation.</p> <p>Narrative: Water drop story</p> <p>Report: Marine creature</p> <p>Procedure: Making paper/packages</p> <p>Recount: Holidays/Excursion</p> <p>Exposition: Various</p> <p>Other: Scientific report, Newspaper/newsletter, Kitchen Garden Capers, Advertisement</p> <p>Healthy product, Diary/Learning reflections</p> <p>Each semester a spoken component will be assessed and graded on a variety of criteria set out in a criteria rubric.</p> <p>News sharing-modify information to include background information and select information likely to be of interest to their audience. Formal talks – reports</p> <p>Participation in readers circles and literacy groups</p> <p>SA Spelling Test and personal spelling words</p>
		Speaking and listening		

Strand	Domain	Dimension	Standards	Tasks and assessment across level unless specified
Discipline-based Learning	Science	<p>Science knowledge and Understanding</p> <p>Science at work</p>	<p>At Level 3, students classify a range of materials such as solids, liquids and gases according to observable properties, and demonstrate understanding that this system of classification of substances is sometimes problematic. Students describe examples of reversible and non-reversible changes in substances. Students identify the actions of forces in everyday situations. They use the words <i>push</i> and <i>pull</i> in discussing how things can be moved and stopped. They identify forms of energy and energy transformations in the everyday world. They use appropriate scientific vocabulary to describe and explain their observations and investigations. Students identify and describe the structural features of living things, including plants and animals. They identify how these features operate together to form systems, which support living things to survive in their environments. They distinguish between biotic and abiotic factors in their environment and describe interactions that occur between them. They describe natural physical and biological conditions, and human influences in the environment, which affect the survival of living things. They describe the relationship between day and night and the rotation of the Earth. Students explain how processes of weathering and erosion alter features of the landscape.</p> <p>At Level 3, students plan, design, conduct and report collaboratively on experiments related to their questions about living and non-living things and events. They select and use simple measuring equipment, use a range of appropriate methods to record observations, and comment on trends. They describe the concept of a fair test and identify the variables associated with an experiment. They develop fair tests to make comparisons and explain how they have controlled experimental variables. Students describe safety requirements and procedures associated with experiments. They explain how scientific knowledge is used, or could be used, to solve a social issue or problem.</p> <p>They describe aspects of the work of scientists and how this has contributed to science knowledge.</p>	<p>Term 1: Examine a terrestrial environment (e.g. garden) compare and contrast habitat with the marine environment Classify things into living (biotic) and non-living (abiotic) Identify the differences between plants and animals and their different requirements.</p> <p>Create a Venn diagram comparing needs of plants and animals Examine and identify the various mini beasts in a compost heap or worm farm and marine environment investigate/research these creatures with an emphasis on adaptation to environment and survival. Create food webs for the compost heap/ worm farm and also the marine ecosystem- similarities and differences?</p> <p>Create a menu for a worm restaurant. Explain how humans effect the survival of living things. Maintenance plan to encourage fruit and vegetable growth, not weeds. Plant seeds and keep a growth diary</p> <p>Term II: Kitchen chemistry- changes in foods-permanent or not? Inquiry- different types of paper and how the characteristics influence their use/purpose. Design packaging to store seeds</p> <p>Term III: Earth/Space. They describe and model the relationship between day and night and the rotation of the Earth. (Act it out) Make a mini ecosystem (Terrarium) conduct inquiry into the requirements of living things. Explain how the earth's movement on its axis causes seasons -year, day/night, seasons, climate zones, tides and our place in the solar system. Multiple Intelligence Earth and space tasks e.g. Make a shadow clock or create companion planting guide etc.</p> <p>Term IV: Simple Machines; identifying forces including push and pull -simple machines used in the garden and kitchen e.g. the wheel and axle, inclined plane and levers etc. Create an information card on a scientist and their contribution to knowledge. Discovery of pathogens- why hygiene is necessary to stop spread of diseases.</p>

Strand	Domain	Dimension	Standards	Tasks and assessment across level unless specified
	The Arts	Creating and making Exploring and responding	See ART/Music Planner	Character scarecrows Plant label designs
Discipline-based Learning	The Humanities	Humanities knowledge and understanding Humanities skills	<p>At Level 3, students describe and sequence some key events in Australian history, some key commemorations and celebrations including Anzac Day, and key aspects of the histories of cultural groups that make up their class, community and nation. They describe how aspects of places in their local area have changed over time. From direct observation or observation of a variety of media, they describe the human and physical characteristics of their local area and other parts of Victoria. They describe how people use and affect different environments in Victoria.</p> <p>At Level 3, students use a range of historical evidence, including oral history, artefacts, narratives and pictures, to retell events and describe historical characters. They develop simple timelines to show events in sequence. They explain some of the differences between different types of historical evidence, and frame questions to further explore historical events. Students draw simple maps and plans of familiar environments observing basic mapping conventions. They identify the location of places on a simple map using an alphanumeric grid and describe direction using the four cardinal compass points. Using atlas maps and a globe, they locate the states and territories of Australia.</p>	<p>Civics Day (Grade 3 and 4)</p> <p>Children rotate through the activities; they are assessed on participation, work produced demonstrating their understandings, contribution to discussion, the quiz on work covered and class set assignment work. (Mapping skills will be covered in maths and orienteering activities.)</p> <p>Important Australian commemorations</p> <p>The Australian Flag</p> <p>Timeline of important historical events</p> <p>States and Territories of Australia and their emblems and symbols</p> <p>Three levels of Gov.</p> <p>Laws and responsibilities</p> <p>Australian Citizenship test</p>

Strand	Domain	Dimension	Standards	Tasks and assessment across level unless specified
Interdisciplinary Learning	Information and Communications Technology (ICT)		<p>At Level 3, students use ICT tools to list ideas, order them into logical sequences, and identify relationships between them. Students retrieve their saved visualising thinking strategies and edit them for use in new, but similar situations. They explain how these strategies can be used for different problems or situations.</p> <p>Students organise their files into folders classified in a way that is meaningful to them. Students explain the purpose of passwords for accessing files stored on networks. They follow simple plans and use tools and a range of data types to create information products designed to inform, persuade, entertain or educate particular audiences. They create information products to assist in problem solving in all areas of the curriculum.</p> <p>With minimal assistance, students use ICT tools to capture and save images. They use simple editing functions to manipulate the images for use in their products.</p> <p>They make on-going modifications to their work to correct the spelling of frequently used words and to rectify simple formatting errors. They evaluate the final information product and describe how well it meets its purpose. Students make adjustments to their equipment and apply techniques that are ergonomically sound.</p> <p>At Level 3, students initiate and compose email messages to known and unknown audiences and, where appropriate, send replies.</p> <p>Students create folders in their mailbox to organise the storage of email messages they wish to keep.</p> <p>They locate information on an intranet, and use a recommended search engine and limited key words to locate information from websites. They develop and apply simple criteria to evaluate the value of the located information.</p>	<p>Yellow Pages</p> <p>Animated Kahootz story</p> <p>Poster showing reflect, rotate and translate.</p> <p>Computer tessellation</p> <p>Worm menu</p> <p>Grade 4 recipe book</p> <p>Invitation to kitchen garden celebration</p> <p>Create a character secret box and email messages</p> <p>Ezene</p> <p>Variety of graphs -using Excel for spreadsheets</p>

Strand	Domain	Dimension	Standards	Tasks and assessment across level unless specified
Interdisciplinary Learning	Design, Creativity and Technology	<p>Investigating and designing</p> <p>Producing</p> <p>Analysing and evaluating</p>	<p>At Level 3 students, individually and in teams, generate ideas based on a design brief, demonstrating understanding that designs may need to meet a range of different requirements.</p> <p>They use words, labelled sketches and models to communicate the details of their designs, and clarify ideas when asked.</p> <p>They identify simple systems components and common materials/ingredients and explain the characteristics and properties that make them suitable for use in products.</p> <p>Students think ahead about the order of their work and list basic steps to make the product or system they have designed.</p> <p>At Level 3, students use their list of steps and are able to choose appropriate tools, equipment and techniques to alter and combine materials/ingredients and assemble systems components.</p> <p>They use a variety of simple techniques/processes and a range of materials/ingredients to safely and hygienically alter and combine materials/ingredients and put together components to make products and simple systems that have moving parts.</p> <p>At Level 3, students test, evaluate and revise their designs, products or simple systems in light of feedback they have gained from others. They identify what has led to improvements and describe what they consider to be the strengths and drawbacks of their design, product or simple system. They consider how well a product or simple system functions and/or how well it meets the intended purpose.</p>	<p>Terrarium (mini ecosystem)-connects with science</p> <p>Character scarecrow with moving parts-connects with science simple machines</p> <p>Tea bags and packet advertising the product using herbs grown, harvested and dried from the garden to make tisanes</p>

Strand	Domain	Dimension	Standards	Tasks and assessment across level unless specified
Interdisciplinary Learning	Thinking Processes		<p>At Level 3, students collect information from a range of sources to answer their own and others' questions. They question the validity of sources when appropriate. They apply thinking strategies to organise information and concepts in a variety of contexts, including problem-solving activities. They provide reasons for their conclusions.</p> <p>At Level 3, students apply creative ideas in practical ways and test the possibilities of ideas they generate. They use open-ended questioning and integrate available information to explore ideas.</p> <p>At Level 3, students identify strategies they use to organise their ideas, and use appropriate language to explain their thinking. They identify and provide reasons for their point of view, and justify changes in their thinking</p>	<p>VELS 3.0 Grade 4 Thinking strategies</p> <p>Grade 3 list plus Graphic organisers, tree diagrams, mind maps 2-way tables (karnuagh graphs), thinking hats, stop lights.</p> <p>Reflective Kitchen garden journals, diary records, anecdotal notes, peer, group and individual assessment against criteria rubrics will be the basis for assessment. As well as the students approach to fair testing, exposition writing, concept and mind maps,</p> <p>Identification of strategies and general approach to problem solving. These dimensions are important in all the domains.</p> <p>Portfolio presentation and identification of the learning goals and self-assessment of learning that has taken place will also be used for assessment.</p>

Note: Standards in bold type could be addressed by work in the Grade 4 Kitchen Garden unit (Grade 4 2009 Curriculum document)

Appendix S: The teachers' planning for Pantry Plunder Unit

Pantry Plunder tasks Characteristics of authentic learning are in blue	Relevant e5 dimensions	The Grade 5/6 professional learning team's planning for the Pantry Plunder Unit using and exploring the e5 Instructional Model
<p>Several tasks were designed to scaffold the children's learning leading up to the "Pantry Plunder" invention task.</p> <p>Task 1.</p> <p>Create a mind map on all you know about nutrition.</p> <p>The mind map about nutrition was to judge the prior knowledge and the misconceptions of the children.</p> <p>Task 2.</p> <p>Write a lifestyle report for weekend newspaper on their own exercise and eating habits, using the provided newspaper article as a model.</p> <p>Writing the lifestyle report was to tune the children into the health topic, connect to their lives, as well as find out about what they knew about healthy eating and exercise. It provided a starting point for discussions on why being healthy should be of interest to each of them. The task prompted reflections on their lifestyle choices. It was also used as a literacy and information and communication technology task. (Appendix N)</p> <p>Elements of real-world problem (healthy lifestyle).</p>	<p>The teacher stimulates interest and curiosity in the learning, making links to students' interests and connects learning to real world experiences (Engage L1).</p> <p>They use stimuli to draw out what students know and support students to link their experiences to the topic (Engage L2).</p> <p>The teacher stimulates interest and curiosity in the learning, making links to students' interests and connects learning to real-world experiences. (Engage L1)</p> <p>They use stimuli to draw out what students know, and support students to link their experiences to the topic (Engage L2).</p> <p>The teacher selects resources relevant to the inquiry and presents examples of information in an organised format (Explore L1).</p>	<p>When planning we use the e5 model in conjunction with Bloom's Taxonomy, so with the (initial) planning it is probably more Bloom's, making sure that we have got the depth in the task. The e5 model is something that describes what teachers do. It helps us more when we have done a session and we are talking about what we did... and whether it was effective or not; it helps us with planning the next step of what we are doing (Tom T, Grade 6 teacher).</p> <p>I generally don't refer to VELS for a point of "this is where the kids should be" simply because we would start the majority of work finding out what the kids know and then we just teach from there anyway (Tom T, Grade 6 teacher).</p> <p>I think e5 helped with planning because we had to query the depth of what we were doing.</p> <p>We had to look at it more closely so that it wasn't just knowledge based, so that the kids had to do some exploring before they could go to the next step (Lyn T, Grade 6 teacher).</p>

<p><u>Task 3a.</u> Evaluate breakfast cereals and decide which is the healthiest option. Then design packaging with all the relevant nutritional information. This also involved researching the tricks and gimmicks used in advertising to get consumers to buy particular products. <i>Real data and elements of real-world problem.</i></p> <p>Grade 5 — made a drawing or net showing what it would look like. Grade 6 — made a mock-up of a 3D cereal box.</p> <p><u>Task 3b.</u> A criteria rubric was co-constructed by the children and the teacher for evaluation of this task in both Grades 5 & 6, although the way this was done, and the instructions were different.</p> <p>Grade 5 had input into the creation of the criteria rubric (constructivist approach) <i>Substantive conversation, discourse, problematic knowledge and meta-language.</i></p> <p>Grade 6 could argue for modifications of the teacher-designed rubric.</p> <p>Peer feedback before final evaluation in Grade 5.</p>	<p>The teacher provides tasks that support the transfer of learning and assists students to apply concepts from familiar to unfamiliar contexts (Elaborate L2).</p> <p>The teacher verbalises the connections between new content and past learning. Students are provided with opportunities to practise new skills and processes (Explain L1).</p> <p>The teacher supports students to identify what they know and what they need to know, enabling students to monitor their own learning (Engage L1).</p> <p>The teacher negotiates conversational protocols, which support all students to make meaningful contributions, build on and challenge one another's ideas (Elaborate L3).</p> <p>The teacher structures conversation, acknowledging the value of students' ideas, and uses these to build individual and collective understanding (Elaborate L2).</p> <p>The teacher gives feedback referenced to assessment criteria, when monitoring student progress (Elaborate L2).</p> <p>The teacher provides feedback and structures opportunities for students to give feedback to one another (Elaborate L3).</p> <p>They support students to critique one another's ideas to increase the intellectual rigour of the conversation (Elaborate L4).</p>	<p>The rubric for the cereal box was negotiated. The children came up with the rubric; it is in the words the children used. I only had to get it started with one (criteria) and they took over. Although I do have a concern, even though some children realised that they were missing things they did not go back and put them in... and now that I'm assessing I am really pleased that I have clear guidelines for both the self and teacher assessment; I found the criteria rubric very useful (Ruby T, Grade 5 teacher).</p> <p>If they were used to the criteria you might have less visual features in the criteria, it might just be one element of the criteria and you might have more academic research in the rest of the criteria (Tom T, Grade 6 teacher).</p> <p>Yes, definitely and that's in the nutritional chart, that's the research for the nutritional chart (Ruby T, Grade 5).</p> <p>For this to be successful, it (criteria rubric) needs to be used throughout the year (Ruby T, Grade 5 teacher).</p> <p>Sometimes they just choose... and I've been thinking about how to get around that... if there is a bit they don't like they'll just say "Oh! I didn't do that" They'll just choose to ignore it (Judy T, Grade 5 teacher).</p> <p>We approach it a bit differently. In the Grade 6 classes, we actually make the criteria the expected level so if they have not achieved the criteria they have not completed the task (Tom T, Grade 6 teacher).</p> <p>We have a list of things that must be included in the work. The children cannot opt to do some things and not others (Carol T, Grade 6 teacher).</p>
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<p><u>Task 4</u></p> <p>Research healthy recipes, trial at home for Task 5 and fill out nutritional chart and food pyramid for the selected recipe.</p> <p>Task 4 fitted the authentic learning characteristics of a poorly or ill-defined problem as well as open-ended inquiry. The multiple resources, different perspectives and real data also added to the real world context and had key elements of the working as professionals do criterion. Elements such as choice, negotiation, decisions and justification, together with the use of technology for research. Children worked in collaborative groups.</p> <p>The learning tasks were scaffolded over the eight weeks, building up to the “invention test”, and a performance of understanding on the judging day. The teachers acted as facilitators; the students had ownership of the tasks and their achievements.</p> <p><u>Task 5: The invention test</u></p> <p>“Design and produce a nutritional lunch.” Real-world problem. As part of the challenge, the groups were to produce a meal for each person in the group and one for judging, with the additional criteria that they could not exceed a budget of \$10.00 for the five meals. The Grade 6 task added the criterion that the meal had to be able to come to school in a lunch box. The Grade 5 task differed in that it was based on foods from different cultures and they had access to cooking facilities.</p>	<p>The teacher verbalises the connections between new content and past learning. Students are provided with opportunities to practise new skills and processes (Explain L1).</p> <p>The teacher models the language of the discipline (Explain L1).</p> <p>The teacher explains reasons for the use of particular strategies to help students organise information (Explore L3).</p> <p>They explain the reasons for selecting particular modes of language and expect students to use the language of the discipline (Explain L3).</p> <p>The teacher provides tasks that support the transfer of learning and assists students to apply concepts from familiar to unfamiliar contexts (Elaborate L2).</p> <p>The teacher stimulates interest and curiosity in the learning, making links to students’ interests and connects learning to real-world experiences (Engage L1).</p> <p>The teacher supports students to identify what they know and what they need to know, enabling students to monitor their own learning (Engage L1).</p> <p>They use stimuli to draw out what students know and support students to link their experiences to the topic (Engage L2).</p>	<p>The kids who are very successful, we know from the feedback from talking to parents that the children talked about vitamins and minerals at home. They almost demanded that they be allowed to experiment with flavours. Those kids then came back to their groups with their results of their experimentation—that’s why their groups were successful. Other kids didn’t do that; they were less successful. But their achievement and the level of knowledge that they gained was still far greater than if we had just had a couple of sessions just talking about the food pyramid and then a couple of sessions of making up a lunch that were never actually going to shop for or prepare and taste (Tom T, Grade 6 teacher).</p> <p>When we went out to the kitchen garden, we said we don’t know what is in the garden. Well, they were able to tell us everything that was in the garden and were able to say that is such and such and we are going to use that or they’re chives and we’re not going to use those because we’ve used them before and we don’t like them or they won’t go with... whatever they were going to prepare (Tom T, Grade 6 teacher).</p> <p>There was a lot of base knowledge and that was really borne out in two ways. They had to use the Coles online website. The sorts of ingredients that they immediately started researching, pricing and looking for meant that they had a knowledge of foods and which foods to put together. And the second was... we were a little bit... not concerned but very aware of trying to make sure that it was safe and we had parents organised, but the parents became a little bit superfluous they were there really just to talk to them. The knife work was good straight away (Tom T, Grade 6 teacher).</p>
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<p>Working as professionals</p> <p>Children went onto Coles on line. They used a local Post Code to generate a list of prices for groceries. They had to include the recommended daily allowances of the 5 main food groups Meat/Protein, Grain/cereal, Dairy, Fruit and Vegetables. The students all wanted different things and the selection had to be narrowed down. Most groups were over budget and then had the dilemma; shall we reduce or modify the grains or protein categories?</p> <p>Once the children had selected their ingredients, balanced the amounts and price, they went back to wolframalpha to check the RDI. The next step was to work out the quantities required per person/serving and total per group and then the total cost for the meals. Lots of revision and adjustments needed to be made due to the cost.</p> <p>The children were given an ingredient list consisting of the choices that the two classes had voted for. In their groups they had to highlight what they wanted. They were allowed to select ten items.</p> <p>“The children have also been exposed to guest chef demonstrations in the form of live demonstrations by parents and videos produced by both parents and children. At the end of each demonstration the groups would discuss what they had got out of it and hints that they had taken on board that were relevant to what they were going to do” (Lyn T)</p>	<p>The teacher explains reasons for the use of particular strategies to help students organise information (Explore L3).</p> <p>The teacher provides tasks that support the transfer of learning and assists students to apply concepts from familiar to unfamiliar contexts (Elaborate L2).</p> <p>The teacher uses strategies to involve all students in focused conversation, facilitating the sharing of ideas (Elaborate L1).</p> <p>The teacher gives feedback referenced to assessment criteria, when monitoring student progress. (Elaborate L2)</p>	<p>The kids could see why they had to budget. The kids could see why they had to know about the carbohydrate and the protein and even the salt... because we had done the previous work. They could understand why they had to have clean hands and utensils. They could understand why flavours and textures and colours were important (Tom T, Grade 6 teacher).</p> <p>This was very rigorous academically; there was a lot of challenging mathematics involved with working out fractions for costing 1/8 of a lemon (Lyn T Grade 6 teacher).</p> <p><i>The assessment was integrated and the performance or product was directed to a real audience, including their peers, the children’s parents, teachers and judges. Academic rigour was a concern of the teachers and was frequently mentioned in the planning meetings.</i></p> <p>One of the criteria was nutritional knowledge. We didn’t want them to just have a plate of food. We wanted them to have their knowledge on display so that the judges could ask questions and any parents that were there understood the complexity and depth of the task, of what the kids had to do. Plus the kids understood that it was a useful resource when the judges asked them questions. They were allowed to go back to the information, rather than shuffling bits of paper around. It served a number of purposes, and it also made the judges’ job a bit easier in that they knew that there was some consistency with what they were going to see on the tablecloth, so they knew that they could confidently ask about the food pyramid or carbohydrates or protein... or RDI intake, knowing that there was an expectation that the children knew about that. (Tom T, Grade 6 teacher).</p>
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<p>The children had to fill the food pyramid with their chosen ingredients, checking on the food pyramid in their invention test planner that they had a well-balanced, nutritional selection. Many children had to adjust their ideas at this stage. Poorly defined problem required lots of negotiation between the different perspectives of the collaborative group members.</p> <p>Not only was the food judged, but also the children's knowledge and justification of their choices.</p> <p>The Grade 6 children went through the process of predicting questions, rehearsing answers and testing one another's knowledge. For the judging day the children had designed tablecloths/posters, with the name of their group, the menu and additional nutritional information, such as where their ingredients were placed in the food pyramid and the RDI of the various parts of their menus.</p> <p>Grade 5 & 6 children stood by their creations and answered questions. The judges scored the groups on several categories out of 5, adding to a maximum of 25. The "products" were then eaten. (See "invention" test results.)</p>	<p>The teacher provides strategies for students to reflect on and refine their work in preparation for a performance of understanding (Elaborate L2).</p> <p>Teacher assists students to prepare for a performance of understanding (Elaborate L1).</p> <p>They support students to review samples of their work to identify evidence of their learning and reflect on their overall progress (Evaluate L3).</p> <p>The teacher presents guiding questions to enable students to reflect on their learning (Evaluate L1). The teacher models strategies for self-reflection (Evaluate L2).</p> <p>Each time we planned a task, within each lesson, we would say what level have we got to with Bloom's? Where have we got to, on Bloom's Taxonomy? We tried to make it so they were not just remembering but that they were analysing and evaluating and doing those other things as well. So we tried to include that in each lesson (Judy T).</p>	<p>We got them to do their lunch food diary in their Pantry Plunder book. I think that next time you'd get them to do for each of the meals and then analyse each of those meals to give them an idea of which meals took up the bigger % of RDI for the carbohydrate, protein and fibre. Most of them went way over on the protein but we didn't see that as a problem, as long as they could justify it to the judges (Lyn T, Grade 6 teacher).</p> <p>We told the children that they needed to be on the front foot a little bit. "Ms Duncan, (visiting Politician/judge) you will have realised straight away that our protein is 46% of the RDI, this is because for breakfast we had... and for dinner we're intending to have..." so the balance is still going to be there over the whole day. I think they got that information in the end, although it wasn't planned. It was done because of that weaving (in and out of the different e5 domains) that we do (Tom T, Grade 6 teacher).</p> <p>The kids just loved that they had adults tasting their food. I think it gave purpose and credibility to the task... it added value to the day (Lyn T, Grade 6 teacher).</p>
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<p>Assessment was integrated throughout the unit. Both the children and the wider school community valued the achievement. The achievement was regarded as significant.</p> <p><u>Task 6</u></p> <p>Reflections: the children were required to write a reflection on Pantry Plunder. The Grade 5 children created a page celebrating their success in their portfolios. They were required to have a photo and also identify what they did well and what could have been improved. After discussion the Grade 6 students created a page for their blogs. The teachers explained the format they were to use (pie chart) and the types of behaviours that might have contributed to the success or failure of the groups were identified. The groups reflected on their teamwork and identified the elements that had a bearing on their outcome.</p> <p>Task 6 involved higher-order thinking skills (HOTS) because the children reflected and evaluated the teamwork skills that they needed to complete the task successfully. The comments also illustrate the authentic learning characteristic of the collaborative community of learners and demonstrated higher-order thinking</p> <p>Types of HOT identified in the reflections: Critical thinking, Habits of the mind, Deep reflection, connecting cause and effect, Knowledge has depth, Critical thinking and logic, Integration of knowledge, skills, attitudes etc.</p>	<p>Real context links to children's lifeworld</p> <p>Working as professionals do — Complexity, challenge & discourse</p> <p>Ownership</p> <p>Learner centred / student driven / student ownership</p> <p>Engagement, choice, real/relevant, motivation</p> <p>¹ experiential, hands on approach</p> <p>² empowerment through choice</p> <p>Collaborative learners</p> <p>Substantive conversation and different perspectives</p> <p>Assessment</p> <p>The performance or product is directed to a real audience; it has value in the wider community.</p> <p>Elements of authentic assessment:</p> <p>Assessment was integrated</p> <p>Relevant & transferrable skills</p> <p>Tangible benefits to learner</p> <p>Valid assessment</p> <p>Competency-based assessment</p> <p>Social support for achievement</p>	<p>With assessment, they had to have certain things displayed on their tablecloths, but the main assessment was through their reflections. They found that if they hadn't done one thing properly, then it led to something else not being done properly. We spoke about what were going to be the indicators of success. That it had to be a healthy meal. We spoke about things like the aesthetics: the texture of it, the taste, the nutrition and the plating up of it. The sheet that the judges used for the judging, the children used it as a guideline so they knew how they were going to be judged. They had input into it beforehand as a big double group" (Lyn T, teacher interview).</p> <p>It was interesting they were quite critical about the results in their blogs. We gave them the group's strongest scoring area and their weakest scoring area and they were asked to say why they scored strongly and why thought they scored not as well in the lowest area. Mind you, all the scores were fairly high — the lowest score was 17 1/2 out of 25, which is pretty high — but they were able to identify the items where they didn't do well and lots of them talked about presentation. It wasn't just a general comment; they talked about presentation in terms of the consistency of each plate against each other (Tom T, teacher interview 17 September 2010).</p> <p>When we use the inquiry process it is important to cover the "evaluate" part of e5. It is essential that children look deeply at what they've done and the feedback from their teachers. At the end of that session you've got to have that sharing, you've got to find out what they now know compared to what they knew beforehand (Tom T teacher interview 17 September 2010).</p>
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Appendix T: Contrast of Grade 5 and 6 teaching approaches

Learning task	Grade 5 teachers' approach	Grade 6 teachers' approach	Comparison
<p>Task Introductory task for the Pantry Plunder unit was to create a 'perfect' breakfast cereal. The task combined advertising and nutrition. A criteria rubric was created for assessment of the cereal box.</p> <p>Themes Using e5 — building on children's learning</p> <p>Academic rigour</p> <p>Children choosing not to achieve criteria</p> <p>Critical reflection on teaching practice — how it could be done better next time.</p> <p>Democratic, inclusive approach/ownership of learning</p> <p>Different products: The end product and what it should look like had not been discussed in detail at the planning meeting, only the task.</p>	<p>Ruby T identified that the PLT4 focus on e5, had made her look at the 6 Dimensions of quality questions closely.</p> <p><i>"This was really good... the sheet with the questions, the question about 'how do we actually decide the nature and the quality of the assessment task? That (6 dimensions of quality) actually made me negotiate the criteria rubric with the children'" (RubyT, PLT4 planning meeting).</i></p> <p>The criteria rubric that she developed with the class to evaluate the cereal box, was very useful (especially now that she had come to assessment).</p> <p>The whole class developed the criteria rubric; children could make suggestions, discuss and moderate the criteria.</p> <p>Ruby T only had to make the first suggestion for one of the criteria then the children took over whilst she typed suggestions Children had ownership but also everyone had a clear idea of what was involved in the task and the standard expected.</p> <p><i>"Sometimes they just choose...and I've been thinking about how to get around that... if there is a bit they don't like they'll just say oh! I didn't do that; they'll just choose to ignore it" Julie T.</i></p> <p><i>"For this to be successful, it (criteria rubric) needs to be used throughout the year" Ruby T.</i></p>	<p>The two Grade 6 teachers had planned out the criteria for the cereal boxes. The children were able to argue for modifications to the criteria.</p> <p><i>"We approach it a bit differently, in the grade six classes, we actually make the criteria the expected level so if they have not achieved the criteria they have not completed the task" (Tom, Grade 6 teacher, PLT4 planning meeting).</i></p> <p><i>"We have a list of things that must be included in the work, the children cannot opt to do some things and not others" (Carol, Grade 6 teacher, PLT4 planning meeting).</i></p> <p>They made the criteria the expected level. If the child had not achieved the criteria they had not completed the task. The Grade 6 criteria rubric had a list of things that must be included in the work. Children could not opt to do some things and not others.</p> <p><i>"If they were used to the criteria you might have less visual features in the criteria, it might just be one element of the criteria and you might have more academic research in the rest of the criteria" Tom T.</i></p>	<p>The Grade 6 children made a 3D representation of their cereal boxes; as they had access to net books they typed or printed images for the finished product. The Grade 5 children had drawn a 3D representation of what their cereal box would look like — they would have liked to have constructed a 3-D representation of the cereal boxes — they hadn't thought of doing a mock up of the product</p> <p>The Grade 5 teachers agreed that although the children knew what was in the criteria rubric, self and/or peer assessment before the final grading would have been useful and help raise the standard of the work presented. Concern that even though the children knew that they had left out some of the criteria and had time to remedy this, very few took the opportunity resulting in a lower score than what they were capable of achieving e.g. when the children were presenting their cereal boxes to the class, the peer feedback identified that the bar code on their product had been left off and although they had the opportunity to fix it, they did not.</p> <p>The Grade 5 children were familiar with criteria rubrics as demonstrated by their ability to take over the process of creating one. The Grade 6 teachers' priority of academic rigour led them to create the rubric themselves, and then get the children to discuss and evaluate the criteria.</p>

Appendix U: Evaluation of the PLT4 e5 inquiry using the 7 principles of highly effective professional learning

Principle 1. Collaboration, Reflection, Feedback	Supporting quotes ¹
<p>Collaborative team, with all the members of PLT4, teaching across VELs level 4 (Grades 5 & 6).</p> <p>Learning tasks were discussed and directly planned into planning document in columns aligned with the e5 Domain Level 1 profile statements (as cited in e5 Instructional Model, 2009).</p> <p>Initially each teacher was assigned one of the e5 components to reflect on how successful it was in the implementation of the learning task and report back to the group for feedback (This also shows individual and collective responsibility).</p> <p>Reflection, discourse and feedback on how tasks were implemented in the classroom -What worked what didn't were in evidence in the PLT 4 meetings.</p> <p>Suggestions for alternative ways or ways to elaborate on learning were shared.</p>	<p>I think e5 helped with planning because we had to query the depth of what we were doing. We had to look at it more closely so that it wasn't just knowledge based, so that the kids had to do some exploring before they could go to the next step. Lyn T</p> <p>We used the e5 document and we each took on an area of the e5. In the planning we planned it all together but once we were delivering the lessons we noticed things about the e5 implementation and came back to the PLT with our evidence. When we shared the next time, we used that evidence to inform our next lot of planning...we worked a lot on that substantive conversation element... that perhaps e5 has made us think more about. We were also very aware that we kept jumping from one 'e' to another. So we started on explore and then we would go to explain and then we would go back to explore again or then go on to elaborate. Judy T</p> <p>e5 made us think more about the quality of the task that we were actually setting for them. We wanted them to get a deeper understanding of what was happening. That meant that for us as teachers, we needed to plan more carefully and in more depth. We needed to consider the progression in a lesson. And sometimes we would have to jump forwards or backwards. So it did help us, quite markedly actually, it made you stop and think about what you were doing as a teacher; to make sure that what you are doing in the classroom is valuable and has more depth. The kids get a lot more out of it. Lyn T</p> <p>When we came back with our evidence we looked at the areas of e5 that we didn't think we were delving into as much as others and may not have covered so well and discussed how we might elaborate more in the next one. Judy T</p> <p>When we came back with our evidence sometimes we would say well I don't think I am doing that area very well and discuss it and get ideas from each other about how they approached it. Judy T</p> <p>On the whole I thought that it went really well... I think that we planned it really well. Judy T</p>

¹ The quotes in bold were threaded together to synthesise the PLT4 Collective understandings (Part 7).

Principle 2. Evidence based, data driven, to guide improvement & measure impact	Supporting quotes
<p>The teachers found that the children's initial mind map on what they knew about health and nutrition when compared against their reflections on what they had learnt showed learning and improvement (difficult to quantify).</p>	<p>The nutrition unit came from us having to cover the nutritional aspect of VELS in Health and there was some science obviously involved there. There was that practical element as well so it wasn't just all theory. And they can all relate to what is nutritious food and... they can all relate to food! Lyn T</p> <p>The actual table with the RDIs for all the ingredients, that was very hard and several children didn't complete it, or they needed help, or we modified it for them. So that was quite difficult... and we as teachers were learning as we went along, we had to show them how to do a table properly, so when we just said for them to do it... they didn't really have any idea how to set it out. As the more logical children were finishing it off, we were able to get ideas on how to improve the table. Judy T</p> <p>Interviewer: Did you find that the inquiry catered for all of the children and their different levels?</p> <p>I think it did, I mean I think some parts of what we asked the children to do they struggled with; there was a fair amount of tricky math in it. A couple of children struggled with that but because they were in a group...the group as such coped. Lyn T</p> <p>We start the majority of work finding out what the kids know and then we just teach from there anyway. Now, if that happens to be VELS level 3.5 then that is where we go from. If it happens to be a case of a level of 4.5, as is the case of a lot of our reading activities, then that is where we go from as well. Tom T</p> <p>When we use the inquiry process it is important to cover the "evaluate" part of e5. It is essential that children look deeply at what they've done and the feedback from their teachers. At the end of that session you've got to have that sharing, you've got to find out what they now know compared to finding what they knew before hand. Tom T</p> <p>Our use of VELS is around that assessment and being able to place the children on that continuum. Tom T</p>

Principle 3. Integration into culture & operations School & broader network	Supporting quotes
<p>The PLT4 e5 inquiry was part of a broad focus for the whole school.</p> <p>This fed into the broader school network in terms of common language.</p>	<p>When I led the Year 2's "e5" evidence meeting for the last inquiry, I was using the e5 language... there was some understanding...it is a different understanding than with the Grade 5 & 6 teachers because three of the Grade 5 and 6 teachers had the training in e5... so their depth of knowledge and understanding is greater but they understood what I was talking about. Tom T</p> <p>PoLT says this is what it will look like if it is being successful and this is what it will look like if it is not successful. The teacher then looks at how they are going to get the best result using the e5 model. So from our perspective for this school, the emphasis that we have had on PoLT has fed nicely and harmoniously into the e5 model. We can continue to use the structures that we've had in place in relation to our planning. We are saying, 'what is it going to look like at the end?' and then 'where is it going to fit in relationship to the instructional model?' 'What elements are we going to incorporate?' Mark AP</p> <p>When I sit in on some of the sessions [e5 inquiry] with staff and I ask them to show me their evidence and why they did something. 'Why did you do it differently to what you originally said you would do?' And hearing their explanation... it is about reflection and it about evaluating what they got out of it and evaluating the learning that took place or didn't take place...that is more important... The learning that doesn't take place! That is an interesting process for me... to sit and hear different year levels talk about what they deliver and what comes out of it at the end. Mark AP</p> <p>Now I know it is only one piece of evidence but pleasingly NAPLAN has said yes we appear to be on the right track. We have gone from being below the state norm to quite well above the state norm. It might be the cohort of kids... and that is what we need to be looking at over the longevity of the strategic plan. Was it just that cohort that got us above? Or is it something that we are able to sustain? Mark AP</p> <p>You asked what do we do at the end with all this data? ...but it is about accountability as well..... it needs to be required. It was surprising when we went to the briefing in Melbourne as one of the 100 or 200 schools that were in that 1st or 2nd phase in relation to undertaking the e5 model, there were schools that were sitting there that had not seen the black book. Didn't know what that the e5 Instructional model was! They had heard about it and maybe had the book in their schools but had not opened it. And yet they were supposed to be at the forefront of this Instructional Model process within their cluster of schools. That was disturbing! Mark AP</p>

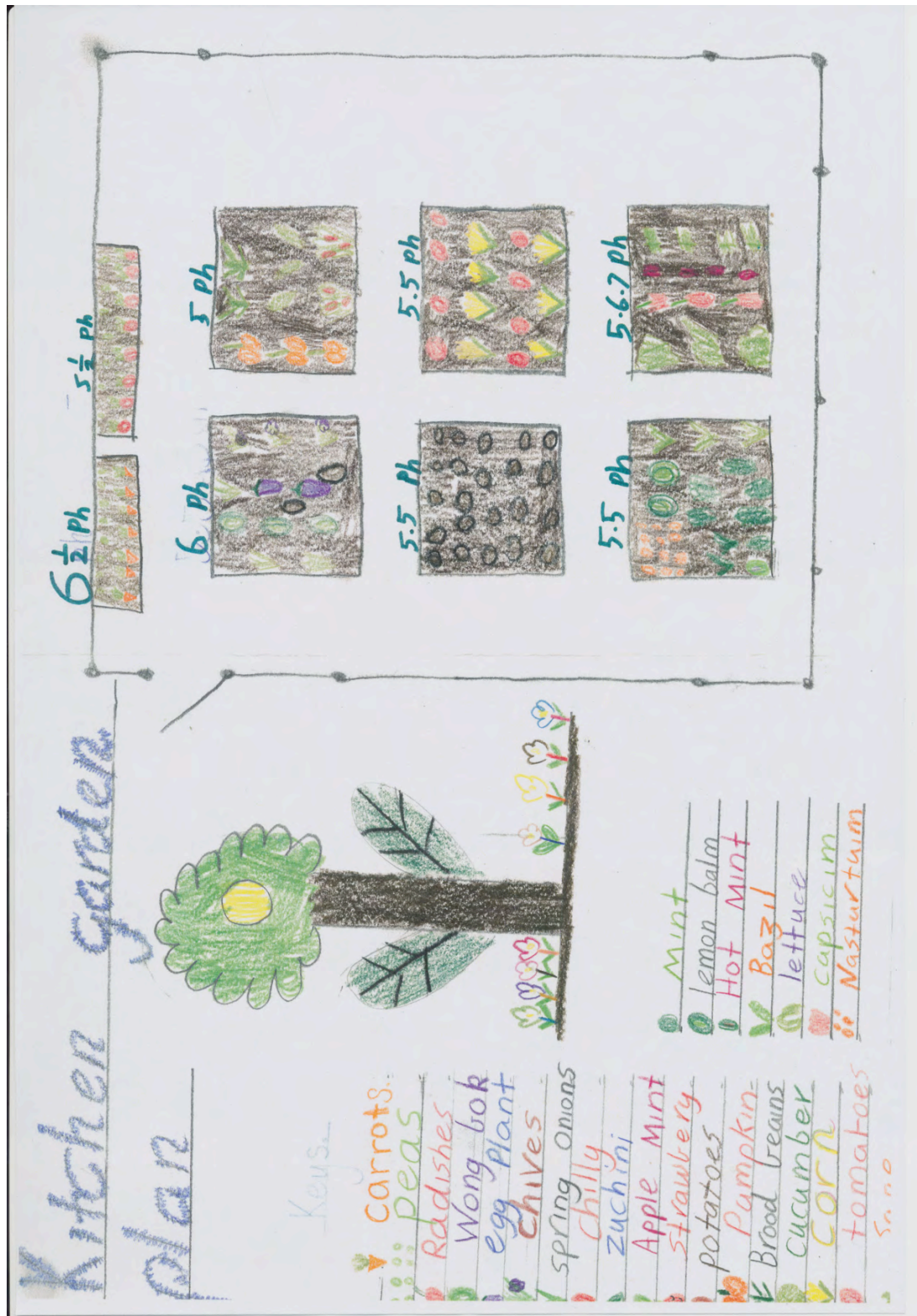
Principle 4. Individual and collective responsibility	Supporting quotes
<p>Individual responsibility for teaching, implementing, reflecting and evaluating within their own classroom. Collective responsibility to contribute research and report back and discuss with PLT4.</p> <p>The was support from teachers about the collaborative approach to planning being useful in establishing shared understandings, common language, helpful ideas and alternative ways of doing things as the conversation transcript from one of the e5 inquiry meetings shows.</p> <p>The teachers said that they valued the fortnightly meeting to report and debrief. There was substantive discussion focussed on some practices, for example the introduction and use of criteria rubrics.</p>	<p>“e5” was our PLT inquiry and it was based around this unit of work. What was interesting was that we did a lot of shared planning on this unit with the grade 5 teachers; however they did things differently from us. We still pretty well followed the e5 weaving in and out ... and the e5 exploring and elaboration was still the same. Lyn T.</p> <p>Questioning is an under-rated as a thought process! Tom T Yes...when you ask why? You go deeper into the answer. Ruby T</p> <p>...and most sessions even if it just a small task in the classroom, I will say that at the end of this session, I want something written down onand I write something on the board modelling what I want... or a statement about what I want. Judy T And that’s a criterion too, it is what you should expect whether it is staff or Prep or Grade 1. Tom T</p> <p>The question about ‘how do we actually decide the nature and the quality of the assessment task?’ that actually made me negotiate the criteria rubric. Which made the outcome stronger in the end. So by me coming to these meetings and reflecting more, made me start the criteria rubric. They were halfway through the cereal boxes and then we did this...[made the criteria rubric]. Would it have made a difference if I had started this criteria rubric earlier? Ruby T It may well have. If you had this group again next week...would you do this negotiated criteria rubric the same way with another class? Tom T I would do the tuning in and then the assessment criteria and then off we go. Ruby T Be careful of starting the criteria rubric too early because none of you know exactly what you want. I actually don’t do it straight away. I wait until the children start asking ...Do you want... Do you want? And then I say come up to the board and we’ll work it out. Judy T When we do criteria we don’t actually give them a sheet, I mean we’ll show them. Tom T We should be aiming at the highest possible score! Ruby T Maybe we don’t let them assess until they have covered all of the criteria. Judy T I think that for this to be successful it needs to be rigorous. Tom T The questions [5 Dimensions of quality] made me reflect more on what I was teaching. Ruby T</p>

Principle 5. Focused on student outcomes	Supporting quotes
<p>The Pantry Plunder Unit was implemented using the e5 instructional model. The tasks were designed to scaffold the children's learning.</p> <p>The teachers felt that it was an effective way to plan. Student outcomes were achieved but it was difficult to measure how much was due to use of the e5 model.</p>	<p>...and the tasks built. With the e5, if the children didn't do too well for example if they hadn't worked out what constituted a balanced meal and didn't have the food pyramid filled out and/or if they didn't have all of the nutritional information worked out, they would fall down in the next task because they didn't have this information to back them up. So the children who were on the ball and made good use of the time always seemed to be ahead. One step asked for elaboration on the previous, so it was almost like building blocks. So the first building block was, 'What do you know about nutrition?' and so the next step was the food pyramid and from there the deeper nutritional knowledge of the foods and then going to the RDI of the foods and then the rubric on what their food had to be and then there was the further elaboration on what food goes with what...Lyn T</p> <p>We wrote down what our guiding questions would be, to make the children justify their choices as we went around to each group. So we had a lot of ideas on the type of language we wanted them to use. Judy T</p> <p>I think about why am I teaching this? What use is it to the students? ...and is every student moving forward? Which part of the class is it really aimed at? Is everyone able to take it on in their own way, or at their level and move on with their learning? To me, that's what as a teacher, it helps you with. I think I use a mixture ... I use PoLT as well because it was our focus for so long. Judy T</p> <p>Different kids progress at different rates but there is still an expectation that kids will learn and be able to reflect on their learning as well. Tom T</p> <p>We worked out which children had the required knowledge and which children didn't so we either had to go to explain or elaborate for the next session; to make it the most demanding task that we possibly could. So that's where I think the e5 plan works. Tom T</p> <p>On the day... the kids were so engrossed in what they were doing ... they were so excited ...there was not one behaviour issue. There was no messing around. They really took the judging seriously. They were really impressed that a local Politian was there and Mark (Assistant Principal), they really took that quite seriously. It was a really busy session from the time in the morning when we started to when they finished preparing their meal it was full on. There was a real buzz. We were just moving around and just checking that they knew what they were doing, that they were tacking care with their food handling practices. Lyn T</p>

Principles 6. Embedded in teacher practice	Supporting quotes
<p>Common goal of using e5 in planning and having a shared language so that teachers within the school had a collective understanding of the e5 model.</p> <p>Teachers were required to highlight their use of e5 in their weekly planners</p>	<p>Interviewer: Do you think that using the e5 model helped establish a common language?</p> <p>If you are talking about between the teachers... then yes it did. So even though it turned out that there were obviously different outcomes in our invention test, what we were trying to do as teachers was the same. At the end of this unit we wanted the children to have a really good idea of what nutrition is and a really good understanding of what makes a nutritious meal... what are the main nutrients in the food and what do we need to have less of and what do we need to have more of? We wanted them to have a good understanding of those ideas. Tom T</p> <p>And when we had our inquiry meeting we had the e5 chart in front of us and we had lots of debates about ... when we were looking at certain lessons what was classified as “elaboration”... and what was “explore”? Evaluation was probably the easiest to pinpoint so we had lots of discussions about that. And I guess you could justify either way a lot of the time. Judy T</p> <p>Interviewer: Sometimes they had components of both? Yes, and so those discussions were really valuable. Judy T</p> <p>If Lyn and I are saying that we need to talk about ... and it's in elaborate, then we have the same language that we are using with each other. Tom T</p> <p>It [e5] helps us with more when we have done a session and we are talking about what we did. And whether it was effective or not and so therefore, it helps us with planning the next step of what we are doing. Tom T</p> <p>I think teachers have a really good understanding of both (e5 and PoLT), and using Blooms Taxonomy is probably going to make it easier to plan things that challenge but also make kids successful and also make kids reflect on knowledge learning and learning behaviour. Tom T</p>

Principle 7 Informed by research	Supporting quotes
<p>The e5 model is supported by research and is promoted as effective practice. The e5 Project Board described how they met regularly to “critically review the work” and used critical friends (International educational leaders) to review and provide feedback on the model. They ensured the e5 Instructional Model was informed by “the research base on instructional practice, teacher effectiveness and the work of other education jurisdictions, a systematic examination of local and international instructional models and related documentation was carried out” (e5 Instructional Model p16, 2009).</p> <p>Main Theories/Underlying Research</p> <ul style="list-style-type: none"> • Based on the BSCS 5E Model (Biological Sciences Curriculum Study, 1989). • Standards — referenced (Rasch, 1960, 1980 as cited in e5 Instructional Model, 2009). • Criterion — referenced testing along a developmental continuum (Glaser, 1963 as cited in e5 Instructional Model, 2009). • “Zone of proximal development” and “scaffolded learning” (Vygotsky, 1962 as cited in e5 Instructional Model, 2009). • Theory of cognitive development and learning (Bruner, 1966 as cited in e5 Instructional Model, 2009). 	<p><u>Teachers’ understandings</u></p> <p>It is our responsibility as a teacher to go from the theory and put it into the classroom in the way children can understand and build understandings that can be built on. Judy T</p> <p>For me e5 helps you tease it out into more manageable steps so that it is easier for some of them to understand. It also helps when you are planning so you work out what you want them (the students) to know and what the stepping stones are to get there and I think in some ways e5 is like stepping stones you do keep back tracking and then jumping forwards and then coming back. Lyn T</p> <p>PoLT I think is more about the curriculum delivery getting the kids motivated and the ways you introduced the curriculum into the classroom. So there was a lot of group work, some individual work, there was a real mix of both. And just the way we made sure that we gave explicit instructions ...all of those sorts of things to me it was more about the authenticity of the task and the curriculum delivery so it wasn’t just boring flat curriculum. It had ‘a realism’ to it. And it catered for all the kids. Lyn T</p> <p>...and the video that we saw from Alan Luke that talked about the weaving that we do when we teach. The back and forwards, the move from engage to elaborate to explain in perhaps the space of a few minutes depending on what a particular child or particular group needs. So when we plan, we try to plan into those sections. Tom T</p> <p><u>e5 Instructional Model</u></p> <p>The e5 Framework is an important addition to the Victorian improvement strategy, and it speaks directly to the recurring question that teachers and school leaders ask in the early-to-middle stages of the improvement process. What do we mean by high quality instruction? (Elmore, 2008, [Forward] cited in e5 Instructional Model, 2009).</p> <p>The methodology that supports the e5 Instructional Model is based on the learning theories of Rasch, Glaser, Vygotsky and Bruner to derive an empirical map of learning, in this case mapping the increasing competency of teachers across a number of key domains and capabilities (Griffin, p.35, cited in e5 Instructional Model, 2009).</p> <p>Evidence must be directly observable. Human beings can only provide four types of evidence. We can do things, say things, write things and make things. It is from the things people do, say, make and write that we infer learning, emotions, knowledge, understanding and learning in general. (Griffin, 2008, p.19, cited in e5 Instructional Model, 2009).</p>

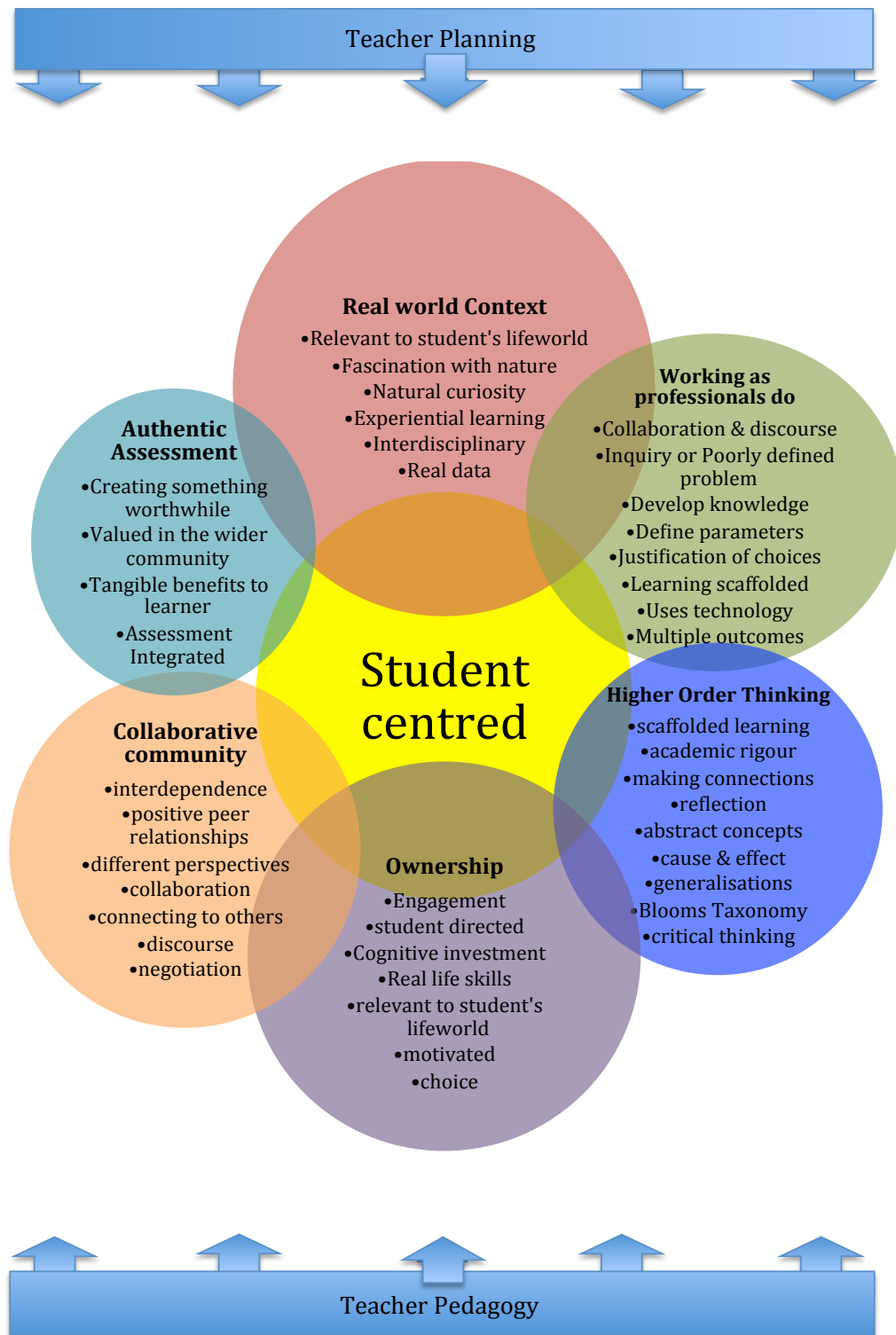
Appendix V: Grade 4 kitchen garden plan



Appendix W: The grade 4 herb inquiry

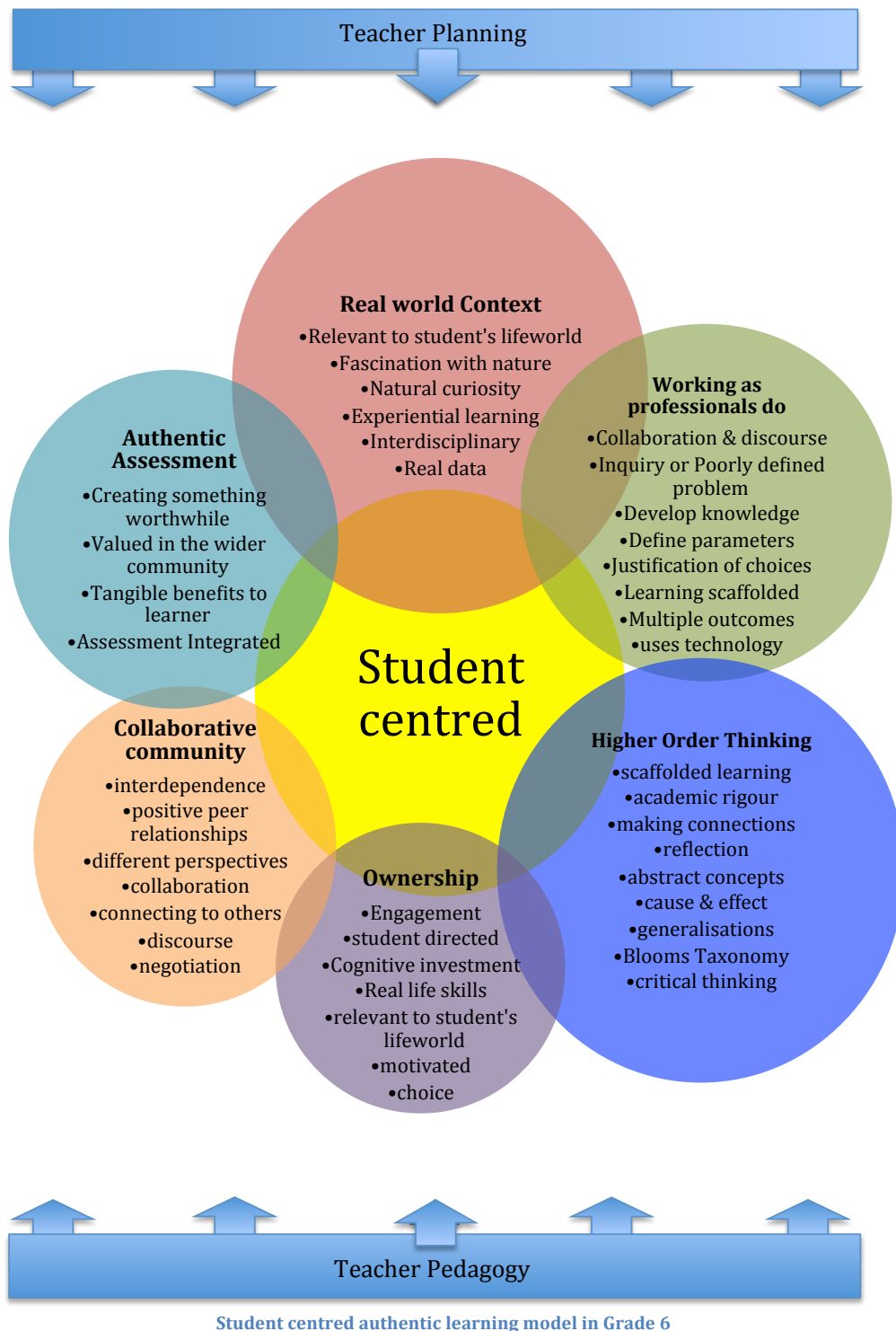
Characteristic of Authentic Learning	Ownership of learning: (self-directed-SD, co-constructed-CC or teacher directed-TD)	Quotes illustrating learning
Real world problem / real context (The inquiry was stimulated by the gardening maintenance task in the kitchen garden-real context)	Pinching out the tips of herbs in the kitchen garden to make them bushy was a teacher directed activity that stimulated student engagement (TD) The herb investigation grew out of students wondering about the scents given off. The students used their lunchtime to test their ideas -Student ownership of inquiry (SD).	"And the mint... it smelled really strong when you picked it, and the herbs grew really well." (Grade 4 focus group interview)
Poorly or ill defined problem or open-ended inquiry	Herb inquiry- ranking of herbs problematic as students liked different scents. After discussion the students decided on a ranking system where each herb was given a score. These scores were then averaged to give an overall ranking (CC)	What's that? It smells really strong! (Mark AP comment to children while on yard duty)
Students need to articulate problem and /or their learning	Students needed to explain how they developed their herb ranking system. Students identified that within the average, there could be extremes of like and dislike (SD)	"Well, they were able to tell us everything that was in the garden and were able to say that is such and such and we are going to use that, or they're chives and we're not going to use those because we've used them before and we don't like them or they won't go with.... what ever they were going to prepare." (Teacher interview -commenting on children's herb knowledge)
Develop knowledge base & skills acquisition	Procedural & descriptive writing (TD) Using a table to collate information (TD) Creating a ranking system (SD) Understanding herbs have different flavours and scents (SD) Research using key words (TD) Respecting different views and opinions (CC)	"...if you didn't know what the plant or herb was in the kitchen garden you couldn't use" (Grade 6 Pantry Plunder focus group interview) "I learnt, when we were cooking in grade 4... I remembered that we put parsley and chives on the food to add flavour and make the food look good" (Grade 6 focus group interview) "...they had a good background knowledge" (Teacher interview) "... the sorts of ingredients that they immediately started researching, pricing and looking for meant that they had a knowledge of foods and which foods to put together" (Teacher interview)
Involves Higher order thinking skills (HOTS)	Used to rank herbs (SD) And in design and layout decisions (CC)	
Multiple resources, different perspectives	Students had different opinions about herbs (SD) Multiple resources used for classifying the herbs and research the herb information posters (TD)	
Collaborative community of Learners	Student to student discussions: students had different opinions about herbs-SD	
Supported by technology	Herb identification and research history of herbs (TD), Students used IT, taking and inserting digital photos (SD). Designing herb poster, layout, editing & printing (SD &TD)	"They had to use the Coles on line web site" (Grade 5 & 6 Teacher interviews). "I found it really good to know my herbs because well usually...Mum would usually tell me to go and get some coriander or some parsley and so before I'd go which one is this?" (Grade 4 focus group interview)
Assessment is integrated (For/As Learning-formative assessment, Summative assessment -Of learning)	Herb data collection sheet (CC-For learning/As learning) Herb information poster evaluation (TD-Of learning-summative for evaluation of research and technology skills)	
The performance or product is directed to a real audience; it has value in the wider community & with the students	The herb information book was used and valued by the students; the individual herb information posters were included in student portfolios as evidence of their learning.	"I learnt, when we were cooking in grade 4, I remembered that we put parsley and chives on the food to add flavour and make the food look good." (Grade 6 Pantry Plunder focus group interview)

Appendix X: Student-centred authentic learning model Grade 5



Student centred authentic learning model Grade 5

Appendix Y: Student-centred authentic learning model Grade 6



Appendix Z: Evolution of the authentic learning knowledge construction model

The evolution of the authentic learning knowledge construction model

