

Victoria University

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School of Education



**Learning Styles, Teaching Styles and Literacy
Acquisition in Upper Primary School**

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This thesis is submitted
in fulfilment of the requirements of
Master of Education (Research)

December 2003

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30001007974068

Galati, Connie

Learning styles, teaching
styles and literacy

acquisition in upper primary

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Declaration of Originality

This thesis contains no material which has been accepted for any other degree in any university. To the best of my knowledge and belief, this thesis contains no material previously published or written by any other person except where due reference is given in the text.



Acknowledgments

I would like to acknowledge the following people for their contribution to this research.

- Jan Thomas, my principal supervisor for her patience and understanding.
- Maureen Ryan, my second supervisor, for her kindness, help and advice.
- The Primary School Principal, for allowing me to reside in her school to conduct my research.
- The Primary School Teacher and his class, for letting me share and become part of their classroom.
- Dominic Galati for supporting me during this long journey.

Abstract

Children all possess different abilities when it comes to learning. They also have different ways of approaching learning; different styles of learning that help them to attain understanding of what is being taught to them. Literacy skills play an important part of learning and improving these skills has always been a significant area of interest to all educators. Knowledge about the different ways in which children learn could be of great assistance in developing teaching practices that enable all children to improve their learning capacity. Literacy skills, learning styles of children and teaching styles, and how all of these manifest themselves in an upper primary school classroom, would therefore be an interesting area of educational research and would have substantial implications in the teaching-learning paradigm.

This research was concerned with the learning styles and literacy skills of students and the teaching styles in an upper primary school classroom. It firstly sought to find whether or not teaching styles were catering to the learning styles of the students and what was the result, if any, of this interaction. In doing so the following question was proposed: *“Is there a match or mismatch between students’ learning styles and the teaching styles in the classroom and is this affecting the learning progress of the students?”*

The literacy skills of students in an upper primary school classroom were considered and evaluated over thirty-six days of observation. Four students with different literacy skills were located and examined for their different learning styles using various learning styles measuring devices. The teacher’s learning styles and teaching styles were also investigated. These two sets of data were then compared and analysed in terms of their interaction and implications in the academic performance of the four students throughout the period of observation.

While the results of this study indicated that, in this particular classroom, the teaching styles catered for nearly all of the students’ learning styles the academic behaviour of

these four students was consistent throughout the observation period. It could not be completely concluded whether matching the teaching styles to the learning styles had a negative effect on the students' learning progress. How positive an effect the matching was on the students' academic performance could not be ascertained either because of the students' consistent results from approximately the beginning to the end of the year.

Clearly there is some relationship between learning styles and teaching styles and the effects of their matching in the classroom. Further research needs to be conducted and more refined techniques, possibly available in the future, need to be used to find an accurate relationship between learning styles and teaching styles and the effects of its manifestation in the learning environment. In the meantime, teachers need to be eclectic in their teaching styles to cater for the variety of students' learning styles. However, this is not always an easy task for teachers due to their class work and time constraints. An awareness of children's learning styles, though, can be an aid when attempting to assist children experiencing problems in the process of learning.

CHAPTER ONE

Introduction

1.1 THE RESEARCH QUESTION

All children are different, not only in obvious characteristics such as physical attributes but also in the way they learn. Learning can take place in many different ways and children's strength in acquiring literacy skills will vary from child to child. Literacy skills are an essential component of educational achievement and ways of improving literacy learning are therefore an important area of study.

It is now widely recognised that children not only learn differently to each other but they learn in dissimilar and genuine ways (Butler, 1995). Farrell-Moskwa (1992) wrote. "As educators we need to focus on the distinctive and specific attributes that have an impact on learning" (p. 1). The different attributes and styles of learning of children could be considered valuable information to teachers and other educators. This type of knowledge could facilitate teaching practices in order to have the most impact on the children's learning capacity. These different and distinctive learning characteristics are referred to as learning styles.

Learning style theory has existed since the 1960s and has gradually been promoted through the 1970s and 1980s by educators who concede that learning style affects the ways in which children learn. Learning style has been viewed from different perspectives. European literature, including Australian and American, consider it as the "attempt to explain the differences observed in how students approach a learning task and how these affect learning" (Newble and Clarke, 1986, p 62). For Newble and Clarke (1986) learning style is taken to mean the relatively stable characteristics of a student's behaviour which displays a definite preferred approach to learning. It is these characteristics that would need to be identified in order to establish whether there is some type of connection between these and the literacy acquisition of children.

The literacy skills of upper primary school children have developed over the period of time from when they began school, or prior to pre-school, up until their present upper primary school level. Many factors such as teachers, learning environment, physical capabilities and peer groups, among others, would have had a substantial impact on the child's literacy acquisition skills during this time. As well as these factors the learning styles of the children would also have had some effect.

A worthwhile and extremely interesting longitudinal study carried out over these early years would disclose some type of relationship between literacy acquisition skills and learning styles of the children. If a significant relationship was found teachers and educators could accommodate appropriate teaching styles to the different learning styles of the children. This time period, though, was beyond the scope of this particular study. However, literacy acquisition skill data and learning style data of a class of upper primary school students was obtainable.

With this information an important question was proposed relating to learning styles and current teaching styles. The purpose of this study was to establish the literacy levels and learning styles of a number of upper primary school students, and determine whether their learning styles were being impeded or assisted by the current teaching styles they were experiencing. So the question proposed by this study was *“Is there a match or mismatch between students' learning styles and the teaching styles in the classroom and is this affecting the learning progress of the students?”*

The need for this exploration was encountered in the early literature search by the researcher. Many believe a problem exists in the form of inadequate literacy skills in Australian society for a significant number of people. To quote an Economic Planning and Advisory Committee (EPAC) paper, “A number of reports have identified high levels of adult illiteracy ... some as high as 20% of the adult population” (Clare and Johnston, 1993, p. v). The consequences of adult illiteracy can have a substantial impact on labour force participation. To quote an Australian Bureau of Statistics (ABS) article on Education and Training (1999):

The rate of participation in the labour force ... by persons aged 25-65 is clearly related to literacy levels...In Australia, about 65% of those with low literacy skills participate in the labour force...for those with high skills the equivalent figure is about 85%. ...Of those aged 16-65 who

are in the labour force, those with low literacy skills have a greater chance of being unemployed than do those who are highly skilled. In Australia, the unemployment rate for the former group (low skills) was 11.3%, more than double that of the latter - 4.6% (p.3).

Considering these important statistics it could be agreed that the literacy skills of a person affects their employment possibilities. Education and literacy assists people to participate in the economic growth of a country as well as giving wider horizons to individuals themselves. It also increases the confidence of individuals who would not otherwise contribute to their social environments.

A significant number of children leave primary school with problems in reading and writing. This was found to be the case in the federal parliamentary committee report mentioned above. It was suggested that it could be as high as 25%. This report drew on previous studies that indicated the level was between 10 and 20%. Because of the complex nature of literacy, the claims drawn from these types of reports may be unsubstantiated. There are many definitions of literacy and they have been changing for many years. What the United Nations Educational, Scientific, and Cultural Organisation (UNESCO) considered as a literate person in 1951 was quite different from their definition in 1978 (Bruce, 1993, p. 13). The Australian Council for Educational Research (ACER) however, has used standardised tests to survey literacy and numeracy levels in 1975, 1980 and 1988. Their results showed that literacy standards as measured by their particular standardised test were not falling, yet this did not alleviate the fact that people with literacy problems still existed.

Whether literacy standards have changed or not, as long as there is any evidence to show that a number of children are displaying difficulties in reading and writing there is a need to investigate and help them. Just as all primary school children have the right, and are required, to attend school they also have the right and need to leave that school with a good knowledge of reading and writing. Carrying out investigations into the identification of reading and writing problems can be helpful in producing some type of assistance program to help these students. If there was some type of testing for a particular standard of 'basics', like the study mentioned by Biggs and Tefler (1987), then this certain standard would need to be attained by primary school students in order to be considered to be passing the test. There will always be different standards that will

be set as can be seen in the past. The performance of students on any test is of importance and, if they do experience problems in learning, this will be reflected in their results.

It was the intention of this research program to focus on the learning styles of children with problems in literacy skills acquisition in upper level primary school. The study would concentrate on the upper primary school levels, although well before this stage it can be determined whether there are difficulties in children's learning. However, at the upper primary school level it is quite evident whether a child's communication skills are developed and one can establish or identify if the child is experiencing any problems. In a quantitative study by McGaw, Long, Morgan and Rosier (1988) it was also found that it is part of this stage, between the ages of ten to fifteen, at which students can make considerable gains in learning, "One thing that these figures clearly demonstrate is that a substantial amount of learning occurs between Years 5 and 9" (p. 102). The upper primary school level is a crucial transition stage because if individual students do not overcome problems here secondary school may be especially difficult for them.

Studying the learning styles of these students with different levels in literacy skills and whether teaching styles accommodate their learning styles would provide indicators of the effects of this match or mismatch of styles to student learning. The results would then be available to inform others and this knowledge could be applied to help these children who are failing to learn.

1.2 AIMS OF THE PROJECT

According to Lembke (1985) there is a significant positive outcome when students approach a topic with their preferred learning style. It would appear from this research that students who have problems in learning seem to benefit when they have access to their preferred learning style.

This study aimed to establish whether children's learning styles were being matched or mismatched by the teaching styles in an upper primary school classroom. The specific objective was to find out if, when the students used their preferred learning styles, the teacher was accommodating these with appropriate teaching styles. Once obtaining

these results the study would also investigate the effects on the academic results of the students throughout the study period. The focus would be placed on a group of students with different literacy acquisition skills, that is, some that displayed difficulty with reading and writing skills and others that did not and they would all have reasonable speaking skills.

It was the intention of this project to observe and analyse students displaying difficulties in achieving literacy skills as compared to others in the classroom displaying no apparent difficulties and to examine their learning styles. The three factors that would be investigated were:

- (i) the literacy acquisition skills of the students,
- (ii) the learning styles of the students, and
- (iii) the teaching styles in the classroom.

Each of these factors was examined.

- (i) In an attempt to ascertain the literacy acquisition skills of the observed students various academic results of the students were collected. As well as this reading tests were administered to the whole class that would provide standardised results. Their teacher also provided individual student profiles.
- (ii) To study the behaviour of students in their approaches to learning and ascertain their learning styles the researcher carried out observations that involved note taking and video and audio recording in the classroom. In addition to these observations two inventory-type questionnaires were distributed to the whole class and completed with the assistance of the researcher's explanations.
- (iii) The teacher's learning styles and teaching styles were ascertained by the researcher carrying out observations on the teacher that involved video and audio recording in the classroom. The teacher also completed two inventory type questionnaires.

Students come to the classroom with different learning abilities and, some would argue, their own individual learning styles. If their learning styles are providing them with helpful ways of gaining knowledge and understanding it would be of great advantage to student and teacher to match these learning styles with teaching styles. According to Brown and Cooper (1983) we need to teach to a student's learning preference, then he

or she will learn more efficiently and this will increase achievement and reduce frustration. There is importance in recognising the need for different teaching methods to be adopted in order to cater for the needs of the preferred learning styles of students. Learning success could be associated with the student's self esteem and a high self-esteem is also a significant accomplishment in a student's life.

In the long term the results that would be obtained by this research could also enhance understanding for teachers who constantly deal with children and learning. A teacher's work is involved and full of activity and for a teacher to learn extra skills can be challenging. Yet, some awareness of children's learning styles, or just to know that they can exist, could be an asset or an aid when attempting to assist children experiencing problems in the process of learning. Schools could continue to accommodate students by having teachers apply their awareness of what the students' preferred learning styles are.

CHAPTER TWO

Literature Review

2.1 INTRODUCTION

This chapter has been divided into three sections discussing the following research literature: literacy acquisition, learning styles and the interaction of learning styles and teaching styles. Each of these three is of equal importance to the background of this study and the underlying theme behind all of these is effective learning.

Literacy can be defined in various ways but essentially it concerns one's abilities in reading and writing. Children that experience problems in literacy are a major concern to educators because this could hinder the child's development, academically and socially, limiting their opportunities in later life.

Learning can take place in different ways: discovery, experience, making decisions, drawing conclusions and through various media. Different learning environments, abilities and interests may produce a range of learning styles in students. It has been found through various studies that when students use their preferred learning styles to approach learning tasks they experience increased academic achievement and have improved attitudes towards school (Lembke, 1985). Is it possible that students who have problems in learning are not having the chance to use their preferred learning styles or their learning styles are not being accommodated by teaching styles?

The concept of learning styles has existed since the 1960s and it relates to the way in which students learn and the differences among students associated with learning. According to Grinder (1991) students fall into three main categories of learners: visual, auditory and kinesthetic. Some students may use combinations of these three modes.

Knowledge of these learning styles is useful not only to inform teachers but for students themselves. Once students are aware of their own learning styles and preferences they are more likely to know where their learning strengths lie. Employing metacognition in this way they may also be assisted in learning other strategies and, when they approach different or difficult tasks, they have an understanding of which strategies to use.

2.2 SECTION I - LITERACY ACQUISITION

Literacy skills have been a matter of great controversy in recent years. The Learning Assessment Project (LAP) tests conducted by the Victorian government a few years ago, which were controversial in themselves, ascertained that 90% of Year 3 and Year 5 children could read and write at the standard expected (Holroyd, 1996). This still leaves 10% experiencing problems with the acquisition of these skills. These tests are still carried out today under the name of AIM (Achievement Improvement Monitor). Even though literacy problems have always existed they have more of an impact today because of present society's complex nature. The definition of literacy can also change as society changes.

Literacy can have a number of definitions. In Western cultures it is usually defined in terms of the ability to read and write. This definition can include a number of particular skills and types of knowledge. Biggs and Telfer (1987) discuss a study by the Australian Council of Educational Research (ACER) that measured pupils' attainments in literacy and numeracy. The pupils were tested for basic skills considered essential for participation in Australian society. Thus, literacy here was being defined as the 'basics' needed to take part in society. Cambourne (1988) claimed, from a personal point of view, that "literacy manifests itself in sustained reading, writing, talking, listening, thinking, remembering, selecting, organising, inferencing and other cognitive behaviours" (p. 4). It was his belief that literacy describes a whole collection of qualities, that it is not a single entity, and that it cannot be measured and quantified.

Another similar definition of literacy is discussed as follows, "The use of the word 'literacy' in Australian classrooms typically refers to all modes of language: reading, writing, speaking and listening. The language processes are seen as interrelated and recursive, with one language mode providing support for the other one" (Van Kraayenoord, 1993, p 639).

Hoy (1988) divided literacy in English into four basic categories because these convey an idea of the student's movement between stages of literacy. She defines :

- *pre-literate learners* - Those who speak a language for which there is no written form
- *non-literate learners* - Those who speak a language that has a written form but who have no reading or writing skills

- *semi-literate learners* - Those with only rudimentary skills in reading and who can write only a few words, and
- *non-Roman alphabetic learners* - Those who can read and write in a language that features surface characteristics different from those of the Roman alphabet.

In this research students who have difficulty with reading and writing skills but have reasonable speaking skills will be considered as having problems in literacy skills acquisition. These students will have concepts of what reading and writing are and they may be able to write, but what they write is not grammatically correct or coherent. Because of this they will fall most appropriately into Hoy's category of semi-literate learners. The use of language and the way students listen, reflect and recall in their learning environments can also be used to determine their literacy skills acquisition as explained by the other definitions presented above.

Lack of Literacy Acquisition Skills

The lack of literacy acquisition skills disadvantages children in the short and long term. For example, Prior (1994) suggests reading difficulties can be detrimental to children. In the short term they would face failure in certain areas of curricula and in the long term they could be confronted with low confidence and self esteem, possible unemployment or restriction in the employment they do attain, and social adaptation problems. She concluded "accurate and early identification of reading difficulties, or 'at risk' children is essential if we are to have any hope of prevention or effective intervention" (p. 4) and that this type of identification has different levels of importance placed on it by different teachers. Their role is, however, crucial in the child's acquisition of literacy skills.

Literacy Acquisition Skills and Teachers

A study conducted by Fang (1996) suggested that there is evidence that teachers tend to teach literacy skills maintained by their own theoretical perspectives, with their beliefs originating from their own experiences of learning at school. Currently beliefs about literacy learning are influenced by Cambourne's (1988) whole language principles. Westwood (1996) claims these beliefs can be influenced and that these student teachers/teachers could consider the importance of explicit teaching by focusing on this type of instruction. Despite his sample size being small (34) his findings suggested that "studying the research evidence and arguments supporting explicit teaching, and highlighting the importance of instruction in word identification and decoding skills in early literacy may well have an impact on teachers' existing beliefs" (p. 16). His results showed there was a significant change in thoughts about literacy learning and teaching after these

students participated in a program that had a focus on explicit teaching of students and showed a preference towards the teacher directed, explicit instruction approach.

Literacy and Opportunities in Life

Literacy is important because of the opportunities it can offer people. According to Grant (1986) it allows them the possibility to make sense of, and to read and reread their experience, both to “take meanings” from the world and also to act and transform that world. Citizenship and social life, families, health, consumer rights, labour force, crime and social welfare were found to be social costs affected by inadequate literacy skills (Hartley, 1989). In Hartley’s report a social cost was defined by “... any consequence which limits, restricts or negatively affects an individual’s participation in society, as well as any consequence which has implications for society as a whole” (p. 7). The implications, therefore, for finding relationships between the acquisition of literacy skills and teaching and learning techniques are of major importance not only for the present but for the future as well.

2.3 SECTION II - LEARNING STYLES

According to Newble and Clark (1986) there are many ways of defining learning style because it can be looked at from different perspectives. There appear to be two different sets of ideas, one from North American literature and the other in European literature. There seems to be a lack of intersection between the two. Focus on identifying basic learning processes or consistent, fundamental individual characteristics is the approach used by the North American literature. In this way the learning style is looked at in terms of information processing strategies or personality traits. For example, Kolb (1984) discusses his theory of experiential learning and its process based on his research in psychology, philosophy and physiology. The other literature is based on educational research within the everyday learning environment. In this case, how students approach a learning task and how this affects learning is observed to distinguish differences and attempt to explain them. For Newble and Clarke (1986) learning style is taken to mean the relatively stable characteristics of a student’s behaviour which displays a definite preferred approach to learning.

Kolb (1984) does not see learning styles as fixed personality traits but as what he has called "... possibility-processing structures resulting from unique individual programming of the basic but flexible structure of human learning" (p. 97). He attempts to demonstrate this with the example of active participation in active tasks that give him performance satisfaction, therefore he prefers active tasks and this further improves his active skills. He writes about his studies of learning from experience. His process of experiential learning draws from the work of John Dewey, Kurt Lewin and Jean Piaget. The focus of his work is based on the ideas of Vygotsky that "learning from experience is the process whereby human development occurs" (p. xi).

Other definitions of learning styles were mentioned by Henson and Borthwick (1984). For example:

Gregorc's (1979), in Henson and Borthwick (1984), had learning styles consisting of distinctive behaviors which serve as indicators of how a person learns from and adapts to his environment. It also gives clues as to how a person's mind operates (p. 234).

Hunt's (1979), in Henson and Borthwick (1984), learning style describes a student in terms of those educational conditions under which he is most likely to learn. Learning style describes how a student learns, not what he has learnt. He narrows this definition by dealing with "how much *structure* the student needs in order to learn best" (p. 27).

Keefe's (1982), in Henson and Borthwick (1984), learning style is the characteristic cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment (p. 44).

He strongly suggests that learning style and cognitive style are not equivalent. "Learning style, in fact, is the broader term and includes cognitive along with affective and physiological styles" (Keefe, 1979, p. 4 as mentioned in Keefe (1982)).

Kuchinkas (1979), in Henson and Borthwick (1984), preferred to use the term *cognitive style* which he defined as "the manner in which an individual acts, reacts and adapts to the environment" (p. 6).

Schmeck (1983), in Claxton and Murrell (1987), defined learning style as
a predisposition on the part of some students to adopt a particular learning strategy

regardless of the specific demands of the learning task. Thus, a style is simply a strategy that is used with some cross-situational consistency (p. 233).

However, Dunn's (1984) definition of learning style is "the way in which each person absorbs and retains information and/or skills; regardless of how that process is described. It is dramatically different for each person" (p. 12).

Other more current definitions of learning styles are "...cognitive, conceptual, affective and behavior patterns that are exhibited consistently over time and task" (Guild, 1994, p. 8). And further to this, as "...characteristic cognitive, affective, and physiological behaviours that serve as relatively stable indicators of how learners perceive, interact, and respond to the learning environment" as described by the National Association of Secondary School Principals (NASSP), (Jordan, 1993, p. 15).

Learning styles are explored in depth in various parts of this thesis. Examples of slippage in the use of these and related terms are reflective of writing in this area. From all of these definitions mentioned above it is apparent that learning styles manifest themselves in the individual's learning attributes and these can range from being easily recognizable to extremely difficult to analyse and interpret. In this research learning styles are defined as the distinctive preferred approaches to learning which prove successful for and are used by the student. The emphasis is on how the student learns. This is consistent with Newble and Clark's (1986) and Hunt's (1979) ideas of learning style.

Children and Learning Styles

In an article by Brown-Haynes (1992) the implications for enhancing reading instruction is discussed in terms of the necessity for schools' curricula to incorporate the different learning styles of students. She discussed the different approaches to overcome illiteracy but believes they have been either unsuccessful or are too costly to continue. She stated "One commonly perceived purpose of schools is to provide students with skills which allow them to read, write and communicate so that they may become literate members of society" (p. 1). This being the case she considered four factors must be addressed, the first being the

nature of learning. She cited studies of the present approaches to the teaching of reading such as the phonetic approach, the whole language approach and the Reading Recovery Program, but noted that each has its disadvantages. Her main point is that it is the accommodation to the different learning styles of students by schools' curricula which will ensure student acquisition of sufficient reading skills. Also, the matching of teaching methods most compatible with students' learning styles and the time and resources to make student learning styles evaluations is essential.

Brown-Haynes' (1992) article was partly in response to George Bush's 1990 educational goals in his America 2000 proposal which suggests hers is mainly an American audience. Her reference literature does not cover learning style studies to back up her opinions for the need of learning styles to be considered in illiteracy.

Corlett (1992), after analysing various studies concerning learning styles, concludes "A decade of research indicates that students do have identifiable reading styles that predispose them to learn with ease and enjoyment through particular learning strategies, methods and materials" (p. 225). Bradshaw (1995) believes there are four reasons why children in Australia are being frequently mislabeled as children with learning difficulties or learning disabled. He stated that they are learning styles, left/right dominance (brain), self-esteem and behaviour disorders. In discussing learning styles he noted "It has been found that some students can identify their own learning styles, can achieve better when taught through their preferred styles and have improved attitudes to learning if permitted to learn through their preferred styles" (p. 15). He did not cite any references, however, to back up this claim. He suggests a student's response to learning is often the result of interaction between learning styles and teaching styles and recommends that the teachers incorporate a number of different teaching styles for the benefit of all students.

Klavas (1994) reports on the use of the Dunn's Learning Styles Inventory (LSI) (1989) to diagnose students' learning styles and the attempt to use the results to improve the low test achievement scores at Brightwood Elementary School, North Carolina. The results had shown that there was a mismatch in the way they were being taught and the way they

preferred to learn. According to the LSI the students were low auditory, highly tactual and/or kinesthetic. The teachers on the other hand were using teaching-by-talking methods. The school decided to change these methods according to the LSI results. The only statistics provided in this report were the outcomes of the LSI for the school being the dramatic improvement over three school years of these students. These students, however, were also maturing mentally during this time and this may also have attributed to the dramatic improvement. There were 17 learning style categories of outcomes for this school. With all these different types of outcomes for different students many of these groups must have intersected for certain categories. It is not discussed, however, how these groups of students were organised so as not to have conflicting teaching styles applied to them. If the students were low auditory can it be assumed that the LSI questionnaires were answered truthfully and with care and, therefore, are the results realistic? The results are fairly general and seem to be very positive but whether they apply to every student in the study is not disclosed.

Adults and Learning Styles

Lovie-Kitchin, Coonan, Sanderson and Thompson (1989) used the Honey-Mumford Learning Style Questionnaire for undergraduate and post-graduate students studying courses in Nursing, Optometry, Podiatry, Nutrition and Dietetics to discern different preferred learning styles across the different disciplines. The findings were presumed realistic and used to predict types of instructional techniques which would be most effective with these students. Thus their conclusions make recommendations on types of classes these students would have a better response to.

These students are older, more mature, and therefore more likely to give realistic responses to the questionnaire. The Honey-Mumford LSQ is based on Kolb's LSI and is based on statements of behaviour with learners showing, for each statement, whether they strongly agree or disagree. It has been used with other tertiary students with high test-retest reliability. However, there are no studies on the validity of the tool except for the originators' own claims of accurate predictions of peoples' behavior in learning situations.

Glasner and Ingham (1992) have examined the positive aspects of learning styles in library sponsored adult literacy programs. They advocate the Dunns' Learning Styles Model (1983). The only reference cited is the Dunns' and Price Productivity Environmental Preference Survey (1982). They explain that they believe learning styles to be ... " a combination of physical, emotional and cognitive characteristics which determine how each person learns best" (p. 218). These include, according to Glasner and Ingham (1992), learning environment, emotions, types of groupings, time of day and psychological factors.

They mentioned, when discussing learners' emotional approaches, conforming and non-conforming students. The 'conforming' students tend to do as they are told or directed to do and the 'non-conforming' prefer to do things on their own without direction. These two groups sound similar to Munro's (1993) two groups of students where one of the groups prefer direction and the other group preferring their own management and direction in learning. Another similarity to a statement made in Munro's (1993) article is that they mention "The mere awareness of learning style makes a difference for the student's self-awareness, achievement and persistence in the program" (p. 221).

Munro (1993) examined a model of individual ways of learning and its implication for mathematics learning. In this paper he did not refer to these as learning styles but as preferred ways of learning. In a later article (Munro, 1996) he refers to them as cognitive styles. He proposed that students have access to several alternative ways for representing mathematical ideas. These *representations* are :

- | | |
|----------------------|-------------------------|
| 1. Verbal/linguistic | 2. Logical/mathematical |
| 3. Visual/spatial | 4. Body/kinesthetic |
| 5. Rhythmic | 6. Affective/mood |
| 7. Interpersonal | |

By the student/learner knowing which representation they learn best by Munro (1996) claims they can develop a management, or control mechanism, by which they can switch between alternative ways of representing an idea. From previous studies he states it is seen as an aspect of metacognition, "...an awareness of how they feel about these ideas and how

they prefer to learn them” (p. 346). He also added that students could draw on two or more ways of coding an idea at once, but often one of the ways dominates.

The implications of his model are for teachers to try and use some of these representations when teaching an idea, and possibly get students thinking in different ways about the idea. The implications for students are to get them to monitor how they learn best and understand their own preferred ways of learning mathematical ideas. Teachers could also benefit from this knowledge. He claimed that it is the mismatches between teaching styles and learning preferences that can lead to difficulty in learning mathematics.

Munro (1996) further discussed how one aspect of cognitive style explains mathematical learning difference, which is the differences in the *codes* students use. The two main encoding systems are verbal-propositional and non-verbal imagery. The model represented in this article elaborated the two main types of *codes* into similar *representations* used in his 1993 article model only this time they are called codes and there are only six (there is no interpersonal code). The implications in this paper, though, have not changed and he still believes that “A mismatch between preferred ways of learning mathematics and the demands of mathematics curricula can occur throughout a child’s learning history. It can lead to on-going mathematics under achievement and the display of learning disabilities” (p. 22). This last point seems to be in agreement with Bradshaw (1995), on page 13 of this research paper.

Modality styles, a dimension in learning styles which reflects whether a student learns more effectively through seeing, hearing, or touching, was tested in a study by Kampwirth and MacKenzie (1989). Fifty-one students aged from 7 to 9 were given a series of tests in order to assess the relationship between modality styles and reading achievement. The students all belonged to two first grade classes with no special reason for being chosen. Four of the tests were part of the auditory and visual subtests of the Swassing-Barbe Modality Index (SBMI) and Auditory Sequential Memory and Visual Sequential Memory subtests of the Illinois Test of Psycholinguistic Abilities (ITPA). It is interesting that the other two tests

were of nonsense words given after a teaching session that was either primarily auditory or visual. These would show, if the advocates for modality strengths are correct, that the visual modality preference children should retain more of these words when presented visually than when presented in an auditory manner and vice-versa.

Their statistical analysis, Pearsons product moment intercorrelations of the six tests, showed no significant interaction between modality preference and reading achievement. The results of t-tests though did demonstrate particular modality strengths, on either SBMI or ITPA or combinations of the two, and it was found they did retain more nonsense words when they were taught according to their modality strengths.

On the whole their data suggested that even knowledge of the preferred modality of children was not useful in predicting whether the child will learn to recognize 'nonsense' words when taught according to their modality preferences. In fact the reverse was found in some combinations of tests. In summary, they found "Effectiveness of teaching is likely to be based on considerations other than children's modality preferences" (p. 26). Kampwirth (1981) has taken part in other studies that have also shown no support for modality-method hypotheses contained within these studies. This particular study does not disclose what the 'nonsense' words were so there is no indication of how nonsensical they were and they may have been incoherent groups of letters too difficult for the students. It is understood, though, that these nonsense words were meant to represent 'new' words.

Learning Style Inventories

Research involving learning styles has produced various Learning Style Inventories that have been created to aid in the assessing of learning style preferences. Giles (1995) insists "The inventories are not intended as cook books for classroom use or as owners' manuals for the brain. Inventories provide information for teachers, helping them organise instruction" (p. 4). Some that have been developed are the Canfield Learning Styles Inventory, Learning Style Inventory (LSI) [Price Systems Inc.], Learning Preference Inventory and the Honey-Mumford Learning Style Questionnaire. One that has been

encountered often through the studies of others, and was used in this study, is the Learning Style Inventory [Price Systems Inc.] by Dunn, Dunn and Price (1989). The purpose of this instrument was to identify those elements that are critical to an individual's learning style in the aid of prescribing and identifying elements critical to an individual's learning style and how they prefer to learn. It caters for school children in years 3 to 12 in the United States of America.

Some critical reviews have been made of the Dunn, Dunn and Price LSI. Hughes (1992) criticised the authors' failure to provide a clear based definition of learning styles which she claims results in difficulty in establishing the content and construct validity of the LSI. She believed the 22 scales used do not possess adequate reliability to make the type of diagnostic decisions for which they recommend will be the use of the test. She also claimed there is a great lack of test-retest data. Hughes was not convinced there is enough research to support individual learning styles model. The only one she was willing to consider, because there is some founded validity available for it, is Kolb's Learning Style Inventory (1976). This instrument may be a little difficult to understand, though, by younger students.

In contrast, Westman (1992) makes some positive comments about the Dunn, Dunn and Price LSI such as "factors are well described and interpretation is easy" (p. 461). Though not as critical as Hughes, Westman described that the ease of use and reliability of this LSI can be questioned as well as its cost. She also mentioned some obscurity in the statistics used and provided. She did admit, though, that "The LSI provides some good indices on aspects of learning style." (p. 462) as well as suggesting to look at other learning style indicators that are cheaper and less awkward to use.

Dunn (1984) put forward the reason for no 'hard data', that is, no statistically sound data, being provided for the learning style instruments is because of the time factor that these experimental studies would take. She also stated that there is then the barrier of trying to get this information published. On the other hand she admitted that tests should be reliable

and valid, “It is important to use a reliable and valid test or the data it yields may be inaccurate and potentially harmful” (p. 12).

Dunn, Griggs, Olsen and Beasley (1995) were aware of critics of the learning style movement and carried out research, a meta-analysis, of 42 studies conducted during 1980 and 1990 based on the Dunn and Dunn Learning Style Model. In this research they did quote some statistics suggesting the outcomes of the majority of the studies were valid with findings indicating that the matching of students’ learning style preferences with classroom educational factors accommodating these preferences is advantageous to the students’ academic achievement. Six of the studies, though, displayed serious problems in validity.

These researchers answered some of the critic’s accusations of lack of reliability and validity by pointing out that in a comparative analysis of nine different instruments used to measure learning style preferences their LSI had good or better reliability and validity than the others used to assess learning style. One could ask how sound the other eight instruments were. To critics that were concerned that learning-style studies may be biased because they were conducted under the Dunns’ direction they claimed that the studies included in this research were conducted under the direction of 36 different researchers at 13 universities and that “Neither the identity of the researcher nor the researcher’s university was a statistically significant moderator of the effects” (p.359, Dunn et al.).

Learning Styles and Different Cultures

When applying learning styles to a person’s culture Guild (1994) believes that testing a particular group for style will almost certainly result in diversity. She claims “...the ethnicity of a person is not a forecaster of learning styles, but the cultural norms and values prevalent in the person’s experience would be inclined to shape some of his or her behavior” (p.10). Many cultures, for example Aboriginal students, are part of the Australian education systems. Hughes (1990) believed these education systems must recognise that Aboriginal students are in the classrooms and cater for “the different teaching methodologies that will allow their Aboriginal students to learn” (p. 6). He stated that, in

general, Aboriginal people think in a holistic way in contrast to non-Aboriginal society that prefers to function on the whole in a more fragmented way. He realises the non-Aboriginal empirical style cannot be completely changed but that a balance between the two should be promoted.

He spoke of a number of Aboriginal cultural attitudes and aspects that affect the classroom situation that are different to non-Aboriginal attitudes. He re-emphasized that this does not apply to all Aboriginal people but one imperative question which needs to be asked is: "In the key areas of literacy and numeracy how much does the different learning style affect the acquisition of these skills?" (p. 11). Hughes provided no evidence of any kind about what he had discussed except for his own personal experience and strong feeling.

2.4 SECTION III - LEARNING STYLES AND TEACHING STYLES

Matching teaching styles with learning styles has been the subject of considerable debate over the last two decades or so. Both sides of the debate, though, would contend that investigation into these styles, and the benefits of matching them, need to be considered thoroughly. There has been some debate as to the validity of learning styles, and whether teaching styles should attempt to cater for the different learning styles of students. Jonassen and Grabowski (1993) claim that it "... is desirable to adapt the nature of instruction to accommodate differences in ability, style, or preferences among individuals to improve learning outcomes" (p. 19). Behind their claim, though, are underlying assumptions that different learning outcomes require different learning skills or abilities and that individuals differ in their abilities to process information, construct meaning from it or apply it to new situations. Intelligence, Hyman and Rosoff (1984) would definitely claim, is an important factor as well. Cornett (1983) would argue that "... all people possess ways to learn despite their ability levels" (p. 27).

Much of the literature that encouraged matching styles discussed the awareness of learning styles of both the teacher and student. Because the teacher has had more experiences, the teacher's learning style will have greater variation than that of the student. This was found

by Cornett (1983) who also found evidence that showed teaching style influenced learning style. Considering whether teaching styles have some influence on learning styles Kuchinskas (1979) and Coop and Sigel (1971) found some modifications in the cognitive styles of students based on the cognitive style employed by the teacher. Cornett (1983) tended to agree that one should know their own learning style and that learning style is dynamic over time and during daily interactions. She also acknowledged that, even though being aware of learning similarities allows us to structure general learning experiences, each student will approach these general learning experiences in personal individualised ways.

When it comes to matching teaching style to learning style Haring (1985), whose paper was very similar to Cornett's (1983) research, found that it would be undesirable and unrealistic even though Marshark (1979) found in certain circumstances the probability of student success can be increased. Haring based this on the findings of Hunter (1979) who reported that, while certain teaching styles have a relationship to student grades, the matching of these styles do not appear to have a significant effect, and the findings of Cotterell (1982) whose review of twenty-three studies of matching and achievement, found that seven failed to show any relationship and sixteen showed only moderate support for matching. He found little research that displayed some outcomes for matching styles and concluded that matching would be "... most beneficial in remedial and developmental work" (p. 14).

Farrell-Moskwa's (1992) study found that, although there was a negligible relationship between learning styles and academic achievement, there was a relationship between certain learning styles and academic performance when considered on an individual basis. Because of this result she believes that "...as educators we need to differentiate to meet the needs of our students" (p. 14). and that we "...need to teach to our students' learning preferences so that they will learn more efficiently and attain higher academic success" (p. 15).

A common finding in studies matching teaching style and learning style was the problem of the multiplicity of ways that this matching could occur in. This would present a deluge of work for the teacher beyond the scope of the classroom time or resources. Cornett (1983) concluded the value of using matching as the most effective means of maximizing individual development and creativity is debatable. But she also conceded that a matching mechanism is already in place if we accept Hunter's (1979) definition of teaching as "... the process of making and implementing decisions before, during and after instruction to increase the probability of learning" (p. 39).

Ellis (1979) approved of the idea that focuses on developing a variety of teaching styles, that teachers can possess, or have access to, producing a number of learning environments that will eventually match the learning styles of the students. Again there appears to be a multitude of possibilities in the teaching style/learning style combination. Henson and Borthwick (1984) advised that when considering these approaches the practitioners "...should proceed carefully, and only after their specific goals have been clearly identified" (p. 7). They discussed matching teaching styles with learning styles from a historical point of view. They stated that the first significant study regarding teachers' behaviour affecting learner accomplishment was carried out by Carroll (1963). Since this study other researchers have led to the development of different learning systems and programs. Many of the results tended to display "that individual learners have their own preferred learning styles and that teachers have some responsibility for gearing up their teaching styles to "fit" the preferred learning style of each learner" (p. 4). They discussed the attempts at categorizing learning styles and teaching styles and attempts to match the two. They iterated that some studies have shown that the important aspect of matching these two is to question whether the change is beneficial to the learner.

Fischer and Fischer (1979) believed that the capability of change in human behaviour allows for the manipulation of both teaching and learning styles but they also pose the question "Will this change help or hinder the learner in developing toward autonomy?" (p. 254). Hunt (1982) feels it would be useful to consider the learning style of a student as a strength to enrich upon.

Doyle and Rutherford (1984) conceded that there are fundamental differences among students' learning, "Learners differ in a variety of ways and these differences are likely to influence how they respond to and benefit from a given instructional method or program" (p. 20). They concluded, though, that "There is little reason to expect that one dimension of learners, such as style, will account for a large amount of the variance in achievement" (p. 24), and question the quality of instruction that matching would produce. They claimed teachers may not have adequate preparation in the instruments involved to begin to match teaching styles and learning styles and also mentioned the generation of thousands of

possible combinations of matching. The practicality of the classroom would make the task of matching difficult.

They quoted Cronbach and Snow (1977), among other studies that found little significant effect on achievement, whose results indicated that matching did not improve learning and could be detrimental. In contrast to this they also mentioned existing research which suggested "...an important practical interaction between the academic ability of students and the degree of structure provided by instruction" (p.22). Clearly they indicated that learning style cannot be the sole basis for designing instruction and question the clarity of how the styles of students and teachers affect achievement.

In a similar argument, Hyman and Rosoff (1984) claimed there are problems with the learning style paradigm. Firstly, after mentioning several definitions of learning style produced by learning style based education advocates, they concluded learning style definitions are flawed because they felt "... we are left without a clear and readily usable concept of learning style" (p. 38). Secondly, they believed there was a three-way connection between teacher, student and subject matter and stated "Teaching is thus a triadic relationship made up of three critical and constant elements: teacher, student and subject matter" (p.38). They suggested it would be misleading to conceive teaching as a dyadic relationship between the teacher's and student's learning style only because the paradigm omits consideration of subject matter. They found this inappropriate theoretically and realistically. In support, Smith (1963) claimed that teaching requires us to look at subject matter, it requires more than just a focus on the student.

Finally, Hyman and Rosoff (1984) believed that the action strategies and unintended consequences of following the learning style paradigm are undesirable. They did, though, propose some recommendations they felt would yield acceptable possibilities of matching teaching style with learning style but it is not as simple as some learning style based education advocates would have others believe.

In an opposing view, Smith and Renzulli (1984), while they conceded “Despite years of searching for *the* definitive teaching approach, educators have come to realize that there is, in fact, no such entity” (p.49), they still believed that increasing the variety of instructional techniques that are used in the classroom may improve the quality of instruction. This was in agreement with Joyce and Hodges (1966) who suggested that a wide range of teaching styles would accomplish more in the classroom than few teaching styles being practiced. In accordance Friedman and Alley (1984) supported the use of learning style instruments for increased learning via “individualization of the learning process” (p. 81). They based this on the results of five representative cases that were found useful by entire districts in the Wichita, Kansas area. More (1993) produced a report on learning styles and integrating these learning styles into teaching. He regarded teaching style as “...providing a teaching situation in which a particular learning style is emphasized” (p. 10). He viewed the relationship between teaching style and learning style as analogous to the relationship between learning and teaching, this may be considered very simplistic and unrealistic by other researchers.

Corlett (1992) suggests the need for more effective educational programs to cater for learning styles to specifically benefit the at-risk culturally different student. She bases this on research findings that revealed a serious mismatch between learning styles of Native American, Afro-American and low income white students and the current teaching style of beginning reading (p. 224). She also claims from these findings that mismatching student learning styles with instruction can have an adverse effect on a student’s physical state leading to stress.

Jordan (1993) has explored learning and teaching styles research and their manifestations in the middle school classroom to find that “Studies document how well students learn when their personal learning styles are targeted and how poorly that performance becomes when the methods selected do not complement those idiosyncratic modes of cognition” (p. 3). She also calls into question the benefit of this type of research and its findings. She questions the self-interest of the researchers, the true intention of the researchers’ motives:

are they for personal academic achievement or in the name of scholarly benefits? , and whether there are only short lived gains in the research. Whether matching is the only reason for the positive outcomes to students' learning has not been researched enough either. She also concedes that in the studies she has looked at "There is scant evidence that matching instructional strategies to students' preferences is the sole reason for the product outcome" (p. 13).

In her summary, and to finalize the literature discussing teaching styles and learning styles. Cornett (1983) probably stated it best when she declared there are no right answers only right questions with indefinite answers. She asked, "Matching for what?" and believed only an educator can ask the right questions and make considerations that take into account the goals of matching: to improve attitude, decrease anxiety of learners and strengthen a particular cognitive style.

2.5 CONCLUSION

Considering the question proposed by this study, "*Is there a match or mismatch between students' learning styles and the teaching styles in the classroom and is this affecting the learning progress of the students?*", the literature researched displayed that, although matching of styles can have varied outcomes, the intention of this type of research is based on positive outcomes for learners. Much of the research discussed used learning style inventories appropriate to their study to ascertain learning styles of teacher and students as was the procedure in this study. The implications of this type of research would, at least, improve understanding for teachers who constantly encounter different learning situations, and, at most, highlight the kind of assistance needed by certain students.

CHAPTER THREE

Methodology

3.1 DESIGN OF THE STUDY

Introduction

The study aimed to establish whether there was a match or mismatch between children's learning styles and the teaching styles in an upper primary school classroom. It was important, therefore, to find the learning styles of both the teacher and the students so some comparison could be ascertained. The teacher's learning style was required because of its impact on the teacher's teaching style as, according to Cornett (1983) "...whatever the teacher's learning style, it will have an effect on his or her teaching style" (p. 14).

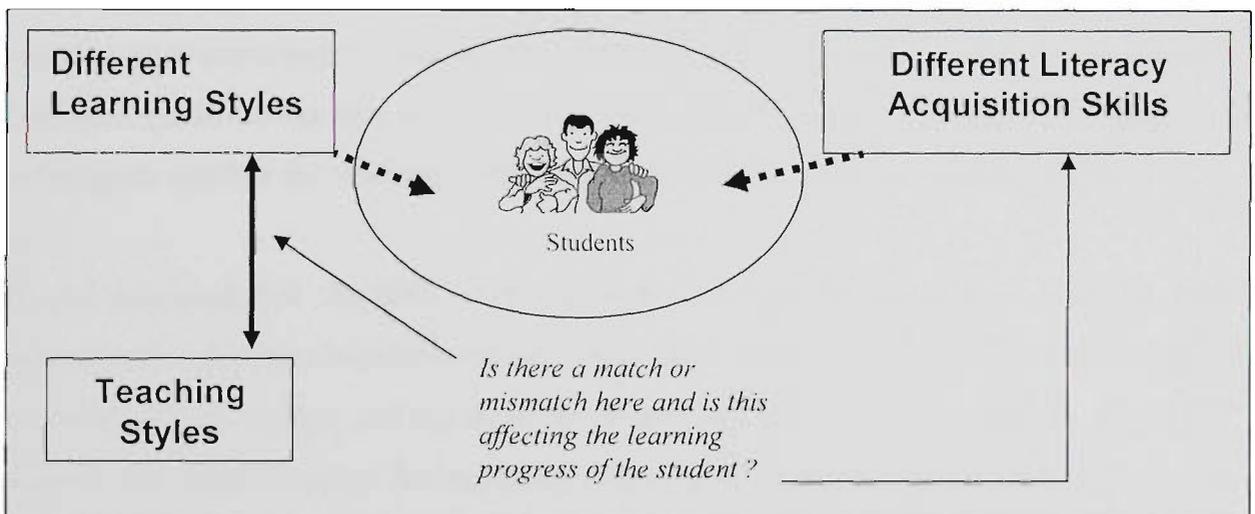


Figure 3.1 : The Conceptual Framework for this research

This research was concerned with the learning styles and literacy acquisition skills of students and the teaching styles in the classroom. If the above conceptual framework is considered the students all possess different literacy acquisition skills and learning styles. It can be considered that teaching styles are interacting with the students' learning styles, but what is the result of this interaction? The questions that arose from this conceptual framework were 'Is there a match or mismatch between students' learning styles and the teaching styles in the classroom and is this affecting the learning progress of the students?'

Once the conceptual framework was established the collection of appropriate data needed to be carried out. In order to answer the question proposed, two types of data needed to be collected:

1. Learning style data which would display the learning styles of the students and of the teacher and also establish teaching styles.
2. Students' literacy acquisition skills data which would display their literacy acquisition skills' abilities and assisted in establishing a group to study. Also by using this data implications, if any, could be found from the match or mismatch of learning styles and teaching styles.

In preparing for the design of this study the emphasis was on gaining some insight about several students with different literacy acquisition skills and their respective approaches to learning. In particular, the study would firstly investigate whether these approaches to learning were consistent for that individual student. The experimental design was then to find these preferred learning styles and the teaching styles in the classroom, and further investigate whether the teaching styles complimented the students' learning styles.

It was proposed that the data collected would not only be quantitative, such as tests assessments and questionnaires, but also qualitative. The qualitative data would consist of observations, written and taped, of the class collected by the researcher. Tests and assessments would be used for acquiring literacy acquisition skills information about the students. This would assist in the selection of the small group of students who would be in the focus of the study. Other questionnaires that would be completed by the class and teacher would provide information about how individuals preferred learning in the classroom. This information, as well as all the qualitative data collected, would assist the researcher in attaining some knowledge of the preferred learning styles of the students and teacher.

Data Collection

It would not be necessarily easy to identify learning styles and literacy acquisition skills of students without spending considerable time in the classroom and analyzing many classroom experiences with them. This was demonstrated by Kamler and Woods (1987) who spent a considerable amount of time, two years, in the classroom as participant

observers. In this research there would be no participant observation. Therefore to produce a good description of the students' behaviour, and so as not to interfere with their learning, non-participant observational techniques were mainly considered to collect data. The following data would allow the researcher to obtain the best possible idea of learning styles and literacy acquisition skills of the students and teacher without being obtrusive to the classroom and would fit within a reasonable research timeframe.

Field Notes for each Student

These were to include observing the student's actions and language and noting these. The actual dialogue would be caught by tape for later analysis. This was to be an attempt to document student behaviour and learning characteristics and anything that was especially noticeable about these students. It was also an attempt to observe as many different teaching styles as possible that were used in the classroom. This was of equal importance in this study.

Texts

Pieces of work - writing, drawing, art work and so on - created by the selected students during observation. The output of the student was useful in displaying different types of learning abilities.

Audio Tapes

These were used to keep an accurate record of dialogue of the students and the teacher. They were to be in operation during any observation and interviews. These would assist in capturing more accurate sound when the video recorder cannot. This dialogue would then be transcribed and analysed as needed.

Video Tapes

These were to be used to film the student's actions, motions, gestures and expressions during observation. They were also to be in operation during any interviews. These tapes would be transcribed for further details of learning situations.

Interviews

Only one interview would be conducted with each of the selected students to consider and discuss any outcomes of a particular lesson. This data would only be used if it was considered relevant for the learning style-teaching style relationship data.

Written Student Profiles from Teacher

These were to be obtained partially from the teacher and partially from my own investigation regarding the students' backgrounds. These were principally for establishing the students' academic performance and help to produce a summary of literacy acquisition skills.

Reading Tests

The Australian Council for Educational Research (ACER) TORCH Reading tests would be used to measure reading comprehension abilities of the whole class. These tests were recommended by the co-supervisor of this research as a reasonable indicator of reading skills. According to Mossenson, Hill and Masters (1993) it would give the students "the opportunity to demonstrate the depth and breadth of meaning they are able to glean from the text" (p. 2). These would also be used in the summary report of literacy acquisition skills of the students.

Learning Style Questionnaires

It was important to acquire just as much information about learning styles as literacy skills because this information would later be compared with teaching style data. An Australian Council for Educational Research (ACER) Learning Preference Scale Questionnaire, Barnes and Owens (1992), would be administered to the whole class because the results of this questionnaire demonstrated attitudes towards cooperation, competition and individualism in the classroom. This was related to a student's approach to learning and considered appropriate to the research. It was chosen firstly because it could be used by upper primary students and not be too difficult for them. Being an ACER publication it was easy to obtain and reliable. There was also selected research by the authors Barnes and Owens (1979-1990) and other researchers which produced clear and significant results concerning learning preferences. It had the added advantage of easy and non-time consuming administering, scoring and interpretation of the output. It also contained a Learning Preference Scale questionnaire for teachers which was appropriate in this research.

Some type of Learning Style Inventory (LSI) needed to be used in the study, and the ones available to the researcher were all directed at secondary school students and adults, for example the Mumford LSI and the Myer-Briggs PSI. An LSI used in some research

mentioned in the literature review by Dunn & Dunn (1989) was obtained. This was the only one found appropriate to the upper primary school level. However its reliability was in doubt and the 1992 Eleventh Mental Measurements Yearbook, Kramer and Conoley (1992), had some critical reviews of this LSI, these will be discussed later. At this stage the need for the students to understand the LSI superceded the need for its reliability. It is possible that all LSI's have some unreliability to a certain extent because of the degree of veracity in the answers collected and the interpretation of these by the LSI. Woolfolk (1980) cautions, "Results should be interpreted cautiously since student responses to these questions often change from week to week" (p. 151).

3.2 PROCEDURE

Selection of the Group

The original aim of the project was to choose a group of six students after observing the class for a period of time. This research was concerned with the regular classroom which meant children without any apparent physical or intellectual disabilities. The class was to be at the grade 5 / 6 level, and the selected group would have an equal number of boys and girls in it with an equal distribution of literacy skills from above average to below average. English Speaking Background (ESB) students were to be chosen to eliminate difficulties in distinguishing between difficulties in language and problems experienced in literacy acquisition skills. As mentioned earlier the upper primary school level is a crucial transition stage because of the amount of learning that occurs in these years. The research would be conducted in 1995.

Data Collection

It was intended that this would be a combination of quantitative and qualitative research using observation as one of the main processes or techniques to collect data. This was so as to inhibit interference with the class and to be as discrete as possible. The observations were to aid the acquisition of the students' literacy skills and also gain some knowledge of their learning styles. Other literacy indicators would be an ACER Reading Test and results from other class work and tests. Learning style information would be sought from the ACER Learning Preference Scale Questionnaire by Barnes and Owens and the Dunn, Dunn and Price Learning Style Inventory (LSI).

It must be stressed here that a learning preference and a learning style can be defined as two different things and, in the context of this research, are not the same. Learning styles, in this research, are learning traits and are considered to be part of learning which is a complex process to define (Jonassen and Grabowski, 1993). They are the ways in which a learner prefers different types of learning and instructional activities. Jonassen and Grabowski (1993) add, "These styles are generally measured by self-report techniques that ask individuals how they think that they prefer to learn" (p. 5). This definition is appropriate to this research because learning style inventories would be used to find out the learning styles of students. They are not directly connected to mental abilities but to the general learner perceptions of their own preferences. The learning preferences discussed in this research refer to the Barnes and Owens' *ACER Learning Preference Scale Questionnaire* learning preferences cooperation, competition and individualisation, and the outcomes of their research. These scales were used because their outcome was useful for suiting modes of classroom activities to student preferences and for investigating the dynamics of learning in the aptitude-treatment interaction.

(i) General Observation in the Classroom

General observation in the classroom was to take place for approximately a week. The purpose of this was twofold. Firstly, the researcher would be able to become familiar with the daily routine of the class, what procedures took place and when, and what activities would be focused on. Secondly, the students would begin to get used to the observer's presence in their classroom. No technical, video or audio, recording would take place at this stage. As stated, this was to be a familiarization with the class schedule and would consist of anecdotal reporting only. This was to get a feel for the classroom and would be a surface observation.

(ii) Determining the Group

Students would be chosen from the class in order to form the group that would be observed individually. Teacher profiles of all students would be obtained and the reading tests would be given to the students to distinguish and determine the students for the observation group. At least three of the group would have between average to good grasp of literacy skills according to the normed test, and the other three would possess problems in literacy acquisition skills, as described in the literature review of this thesis. Both groups were important because their learning styles would be the focus of the study. The

students would be informed that they would be observed but it would not be disclosed that it was based on their past academic performances.

(iii) Observation

Teacher

The teacher's learning style was of equal importance. Time would be taken to observe the 'learning styles' that the teacher used in the classroom. The way the teacher preferred to learn may be reflected in the methods of teaching. Haring (1985) claims from his and other research that "... we tend to prefer to teach the way we prefer to learn unless we make a conscious effort to do otherwise" (p. 7). Considering this the teacher would be asked to complete the Learning Preference Scale and a LSI. This procedure was carried out in order to compare or match the learning and teaching styles of the students and teacher and contrast the resulting student learning outcome.

Students

After the group was selected each student in the group would be observed individually for a period of time to discern learning styles. After this preliminary observation the Learning Preference Scale and LSI would be administered to each student in the group. This would assist in confirmation or rejection of the observation data. The students were then to be observed individually as before. Making note of the amount of time that students took to complete certain exercises, collecting pieces of work and observing actions would be carried out for the first few weeks. Notes were to be taken and technical equipment such as video and tape recorders was also to be used. All of this above procedure would be carried out in order to obtain a close as possible learning style profile of each student. Interviews might also need to be carried out at the end of this observation period if it was considered necessary and if the researcher felt more information was necessary concerning the students or the teacher.

(iv) Periods of Observation

To make the data collected more manageable observation was to be undertaken only at certain times of the school day. To try to constantly observe the whole day for weeks would have produced an overwhelming amount of data that would be beyond the scope of this particular research. Specific lessons, when students would be utilizing their literacy skills, would have to be discerned and these were to be the times that observations would take place. These periods of time would be identified during the general observation in the classroom. They might only consist of a few hours a day. It was anticipated that a week would be spent on each student selected.

Research Design Summary

The proposed research design is summarized in the following table.

Table 3.1 Proposed Research Design Summary

Procedure	Data to be Collected	Objectives
<ul style="list-style-type: none"> ◆ Determine 6 students to be in group to study from literacy skills acquisition performances- <ul style="list-style-type: none"> ▪ Equal number of boys and girls ▪ Equal distribution of literacy skills (above average to below average) ◆ Carry out LSI to establish learning styles of students. ◆ Carry out an LSI to establish learning and teaching styles of teacher ◆ Use observation techniques to study learning styles of teacher and students 	<ul style="list-style-type: none"> ▪ Observational - notes taken during class ▪ Pieces of students' work - text, etc. ▪ Video and audio tapes of students in classroom ▪ Various test results ▪ Interviews ▪ Written student profiles from teacher ▪ Torch Reading Test results from students ▪ LSI results from students and teacher ▪ Learning Preference Scale results from students and teacher 	<ul style="list-style-type: none"> ◆ Familiarity of daily class routine to establish appropriate times to make observations ◆ Establish researcher's presence in classroom ◆ Determine appropriate group of students for study according to literacy acquisition skills abilities ◆ Establish learning styles of students in group ◆ Establish learning/teaching styles of teacher

This procedure was the intended method this research would use in order to find various data needed for the production of results that would investigate the research questions. The actual treatment of the research followed the general proposed research design. The objectives were achieved as planned. Although, as described in the following, the amount of data collected for each student was extensive and the number of students was reduced to four. This enabled more in depth analysis of the data collected.

3.3 TREATMENT

Finding a School and Applying for Permission to Conduct Research

The choice between independent and government school was made in the light of the current education climate at the time, 1995. There was a certain amount of teacher unrest and uncertainty at the time, and it existed to a greater extent in government schools. This was due to the closing of smaller government primary schools, increasing class sizes and the introduction of the Learning Assessment Project (LAP) tests among other factors. It was apparent, and also suggested, that an independent or catholic school could provide a more settled environment during the anticipated research.

Two catholic primary schools geographically close to the researcher's home were firstly considered and a letter of introduction was sent to the respective principals of these schools. A reference letter of support, a proposed schedule of observations and the research proposal were also attached to this letter. One of the schools was approached and, after several meetings at the school, ethics committee approval from the university was granted for the researcher to reside in an upper primary class room and conduct this study.

Data Collection

The general class observations took longer than the original one week intended. These observations went for twenty-two school days in total and took place over six months. The reason for this, firstly, was the researcher's time constraints due to personal commitments which produced non-consecutive days of attendance. Secondly, because of this familiarization was slower than intended, but was well worth the time spent because the introduction of video taping later was not treated as intrusive and adaptation did not present any difficulties to the students. A large amount of information, pertaining to relevant lessons worth video taping, was collected during this time which was advantageous. Finally the teacher was welcoming and had no objection to research being conducted in his classroom.

The research was conducted throughout 1995 during the four school terms. In total about 36 days were spent in the classroom. Table 3.2 shows the actual observation schedule. General class observations, which took up two-thirds of the time spent in the classroom.

were hand-written anecdotal observations of the whole grade 5 / 6 class, including the teacher. These observations began to focus on the students who might be selected. They also aided the researcher's knowledge about class routine, student names, student competencies, student characteristics, their strengths and weaknesses, teacher routines and it assisted in the acceptance of the researcher's presence in the classroom.

Day	Date	Observation Activity
1	Thurs 16 Mar	General class observations, written, no taping
2	Fri 31 Mar	
3	Wed 5 April	
4	Tues 6 June	
5	Wed 7 June	
6	Thurs 8 June	
7	Tues 13 June	
8	Thurs 4 Aug	
9	Mon 7 Aug	
10	Tues 8 Aug	
11	Wed 9 Aug	
12	Thurs 10 Aug	
13	Tues 15 Aug	
14	Fri 18 Aug	
15	Mon 21 Aug	
16	Mon 18 Sept	ACER TORCH Reading test (1st administering)
17	Wed 20 Sept	
18	Thurs 21 Sept	Learning Preference Scale Administering
19	Mon 9 Oct	
20	Tues 10 Oct	
21	Wed 11 Oct	
22	Mon 16 Oct	
23	Tues 17 Oct	ACER TORCH Reading test (2nd administering)
24	Thurs 19 Oct	Pilot VIDEO Session 1: Group of 7 boys & VIDEO Session 2: Group work - Maths VIDEO Session 3: Lego Dacto lesson
25	Tues 24 Oct	VIDEO Pilot - 15 minutes of art class
26	Wed 25 Oct	VIDEO Session 4: Decimal place values - Maths and interviews
26	Wed 25 Oct	VIDEO Session 5: Maths task Centre
27	Wed 1 Nov	VIDEO Session 6: Listening exercise
28	Mon 20 Nov	VIDEO Session 7: Listening test VIDEO Session 8: Division of Decimals VIDEO Session 9: Integrated studies-Pulleys demo
29	Tues 21 Nov	VIDEO Session 10: Watching <i>Behind the News</i> (BTN)
30	Wed 23 Nov	VIDEO Session 11: Maths Task Centre
31		
32	Tues 28 Nov	VIDEO Session 12: Library - Christmas Cards VIDEO Session 13 BTN watching/listening exercise
33	Wed 29 Nov	VIDEO Session 14: Religion - working in pairs VIDEO Session 15: Mental Arithmetic
34	Thurs 30 Nov	VIDEO Session 16: Sequencing exercise
35	Wed 6 Dec	BTN re-showing watching/listening exercise
36	Mon 18 Dec	Administering of LSI

Table 3.2 Actual Observations' Schedule 1995

One hundred and sixty hand-written pages of observational notes were collected. These notes were extremely valuable later when searching and analyzing for learning and teaching style data. The researcher observed the class from different vantage points of the classroom, most frequently sitting in a corner of the room. During the year the student's

table arrangements changed so it was necessary for the researcher to move around to be in a position to see the students and teacher. The students did not sit at their tables all day during lessons, nor did they stay in the same classroom everyday for lessons. Lessons, which consisted mainly of chalk and talk, group activities and private study, were conducted with the students either at their desks, sitting on the floor in front of the teacher, or with a different teacher in another room. There was also a library lesson and a computer session once a week as well as an half-hour watching of an ABC program called Behind The News (BTN).

Selection of the Group.

This Grade 5 / 6 class did not contain any students with apparent physical or intellectual disabilities. It had a 40:60 spread of grade 5's and 6's, and a fairly equal spread of male and female students. The class had a 50 % Non-English Speaking Background (NESB) background but the main language spoken at home was English for most of the students. By the end of the general observations the researcher had managed to locate four students to be part of the observation group. The reading tests, as well as the teacher profiles, only confirmed the choice. The number of students changed from six to four to facilitate the handling and accumulation of data. The reduction in number of the study group provided more in-depth analysis for each student.

There was an equal spread of gender in the group as well as literacy acquisition skills. The four students selected for the group were not informed that they were the focus of the study because it was not necessary for them to perceive themselves as being singled out for any reason. Intrusion was to be minimal, if possible, so as far as they were concerned they were part of a whole class that was being observed. The four students chosen, Shane, Naomi, Luke and Debra (pseudonyms), represented a cross section of the academic performance of the classroom.

Observations

For the purpose of not appearing to focus too much on the selected group they were always observed in mixed groups and all tests and questionnaires were given to the class as a whole. The TORCH reading test results, (chart 4.1, page 55), confirmed the choice of the selected group decided by the observations. This chart displayed their reading and

comprehension abilities as compared to the rest of the class and showed that this group of four students had an equal distribution of literacy skills from above average to below average. Anecdotal notes were taken in regard to the students' actions, use of language, and the way they listened, reflected and recalled what was being taught to them. This occurred throughout the day for no set periods of time.

Video taping began when the equipment became available to the researcher. Sixteen video sessions were recorded of different lessons involving the four selected students. Because of previous observations and familiarity of class routine specific lessons were chosen to video in order to display approaches to learning and literacy acquisition skills. During this time the teacher was also observed because his learning and teaching styles would be juxtaposed with the students' learning styles to see if there was an affect on the students' learning progress. Only one interview was conducted and recorded by video after a particular mathematics lesson. Two of the selected students were asked about what they had learnt in that lesson.

Recording and Data Collecting

All anecdotal notes from the general observations, one hundred and sixty pages, were hand written in a field observation note book and two of these books were produced in total. A typical page of the note book was divided into two main columns. The first column was intended to observe the reaction of students to what was happening in the class. The second column had a time reading and a description of the lesson or what was happening in the class at the time, this is displayed in figure 3.2. See appendix 1 for an extract of the Observational Notes.

Figure 3.2 Extract of Observation Note Book

<i>Student's response or reaction to lesson, etc</i>	<i>Time</i>	<i>Lesson content and happenings</i>
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Any relevant handout sheets and pieces of work were collected and kept with the observation notes for the day. Any spoken dialogue was written down in the anecdotal notes if possible.

3.4 DATA

All data collected is shown in Table 3.3. It is divided up into four categories namely Learning Styles, Literacy Acquisition Skills, Work Samples and Other. This data corresponds to Table 3.1 on page 33, the proposed data that would need to be collected.

Table 3.3 Data Collected

<i>(i) Learning Styles data</i>	<i>(ii) Literacy Acquisition Skills data</i>	<i>(iii) Work Samples</i>	<i>(iv) Other</i>
23 days of general written anecdotal class observations		'Prayers of the faithful' examples	Teacher Profiles on selected students
16 video sessions	Thurs 10 Aug Mental Arithmetic test results	Samples of written work of selected students	Wed 5 April Students self-evaluation for end of term 1
Thurs 21 Sept Learning Preference Scale results	Fri 18 Aug Spelling test results	Homework samples	time table
Tues 28 Nov BTN watching/listening exercise questions	Mon 21 Aug Mental Arithmetic test results	Grammar samples (only for 2 of selected students)	Seating arrangements
Wed 6 Dec BTN re-showing watching/listening exercise questions	Mon 18 Sept & Tues 17 Oct TORCH Reading test results (2 sets)		Interview with two of the selected students regarding a maths lesson.
Learning Style Inventory results	Wed 20 Sept Maths tests and Results		
13 June Word study evaluation results (listening activity)	Thurs 21 Sept End-of Term Spelling Test Results		
	Mon 16 Oct Mental Arithmetic test results		
	Teacher's monitoring and assessment of Reading and writing		
	Various test results from teacher's records - arithmetic 20 Aug, mathematics term 1 test, arithmetic 13 Feb, spelling 10 Mar and 15 Sept.		
	Tues 12 Dec Christmas general knowledge test results		

(i) Learning Styles Data

During the general class observations the researcher tried firstly to discern what type of lessons could reveal any signs of student learning styles. This was in preparation for the video taping sessions. The video sessions themselves were attempts to capture and record the student learning styles, if and when they existed, for each of the selected students. Results were attained after analysing this and all other data combined. The ACER Learning Preference Scales were used as a fairly reliable indicator of the students' learning preferences for cooperation, competition and individualisation, not learning styles. The Learning Style Inventory (Dunn & Dunn 1989), though its reliability was questionable, actually tried to examine and distinguish each student's individual learning

style/s using one hundred and four questions. The results were used as a possible quantitative measure and could then be compared to the teacher's learning and teaching styles. Jordan (1993) also was an advocate for this LSI. She asserts "Used on every grade level, it is simple to administer and score and is inexpensive. Its developers assert that students understand it and are not intimidated by the questions" (p. 6). The researcher went through this LSI with the students, question by question, to clear up any ambiguities that could be possibly encountered. This type of oral procedure was a similar practice adopted by Corlett (1992) in her research. The video sessions were a qualitative and quantitative source of information about the selected students' learning styles. The analysing of these video sessions was anticipated to show whether the students have characteristic learning styles by observing how frequently particular learning styles were adopted.

(ii) Literacy Skills Acquisition Data

The general class observations were used again here to find out what type of lessons would be good indicators of student literacy acquisition skills. From these observations various academic test results were obtained to get a general idea of each student's competencies and literacy abilities. The ACER Torch Reading Tests were the main measuring device used because of their validity as reading comprehension tools. The test, using a different exercise, was administered twice to verify that each student's result was a fairly accurate indicator of their performance (See chapter 4, chart 4.1, page 55).

(iii) Work Samples

These were collected mainly from the four selected students who were video taped. The researcher intended to use this data to get an idea of the way that these students presented and produced their school work.

(iv) Other

Any other type of information that could be obtained about the student was placed in this category. All data was useful in building a picture of the students in their learning environment and it would be used to assist in the determining the literacy acquisition skills and learning styles of each of the four students who were chosen.

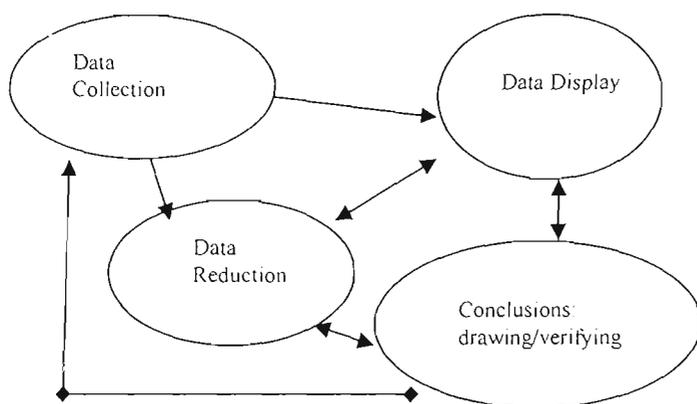
3.5 ANALYSIS OF DATA AND MILES AND HUBERMAN MATRICES

In the beginning of this chapter a conceptual framework was discussed describing the development of the question proposed by this research, *'Is there a match or mismatch between students' learning styles and the teaching styles in the classroom and is this affecting the learning progress of the students?'* Having established this conceptual framework the appropriate data had been collected to help answer this question:

1. Learning style data and teaching style data which consisted of Learning Preference Scale results, Learning Style Inventory results and the video tape transcriptions and observation notes of students and teachers.
2. Students' literacy acquisition skills data which consisted of TORCH Reading Test results, Reading and Writing teacher evaluations, various test results and teacher profiles of the students.

Approach to the Analysis of the Data

A vast amount of data, qualitative and quantitative, was collected and the handling of this data needed a systematic approach. All the data collected was important in finding any reasonable results and so it all needed to be utilized in an organised fashion. It was possible to tabulate and graph the quantitative data but even these results needed to be incorporated with the qualitative data so it could be interpreted. Miles and Huberman (1994) described the components of data analysis in an interactive model consisting of data collection, data reduction, data display and conclusions (drawing/verifying). They explain :



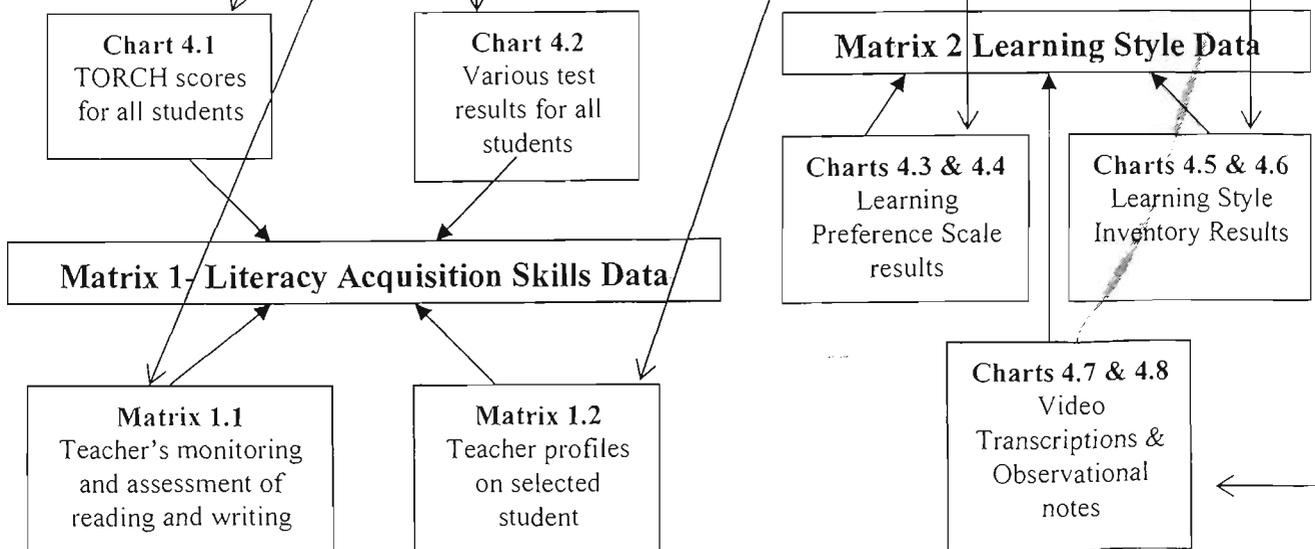
The coding of data, for example, (*data reduction*), leads to new ideas on what should go into a matrix (*data display*). Entering the data requires further reduction. As the matrix fills up, preliminary *conclusions* are drawn, but they lead to the decision, for example, to add another column to the matrix to *test* the conclusion (p.12).

Figure 3.3 Components of Data Analysis: Interactive Model, Miles and Huberman (1994)

This method was adopted to handle the data from this research producing several matrices which facilitated the interpretation of this data collected. The following figure displays which data was used for the matrices.

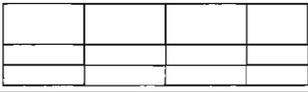
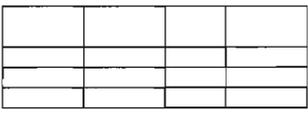
Figure 3.4 Data used in matrices

(i) Learning Styles data	(ii) Literacy Acquisition Skills data	(iii) Work Samples	(v) Other
23 days of general written anecdotal class observations		'Prayers of the faithful' examples	Teacher Profiles on selected students
16 video sessions	Thurs 10 Aug Mental Arithmetic test results	Samples of written work of selected students	Wed 5 April Students self-evaluation for end of term 1
Thurs 21 Sept Learning Preference Scale results	Fri 18 Aug Spelling test results	Homework samples	time table
Tues 28 Nov BTN watching/listening exercise questions	Mon 21 Aug Mental Arithmetic test results	Grammar samples (only for 2 of selected students)	Seating arrangements
Wed 6 Dec BTN re-showing watching/listening exercise questions	Mon 18 Sept & Tues 17 Oct TORCH Reading test results (2 sets)		
Learning Style Inventory results	Wed 20 Sept Maths tests and Results		
13 June Word study evaluation results (listening activity)	Thurs 21 Sept End-of Term Spelling Test Results		
	Mon 16 Oct Mental Arithmetic test results		
	Teacher's monitoring and assessment of Reading and writing		
	Various test results from teacher's records - arithmetic 20 Aug, mathematics term 1 test, arithmetic 13 Feb, spelling 10 Mar and 15 Sept.		
	Tues 12 Dec Christmas general knowledge test results		



Miles and Huberman matrices and charts were coded producing two major matrices. From figure 3.4, page 41, it can be seen that most of the data was collected from table 3.3, page 38, and was organised and sorted into Matrix 1 and Matrix 2. **Matrix 1**-Literacy Acquisition Skills Data and **Matrix 2**-Learning Styles were designed to sort out and display this data.

Matrix 1 Literacy Acquisition Skills Data

Data	What was found	What did this reveal about the student?
<i>TORCH Reading test results</i> (2 sets)	Graph of TORCH scores for all students in the class CHART 4.1 	Each of the four student's position relative to class/nation reading ability on a common scale.
<i>Various Class test results</i> <ul style="list-style-type: none"> ▪ 2 arithmetic ▪ 2 spelling ▪ math's term test 	Graph of all test results of all students in class CHART 4.2 	Each of the four student's position relative to class in arithmetic, spelling and general mathematic.
<i>Reading/Writing teacher evaluation of students</i>	Matrix 1.1 Teacher's Monitoring and assessment of Reading and Writing 	Some basic points about each of the four student's reading and writing skills
<i>Teacher profiles on the four students</i>	Teacher Report on each student Matrix 1.2 	Summary of each of the Four student's language, mathematics and general skills

Matrix 2 Learning Style Data

Data	How can it be used?	What does this data show?
Learning Preference Scale Results	Charts of Learning Preference results, CHARTS 4.3 & 4.4 	Teacher and student's learning preferences in <ul style="list-style-type: none"> ▪ Cooperation ▪ Competition ▪ Individualism
Learning Style Inventory Results	Graph of Learning Styles results, CHARTS 4.5 & 4.6 	Teacher and student's 22 learning style results
Video Transcriptions & Observation notes	Graph of teaching style and learning style occurrences CHARTS 4.7 & 4.8 	Learning style occurrences and teaching style occurrences

In subsequent sections of this research paper these matrices were further reduced to produce another two comparative matrices.

3.6 LEARNING STYLE DATA INSTRUMENTS

Learning Style Measurement Devices

(I) Barnes' Learning Preference Scales (1992)

This research used the LPSS - Learning Preference Scales for Students and the LPST - Learning Preference Scales for Teachers contained in this device. They were used in combination to provide information on the attitudes of the students and teachers towards cooperative, competitive and individualised learning as it occurs in the classroom. The authors suggest that the information obtained from these instruments can be used by teachers to suit the mode of classroom activity to students' preferences.

Output

The output from the questionnaires was standardized according to the LPS instruments. The results of this instrument came in the form of three standardized scores for cooperative, competitive and individualised learning for each of the four students and the teacher. These results were tabulated and charted and used for comparison in learning preferences. (Charts 4.3 and 4.4.)

Features

The scales were self administering and a time limit of about fifty minutes was allowed for the students to complete the thirty-six questions that resembled brief statements. The answers only needed a tick to indicate four possible alternatives - True, Sort of True, Sort of False, False with no option for "I don't know", a 4 point Likert Scale. This was all explained to the students by the researcher. No problems were encountered during the administering and all students completed all questions.

Concerns

The only concern was the veracity of this data, that is, whether the students had answered as honestly as they believed. This concern would exist in any survey regardless of the age of the population sample.

(II) Dunn & Dunn Learning Style Inventory (1984)

This Learning Style Inventory surveyed the students in each of twenty-two learning styles which the authors describe as different areas. The broader areas that these learning styles were part of were (a) environment, (b) emotionality, (c) sociological needs and (d) physical needs. According to the authors the inventory was suitable for Grades 5 to 12. The LSI answer sheet consisted of one hundred and four questions. The answers needed to be filled in with a pencil and there were five choices - Strongly Disagree, Disagree, Uncertain, Agree and Strongly Agree, a 5 point Likert scale. Answer sheets were sent back to the authors and the processed standardized results were sent back to the researcher.

Output

This LSI produced a large amount of output: twenty-two learning style outcomes for each of the four students and the teacher. These results were also tabulated and charted, they were then used for comparison in the learning styles of the four students and the teacher.

Features

The LSI was suitable in that it catered for the students' age group. It covered many learning styles and the manual provided good explanations of the learning style results that were easy to understand and interpret. It also involved learning styles that were categorized based on the cognitive, affective or physiological aspects of the learning process. Haring (1985) also claimed "...learning styles must not be studied in isolation but must consider the conditions and context in which the learning is taking place" (p. 4).

Concerns

The LSI was quite lengthy with 104 questions. To overcome this the researcher went over each question with the students as they went through and completed the questionnaire. The initial part of the answer sheet was a little wordy but this was only the name and details part. Again, whether the students were completely honest is an uncertain factor. Finally the reliability of the LSI is uncertain as discussed in the literature review.

Video Tape Learning Style Occurrences and Teaching Style Occurrences from Observational notes.

This method was based on the video transcriptions and all the class observations that were recorded by the researcher during the time in the classroom.

(III) Video tape Transcriptions and Learning Style Occurrences (See Table 3.5)

From sixteen video taped sessions in total about seventy minutes on each of the four students was found and transcribed for the research. Each of the seventy minutes contained about two to three different learning sessions. See appendix 3 for a sample of a transcription. The transcriptions would be used to locate learning styles that could be attained from the video tapes. Eleven possible learning styles were identified as being potentially traceable on video tape. The definition for these eleven learning styles were based on the Dunn & Dunn (1984) LSI definitions of these particular learning styles.

Output

This produced many pages of text and consequently many opportunities for learning style occurrences. These seventy minute transcriptions were then searched for the presence of each of the eleven learning styles. These were labeled as *Learning Style Occurrences*. This information was then coded in QSR NUD*IST 4 (1996) software for each learning style and the coded text was inserted into learning style node browsers. So for each of the four students a total of seventy minutes of transcribed video was inserted as input files into this software. For each student a node browser file was then created for each of the eleven *learning styles*. Each of these node browser files contained the learning style occurrences, of that particular learning style, that were found in the transcribed files with the corresponding line number references. Figure 3.5 shows a diagrammatical depiction of a file layout for each student.

Appendix 2 displays one of Shane's files (ten minutes of transcription) used with QSR NUD*IST 4 (1996) software and appendix 4 is a resultant node browser for the 'Peer Oriented' learning style for Shane. The frequencies of each of the learning style occurrences were then counted. The final results for each student were then tabulated to produce a table like Table 3.4 and depicted in graphical form.

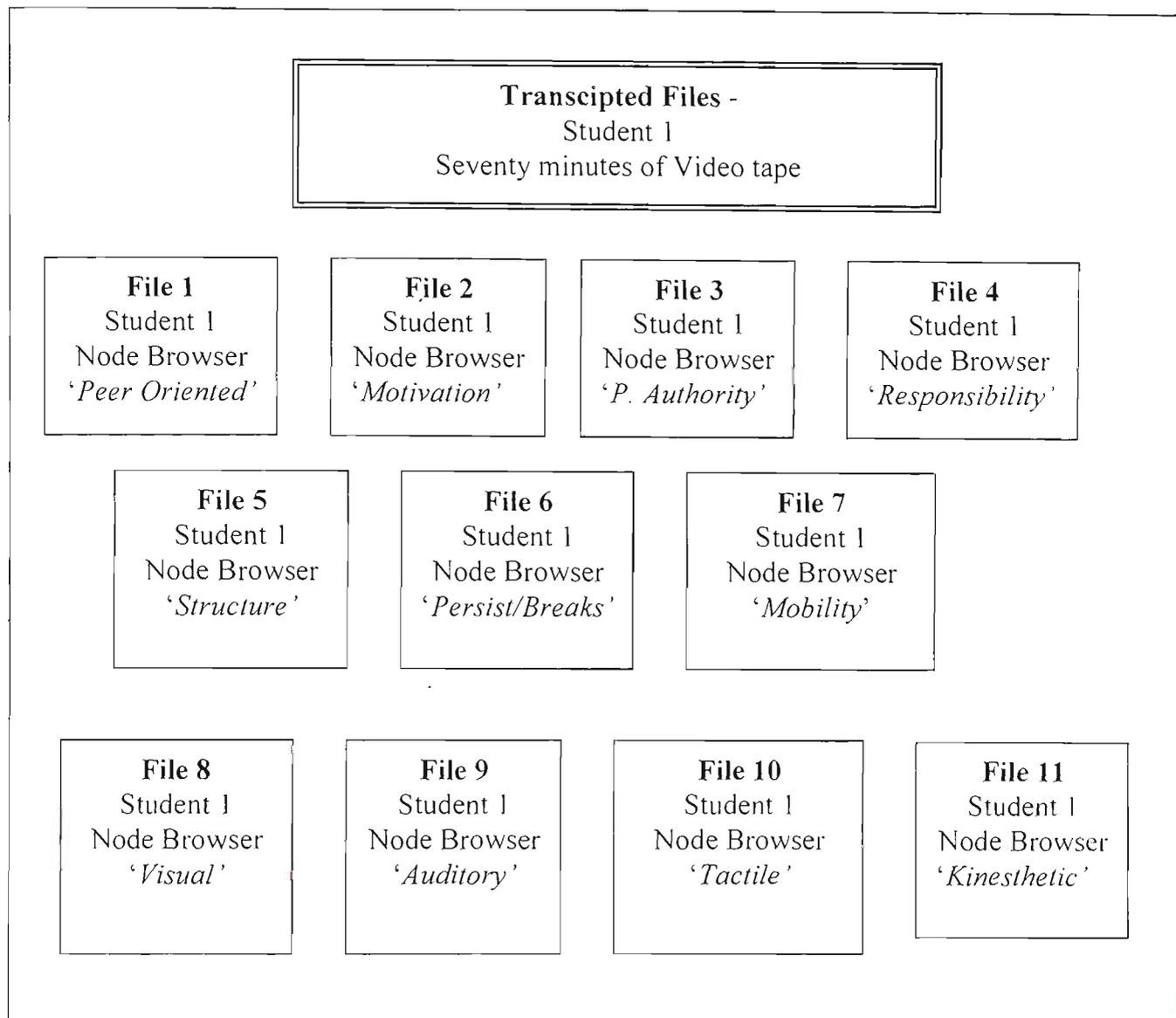


Figure 3.5 QSR NUD*IST File layout for each student

Learning Style Occurrences from 70 Minutes of Tape				
	Luke	Debra	Naomi	Shane
Peer Oriented	65 (19%)	49 (25%)	41 (24%)	42 (28%)
Presence of Authority	14 (4%)	4 (2%)	1 (0.6%)	9 (6%)
Motivation	5 (1.5%)	3 (1.5%)	4 (2%)	0
Responsibility	62 (19%)	40 (20%)	32 (18%)	23 (15%)
Persistent	73 (21%)	42 (21%)	45 (26%)	25 (17%)
Prefers Structure	48 (14%)	7 (3.5%)	2 (1%)	3 (2%)
Mobility	0	0	0	1 (0.7%)
Modalities-Auditory	18 (5%)	28 (14%)	11 (6%)	6 (4%)
Modalities-Visual	41 (12%)	11 (5.6%)	22 (13%)	29 (20%)
Modalities-Tactile	1 (0.3%)	0	2 (1%)	9 (6%)
Modalities-Kinesthetic	14 (4%)	13 (6%)	13 (7%)	0
TOTALS (Percentages shown in brackets in above columns are of student's Total)	341	197	173	147

Table 3.4 Results from QRS NUD*IST software

Class Observations and Teaching Style Occurrences

Twenty-days of observational class notes were recorded by hand and from these fifteen days were used to locate teaching styles practiced by the teacher. Using the definition for the eleven learning styles based on the Dunn & Dunn (1984) LSI eleven teaching styles were created based on corresponding descriptions of the eleven learning styles. This process is displayed for one learning style in the following figure 3.6.

Figure 3.6 Creating a corresponding Teaching style

<u>Learning Style 1:</u> <u>Learning Alone/Peer Oriented Learning</u>		Traits Completed the task when he/she worked with a group. Evidence of working progressively in the group - he/she helps others. - discussion with him/ by him. he/she listens to others.
<i>The learning style above is transformed, using the Dunn & Dunn (1984) LSI definitions, into the teaching style showing the possible traits used by a teacher to cater for that learning style</i>		
<u>Teaching Style 1:</u> <u>Learning Alone/ Peer Oriented</u>		
<u>Peer Oriented</u>	<u>Learning Alone</u>	
<ul style="list-style-type: none"> ▪ Encourages peer/group work ▪ Permits peer assisted learning ▪ Uses small group strategies 	<ul style="list-style-type: none"> ▪ Encourages sole learning ▪ Permits self-pacing & achievement ▪ Encourages creativity 	

This was so it would be possible, later when analysing the data, to see if the teaching styles either catered for or did not cater for the eleven learning style occurrences found previously. It was also in keeping with the conceptual framework of the research. The fifteen days of observations were then searched for the occurrence of the eleven teaching styles. This was done by carefully going over all of the hand written observations and, by using the Teaching Style traits in Table 3.6, any instances of particular teaching styles were marked down noting which teaching style was detected. The frequencies of all the teaching styles during these fifteen days of observations were then tallied by hand to get the total number of each teaching style used. Again the results were then tabulated and depicted in graphical form. The tables Table 3.5 and Table 3.6 describe the Learning Style and Teaching Style definitions.

Output

The hand-written anecdotal notes which were examined to locate teaching styles practiced by the teacher produced tallies for each teaching style. This data was then tabulated as shown below in figure 3.7 for later analysis.

Figure 3.7 Teaching Style Occurrences

Teaching Style Occurrences - 15 Days of Observation			
Peer Oriented	29	Learning Alone	33
Authority Present	17	Less Presence of Authority	21
Motivated	17	Unmotivated	20
Responsibility			15
Persistent	9	Non-Persistent	29
Structured	37	Non-Structured	28
Mobility	5	Non-Mobility	40
Auditory			43
Visual			38
Tactile			9
Kinesthetic			3

Features

These devices were considered valid because they were based on actual learning and teaching situations that were occurring in the classroom. The students and teacher were in their natural surroundings and conducting their normal day's work. This appeared like an authentic source of data.

Concerns

The major concerns were the definitions for learning styles and teaching styles used in the collecting of the data in this device. It was questionable whether these were true characteristics of learning styles and teaching styles in the classroom. A secondary concern was whether enough time was monitored to get a true picture of the eleven learning and teaching styles.

Table 3.5 Learning Style Traits

Using the Dunn & Dunn Learning Style Inventory "*Explanation and Use of the Learning Style Inventory*," the following learning style traits were sought (could possibly be identified) in the transcriptions.

<u>Learning Style 1 : Learning Alone/Peer Oriented Learning</u>	Completed the task when he/she worked with a group. Evidence of working progressively in the group - he/she helps others. - discussion with him/ by him. - he/she listens to others.
<u>Learning Style 2 : Presence of Authority</u>	<ul style="list-style-type: none"> • seeks supervision from teacher often. • seeks the assistance of peers. • works on his/her own without any assistance.
<u>Learning Style 3 : Motivated / Unmotivated</u>	<ul style="list-style-type: none"> • keep reporting to teacher. • seeks teacher's approval in anyway. • needs to achieve academically.
<u>Learning Style 4 : Responsibility</u>	<ul style="list-style-type: none"> • conforms to class instruction? (Does he/she follow teacher's directions?) • does what he/she thinks he/she ought to be done or what he/she likes. • follows through on what he/she was asked to do.
<u>Learning Style 5 : Persistence</u>	<ul style="list-style-type: none"> • inclined to get the task done. • continually on task. • Does not take intermittent breaks. • no evidence of him/her stopping frequently?
<u>Learning Style 6 : Structure</u>	<ul style="list-style-type: none"> • prefers structure. • wants specific instruction.
<u>Learning Style 7 : Mobility</u>	<ul style="list-style-type: none"> • moves around a lot • not able to sit still .
MODALITIES <u>Learning Style 8 : Auditory</u>	<ul style="list-style-type: none"> • appears to listen when teacher is giving instruction, etc . • prefers discussion/ TV / tapes / video .
MODALITIES <u>Learning Style 9 : Visual</u>	<ul style="list-style-type: none"> • reads, views, looks at the work of others or pictures or displays . • closes his eyes to recall .
MODALITIES <u>Learning Style 10 : Tactile</u>	<ul style="list-style-type: none"> • uses his/her hands in learning situations • underline or take notes .
MODALITIES <u>Learning Style 11 : Kinesthetic</u>	<ul style="list-style-type: none"> • In learning situations uses the whole body. • totally involved in a task . • evidence of him/her building, designing, acting or playing in a learning situation .

Table 3.6 Teaching Style Traits

Using the Dunn & Dunn Learning Style Inventory "*Explanation and Use of the Learning Style Inventory*:" the following are teaching styles that cater to the appropriate learning style

Teaching Style 1: Learning Alone/ Peer Oriented	
<u>Peer Oriented</u> <ul style="list-style-type: none"> Encourages peer/group work Permits peer assisted learning Uses small group strategies 	<u>Learning Alone</u> <ul style="list-style-type: none"> Encourages sole learning Permits self-pacing & achievement Encourages creativity
Teaching Style 2: Presence of Authority	
<u>Authority Present</u> <ul style="list-style-type: none"> Continually assists with teacher presence Assists, supervises and checks students work often 	<u>Less Presence of Authority</u> <ul style="list-style-type: none"> Permits isolated work situations in groups
Teaching Style 3 : Motivation	
<u>Motivated</u> <ul style="list-style-type: none"> Encourages self-designed objectives and procedures Permits self pacing 	<u>Unmotivated</u> <ul style="list-style-type: none"> Has short uncomplicated work tasks Allows frequent supervision Logs results and progress Provides positive feedback
Teaching style 4: Responsibility	
<ul style="list-style-type: none"> Provides short term assignments Offers options in work tasks Considers student designed work/study tasks 	
Teaching Style 5: Persistence	
<u>Persistent</u> <ul style="list-style-type: none"> Provides long-term tasks Provides supervision and assistance only when necessary Suggests where help maybe obtained if needed Praises completion of tasks 	<u>Not Persistent</u> <ul style="list-style-type: none"> Provides short-term tasks Provides limited assignments Permits periodic breaks Logs progress Provides options based on individuals interest Encourages peer working relationships Praises completed tasks
Teaching Style 6 : Structure	
<u>Structured</u> <ul style="list-style-type: none"> Is precise about each aspect of tasks set Uses clearly stated objectives in simple form Lists and itemises instructions Clearly indicates specific tasks, time requirements, etc. Establishes specific learning & feedback 	<u>Non-Structured</u> <ul style="list-style-type: none"> Has clearly stated objectives but permits choices of resources, procedures, timelines Provides options and opportunities to display creativeness, talents and abilities Permits latitude for completion if progress is evident
Teaching Style 7 : Mobility	
<u>Mobility</u> <ul style="list-style-type: none"> Provides frequent breaks Provides tasks which require movement Allows mobility in classroom 	<u>Non-Mobility</u> <ul style="list-style-type: none"> Provides stationary learning station Provides tasks that do not require excessive movement
MODALITIES Teaching Style 8 : Auditory	
<ul style="list-style-type: none"> Uses tapes, videos, lectures, discussion, television Uses precise oral directions/ explanations 	
MODALITIES Teaching Style 9 : Visual	
<ul style="list-style-type: none"> Uses pictures, film, video, graphs, transparencies, computer monitors, diagrams, drawings & books Provides resources that require reading and seeing Uses programmed learning & written assignments and evaluations 	
MODALITIES Teaching Style 10: Tactile	
<ul style="list-style-type: none"> Uses manipulative 3-D materials Resources should be touchable and movable Allow demonstrations and reporting Encourages students to keep written or graphic records 	
MODALITIES Teaching Style 11 :Kinesthetic	
<ul style="list-style-type: none"> Provides opportunities for real active experiences in planning and procedures Encourages visits, acting, floor games 	

3.7 MANIPULATION OF RESULTS FROM LEARNING STYLE MEASUREMENT DEVICES

The results from the three learning style measurement devices were placed in tables, all of them displaying the frequency of learning styles and teaching styles. It was considered that the best way to display and observe this data would be in graphical form and that this would be an easier way of interpreting all of this data. It would enable an observer to get an idea of which learning styles were more prevalent for each student and the teacher. Three sets of charts were produced from all of this data:

1. Learning Preference Style graphs comparing the teacher to each student
2. Learning Style Inventory graphs comparing the teacher to each student
3. Teaching and Learning Style Occurrence graphs

These charts are displayed and discussed in chapter 4.

This data still needed to be refined further to display a summary of the outcomes of the three sets of charts. This brought about Matrix 2.1- Summary of Learning Style Data, page 80, which tabulated the graphical comparisons and collated the findings to produce a summary report. This summary report was used as the basis for drawing conclusions to this research.

Summary

This chapter has discussed the design of the study based on the conceptual framework of the research. The appropriate data was collected in order to meet the objectives of this study. Learning style data which would display the learning styles of the students and of the teacher and students' literacy acquisition skills data, which would display their literacy acquisition skills' abilities, was gathered and sorted onto Miles and Huberman matrices. This was done so that the analysis of these results in the following chapter would help to ascertain whether there was a match or mismatch between students' learning styles and the teaching styles in the classroom and if this was affecting the learning progress of the students.

CHAPTER FOUR

Results And Interpretation

4.1 INTRODUCTION

This chapter discusses the results, and the interpretation of these results, in an attempt to find answers to the questions that arose from the conceptual framework of this research. These questions were, *'Is there a match or mismatch between students' learning styles and the teaching styles in the classroom and is this affecting the learning progress of the students?'*

This chapter examines the outcomes from the data collected pertaining to the learning styles of the four students and the teacher and the teaching styles of the teacher and their interaction. Through the utilisation of Miles and Huberman matrices and the examination of tables and charts the results discussed here were achieved. They were analyzed in order to produce explanations that would assist in finding answers to the research questions.

A summary of the research process is presented in Table 4.1 and the selection of the four students for this study will be discussed. The outcomes and findings of all the literacy acquisition skills data will then be discussed to further explain the choices of the four case study students. This will be followed by the learning style data results. This part will attempt to provide a summary of individual findings about the relationships between learning styles and teaching styles for the four students and the impact of these.

Table 4.1 Summary of the Research Process

Procedures	Data Collected	Objectives Reached
<ul style="list-style-type: none"> ◆ Collected data to find the group to study from literacy skills acquisition performance- <ul style="list-style-type: none"> • Equal numbers of female and male • Equal distribution of literacy skills ◆ Carried out LSI to establish learning styles of students ◆ Carried out LSI to establish learning styles of teacher ◆ Used observational techniques to study learning styles of students and teacher and teaching styles 	<ul style="list-style-type: none"> ▪ Observational - notes taken during class ▪ Pieces of students' work - text, etc. ▪ Video and audio tapes of students in classroom ▪ Various test results ▪ Written student profiles from teacher ▪ TORCH Reading Test results from students ▪ LSI results from students and teacher ▪ Learning Preference Scale results from students and teacher 	<ul style="list-style-type: none"> ◆ Acceptance in classroom environment ◆ Determined appropriate group of students for study according to literacy acquisition skills abilities ◆ Established learning styles of students in group ◆ Established learning/teaching styles of teacher ◆ Produced Learning Style and Teaching Style Occurrence tables based on video and audio tape data

Selection of the Four Students

The choice of case studies for this research was based on other case studies such as Kamler & Woods(1987) that showed that descriptive studies should provide insight into student experiences in the classroom. Case studies are not completely representative of learning styles inherent in students but a close analysis of one student’s experience may shed light on learning style behaviour and its relationship to the literacy acquisition skills of a student. While this research shares some aspect of case study methodology, this was not the major approach taken in the study.

The four students, Shane, Naomi, Luke and Debra, were selected for this study according to the criteria of equal distribution of literacy acquisition skills and gender. The choice of these four students was based on the analysis of the literacy acquisition data collected. Referring back to matrix 1 in chapter three, the TORCH reading test results revealed the position of the student’s reading ability relative to the class and nation. Various class test results displayed each of the student’s position relative to the rest of the class in arithmetic, spelling and general mathematics. Teacher evaluations of student’s reading and writing skills provided more useful information on some literacy skills of the class. The above data allowed the researcher to determine the four students used as case studies for this research.

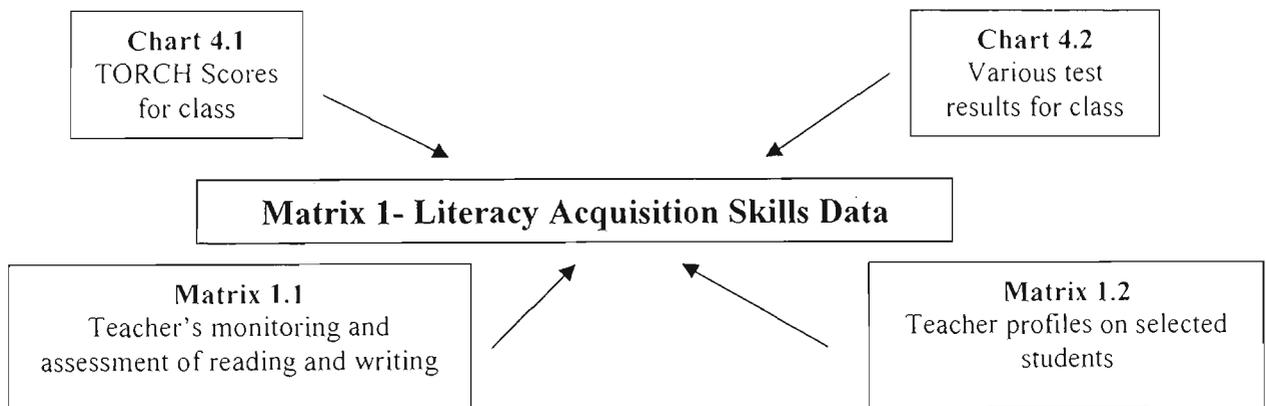
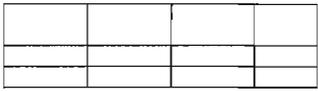
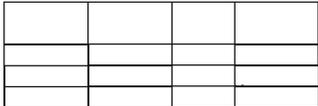


Figure 4.1 Data used in Matrix 1

Literacy Acquisition Skills Results

As displayed by figure 4.1, a Miles and Huberman matrix system was used to sort out and display all the literacy acquisition skills data. Matrix 1, page 54, reveals what type of data was retrieved and incorporated and displayed it in a clearer format for further reduction. As a result of data collection and reduction, Matrix 1.1.1, page 62, generated a summary of all the literacy acquisition skills data. With this matrix it was possible to establish the four case study students suitable based on the criteria needed for this research. The following pages display the output charts and matrices produced in the analysis of all this data followed by the summary of the four case studies chosen.

Matrix 1 Literacy Acquisition Skills Data

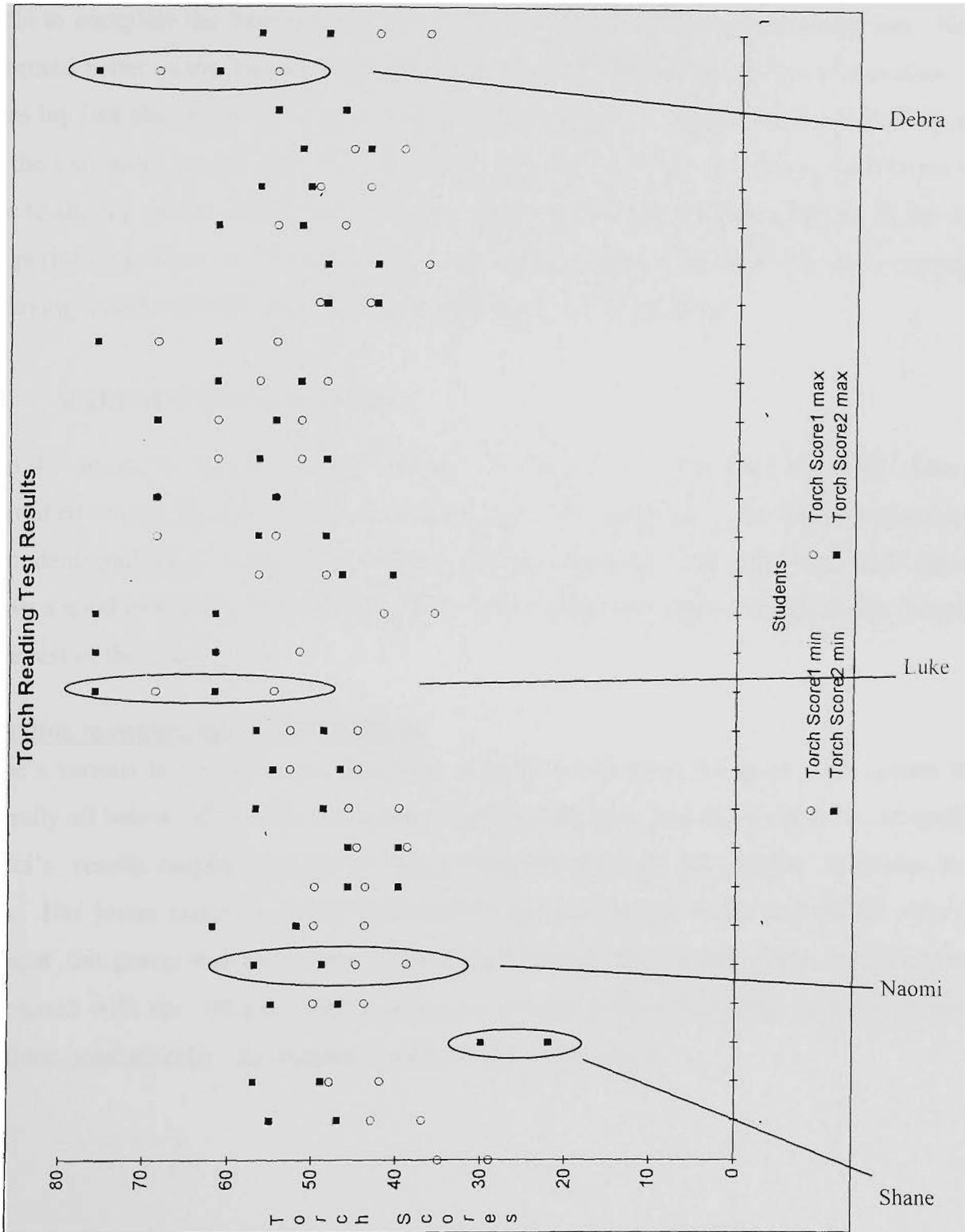
Data	What was found	What did this reveal about the student?
<i>TORCH Reading test results</i> (2 sets)	Graph of TORCH scores for all students in the class CHART 4.1 	Each of the four student's position relative to class/nation reading ability on a common scale.
<i>Various Class test results</i> <ul style="list-style-type: none"> ▪ 2 arithmetic ▪ 2 spelling ▪ math's term test 	Graph of all test results of all students in class CHART 4.2 	Each of the four student's position relative to class in arithmetic, spelling and general mathematics.
<i>Reading/Writing teacher evaluation of students</i>	Matrix 1.1 Teacher's Monitoring and assessment of Reading and Writing 	Some basic points about each of the four student's reading and writing skills
<i>Teacher profiles on the four students</i>	Teacher Report on each student Matrix 1.2 	Summary of each of the four student's language, mathematics and general skills

The following will explain the charts and resultant matrices produced to form Matrix 1

4.2 TORCH READING TEST RESULTS

Chart 4.1 displays the TORCH Reading Test results undertaken by the whole class. As explained in chapter 3 the class was administered two different ACER TORCH Reading tests on different occasions. The results of these two tests were the main measuring device of literacy skills acquisition abilities because of the tests' validity as reading comprehension tools. Two separate reading tests were administered to give a fairly accurate indication of the students' reading ability. This produced two sets of results, Score 1 and Score 2. The resultant TORCH scores, Score 1 minimum and maximum and Score 2 minimum and maximum, were standardised in such a way that they fell into an interval of a minimum and maximum range for each student. If these two ranges were close or overlapped, as for Naomi, Luke and Debra, it was a good indicator that the results were a close approximation of the reading ability of the student and showed how they compared to the rest of the class. Shane complained that the first test was too difficult to complete and received no score in the first reading test. The second score was from an easier test than the one that the rest of the class completed.

Chart 4.1 TORCH Reading Test Results



Note :Shane had complained the first test was too difficult, therefore no score was produced. His score 2 results were from an easier test than the rest of the class sat for. The first test was administered to the class on the 18 September and the second test was administered on the 17 October.

What this revealed about the students

For Shane the TORCH scores revealed low reading and comprehension skills. He was unable to complete the first test and did not perform well on the second easier test. Naomi performed better in the second test, this pattern was consistent with the rest of the class. Her scores lay just above middle of the TORCH score range in relation to the rest of the class and the two score ranges did not overlap but were close. Luke and Debra had scores very close to the top of the TORCH score range. They both had the highest results in the class, also performing better in the second test. Their score ranges from their two tests overlapped displaying a fairly reliable and consistent measure of these abilities.

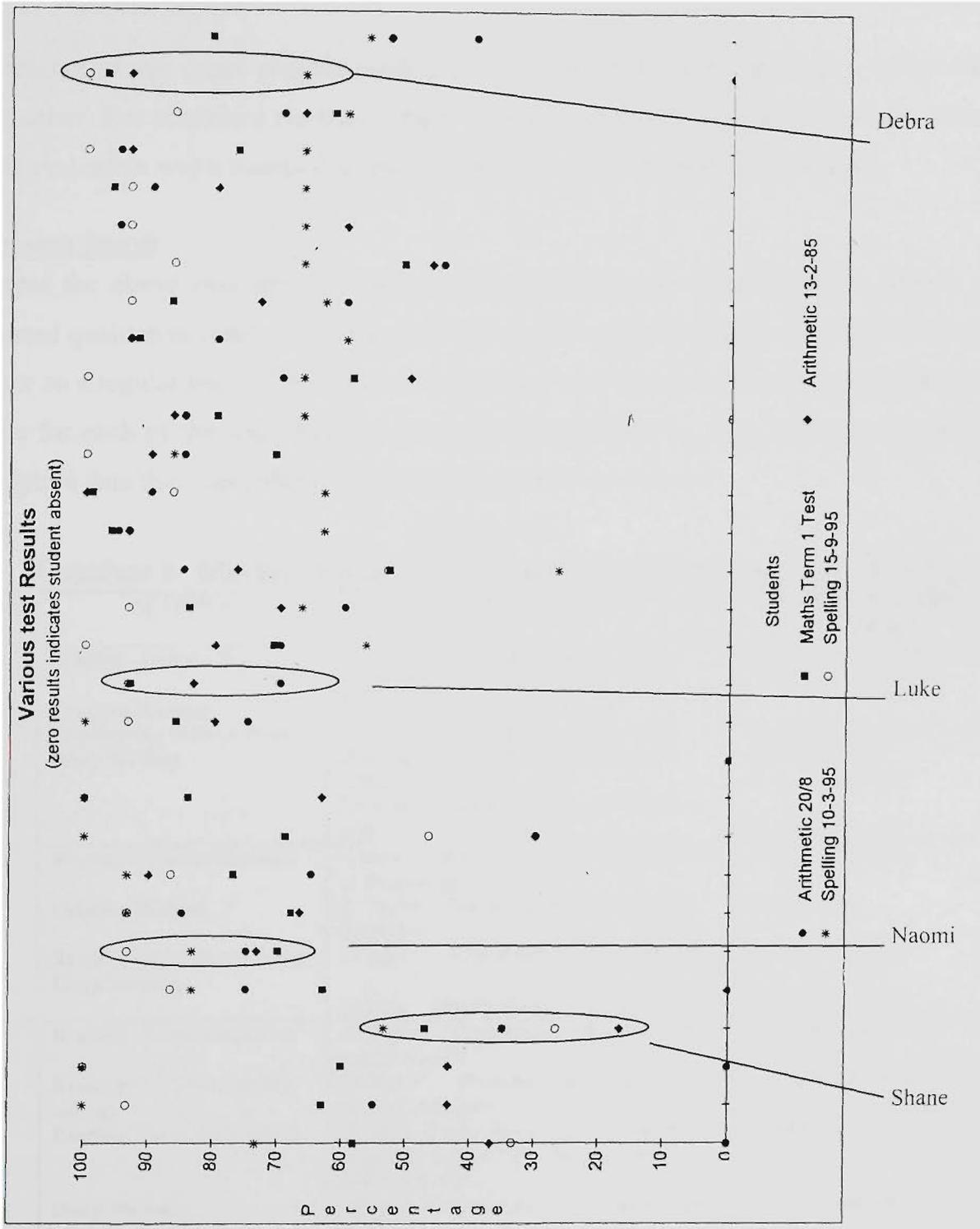
4.3 VARIOUS TEST RESULTS

Chart 4.2 shows the results of five various tests chosen at random that the whole class had undertaken during the year. These tests were part of the teacher's assessment procedure of the students and these results were collected by the researcher. This chart was useful because it gave a good indication of how each of the four students performed academically compared to the rest of the class.

What this revealed about the students

Shane's various test results were amongst, if not, the lowest in the class. The scores were generally all below 50%. His lowest score was in arithmetic and his highest was in spelling. Naomi's results ranged from 70 to 94% putting her amongst the higher achievers in the class. Her lower scores were in mathematics and arithmetic. Luke and Debra were also amongst this group with test results in the higher range of the scores. These results tended to correspond with the ACER Torch reading test results putting these four students in similar positions, academically, as compared with the rest of the class.

Chart 4.2 Various Test Results



4.4 TEACHER'S MONITORING AND ASSESSMENT OF READING AND WRITING

The teacher of the upper primary class that was used in this research kept a folder labeled 'Evaluation' that contained reports on pupil evaluation on each student in the class. One part of this evaluation was a monitoring and assessment record of reading and writing.

What was found

Whereas the above two charts showed more quantitative results this matrix, Matrix (1.1), presented qualitative results in reading and writing for each student that was collected by the teacher on a regular basis. This type of information was crucial in providing a comprehensive profile for each of the four students selected for this research. This matrix only shows the descriptive data that was collected for the four students concerned.

Matrix 1.1
Teacher's Monitoring and Assessment of Reading and Writing

Student	ACTIVITY	OBSERVATION	ACTION REQUIRED by Student
Shane	Reading -Volcano Sequence Creative Writing Reading-Get to know Plants Diary Writing	8 March Required assistance in both sequencing and comprehension of text 22 March A very good attempt 26 April Great difficulty with fluency - due to unknown words. Reading very stilted. 23 June Spelling - structure of sentences poor	Understanding of likely vocabulary -meaning Spelling,/grammatical and story writing structure <i>no action specified</i> <i>no action specified</i>
Naomi	Reading -Volcano Sequence Creative Writing Reading-Get to know Plants Diary Writing	8 March O.K. however needed assistance in sequencing 22 March Plot and characters very well developed 26 April A bit slow but good in all areas. 23 June Good sentence - basic structure	<i>no action specified</i> Paragraphing <i>no action specified</i> <i>no action specified</i>
Luke	Reading- Earthquake Cloze Reading- 1:1 Oral Reading passage Reading-Get to know Plants Diary Writing	30 March Oral reading very poor, written response good 31 March Word attack skills and oral reading very poor 26 April Omits words - fluency stilted and hampered at times by unknown words. Expression O.K. 23 June Poor expression, ideas and order good	Oral reading at home Tracking and sound letter skills <i>no action specified</i> <i>no action specified</i>
Debra	Reading- Volcano Sequence Writing- River of Fire Story Reading-Get to know Plants Diary Writing	8 March Very good, however not confident in order, lazy- needs to re-read text. 30 March Outstanding and creative story 26 April Excellent in fluency, pronunciation and expression 3 July Very detailed, expressive piece.	<i>no action specified</i> Originality of characters, use of metaphors. <i>no action specified</i> <i>no action specified</i>

What this revealed about the students

Shane, though trying hard, displayed many weaknesses in reading and writing. He had poor writing skills and needed assistance in reading. It was an anomaly to find similar results for Luke. Luke also had many reading and writing weaknesses such as poor expression and poor oral reading yet he performed quite well in the TORCH reading test. This monitoring and assessment was taken earlier in the year and his profile did display many more strengths in other areas later on in the year so this could explain the contradiction. Naomi had good writing and reading skills and needed only assistance in paragraphing and sequencing. Debra had excellent reading and writing skills, she was very creative and expressive. She only had minor weakness in reading.

4.5 TEACHER EVALUATIONS PRODUCED AT THE REQUEST OF THE RESEARCHER.

What was found

After the four students were selected for the research the teacher provided a profile on each of these four students at the request of the researcher, the information in Matrix 1.2. Again, this helped to reinforce the appropriateness of these four students for the research and supplied more qualitative data.

What this revealed about the students

The student profiles could be divided into strengths and weaknesses in each of the three areas of language, mathematics and general. This seemed a coherent way of sorting out this qualitative data for each of the four students.

Shane possessed more weaknesses than any of the other three students and these weaknesses were mainly in mathematics. Although he did have difficulties with language his strengths laid in the fact that he had a positive outlook and was always prepared to have a go with interest and a happy disposition. He was aware of his academic position and the gap between him and his peers was evident to the teacher. He was noticed to take a subordinate position in group problem solving activities. Shane, though, was always willing to seek help.

Naomi possessed many strengths in language, mathematics and in general. She was a proficient reader that showed significant advances. She had sound mathematics skills and was willing to seek help when she needed it. She had good oral expression and was well

organised and had sound skills in numeracy. Her weaknesses in language and problem solving skills were only due to lack of practice. She also had a tendency to give up easily in mathematics.

Matrix 1.2 Teacher Evaluations produced at the request of researcher

Debra	Naomi	Shane	Luke
<p>Language Debra is a very articulate and competent speaker however her listening skills are often lazy. Debra has sound reading and comprehension skills. She is a good critical thinker with developed skills of analysis.</p> <p>Mathematics Debra has excellent mental arithmetic problem solving strategies. A very good worker in applying problem solving in task centre. Debra needs to develop strategies for double checking equations. tends to rush and make silly errors at times. Computational and number skills are all sound and enjoys completing more challenging tasks.</p> <p>General Debra is a diligent, well organised student who functions at a high level. Debra needs to develop independent skills (seeks constant direction at times !). Very good research skills as is able to apply previously learnt knowledge</p>	<p>Language Naomi has made significant advances in this area. There is evidence of self-correction in written work with improved grammar and expression being evident. Naomi is a proficient reader who reads for enjoyment. Comprehension skills are average (probably because of lack of practice rather than not absorbing content).</p> <p>Mathematics Naomi has sound skills in numeracy. Her problem solving skills, whilst sound, lack application and often Naomi will give up easily. Naomi is, however, willing to ask questions to clarify understandings.</p> <p>General Naomi is an engaging and interested student who is showing signs of maturing in work. She is becoming more accountable to her areas of need. Naomi has excellent questioning skills with good oral expression. Generally</p>	<p>Language Shane has improved greatly in this area particularly in confidence. His written work is becoming less stilted with improved or more accurate spelling attempts. He has good questioning skills and is generally prepared to have a go.</p> <p>Mathematics Shane is functioning well below expected age level in this area. His numeracy skills are often confused and significant gaps exist in basic computations. His inability to retain concepts adds to this (c.g. Times tables). He has some good problem solving skills however he is inclined to take a subordinate position in group problem solving activities.</p> <p>General Shane is a child who is willing to learn with a happy disposition. In more senior primary classes the gap between his peers is more evident. Shane is aware of his problems and is willing to get help.</p>	<p>Language Luke has difficulty in reading ! His oral reading is poor (very stilted), he does not read for enjoyment! (however he loves magazines etc.) Comprehension skills suffer as a result of this. Luke is a very imaginative writer who is now starting to develop and expand his vocabulary. His ability to write poetry is excellent.</p> <p>Mathematics Luke is very proficient in this area and has excellent computational skills. His problem solving skills are outstanding with good participation interaction in group work in this area. More willing to double check equations. Luke enjoys the challenge of completing more challenging computations.</p> <p>General Luke is a confident and articulate boy with excellent communication skills. He is well organised and keen to question and challenge information presented.</p>

Luke also had many more strengths than weaknesses. Again the weaknesses were in language. He had difficulty in reading and his oral reading was poor and stilted. This could have been due to the fact that Luke did not read for enjoyment and his teacher noted that his comprehension skills suffered because of this. To contrast this it was noted that in language he was an imaginative writer, he had an excellent ability to write poetry and loved reading magazines. In mathematics Luke was very proficient with excellent computational and

problem solving skills. He worked well in groups, enjoyed challenging work and participated well in group work. In general he was well organised, had excellent communication skills and was noted as being confident and articulate.

Debra also had some weaknesses and these were in language and mathematics. These were only due, in the teacher's opinion, to laziness and not double checking. She also tended to rush and make silly mistakes. Out of the four students she was the stronger in language, mathematics and in general. In general, though, most of the time Debra was an articulate and confident speaker, she was diligent and well organised. She had sound reading and comprehension skills, she was a good critical thinker and had good research and analysis skills. In mathematics she had excellent mental arithmetic and problem solving strategies. Debra had sound computational and number skills and enjoyed more challenging tasks. Generally she functioned at a high level. She sought constant direction at times and had good research skills, being able to apply previously learnt knowledge to new situations.

4.6 MATRIX 1.1.1 - SUMMARY OF LITERACY ACQUISITION SKILLS

The four students chosen, Shane, Naomi, Luke and Debra, represented a cross section of academic performance in the classroom. The choice was mainly based on the analysis of the two TORCH reading tests. The second TORCH Reading test was administered to confirm the results of the first. The results from various other class tests were also useful to get an idea of the general test performance of the students in comparison with the whole class. The teacher monitoring information and profiles for each of the four students were helpful to confirm the choice of the four potential case studies. All of this data was represented in Matrix 1.1.1, Summary of Literacy Acquisition Skills. This matrix simplified the data display and the results were easier to interpret to produce the following case study summary.

Matrix 1.1.1 Summary of Literacy Skills , part 1

	SHANE	NAOMI	LUKE	DEBRA
Test results: Above class average		Her highest test scores- Spelling	Torch-one of the highest in class, score ranges from two tests overlap showing fairly reliable, consistent measure of these abilities. Highest scores in Various test results-Spelling and Math's term test.	Torch-one of the highest in class, performed better in second test, score ranges from two tests overlap showing fairly reliable, consistent measure of these abilities. Highest Various test results- arithmetic, Math's term test(both over 93%) and spelling Lowest Various test results- spelling.66 %.(absent for one arithmetic test.
Class Average		Torch – performed better in second test(this pattern consistent with the rest of class) Her lowest scores- Math's term test & arithmetic. Test score range from 70-94%	Various Test results range from 70-94%, results evenly distributed across this range	
Below class average	TORCH-low reading & comprehension skills, unable to complete first test and did not perform well on second easier test. Lowest score –arithmetic, highest-spelling, generally all scores below 50%			
Teacher Monitoring: Strengths	<i>Writing</i> -good attempt	<i>Reading</i> -good in all areas <i>Writing</i> -plot and characters well developed -good sentence structure	<i>Writing</i> -written response good -ideas and order good	<i>Reading</i> -Very good -Excellent in fluency, pronunciation & expression <i>Writing</i> -Outstanding creative piece -very detailed expressive piece
Weaknesses	<i>Writing</i> -Spelling and structure of sentences poor <i>Reading</i> -Assistance needed in sequencing and comprehension and text -great difficulty in fluency, unknown words -stilted	<i>Writing</i> -needs help with paragraphing <i>Reading</i> -slow -assistance in sequencing	<i>Writing</i> -poor expression <i>Reading</i> -Oral reading poor -word attack skills poor -omits words -fluency stilted by unknown words -Needs assistance with tracking&sound letter skills- needs to read orally at home.	<i>Reading</i> -Not confident in order -needs to re-read text

Matrix 1.1.1 Summary of Literacy Skills , part 2

	SHANE	NAOMI	LUKE	DEBRA
Teacher Profiles: Strengths	<p><i>Language</i></p> <ul style="list-style-type: none"> Improved in confidence Less stilted with improved or more accurate spelling attempts Good questioning skills Prepared to have a go <p><i>Math's</i></p> <ul style="list-style-type: none"> Good problem solving skills <p><i>General</i></p> <ul style="list-style-type: none"> Willing to learn Happy disposition Aware if his academic performance, willing to seek help 	<p><i>Language</i></p> <ul style="list-style-type: none"> Significant advances Evidence of self-correction in written work Improved grammar and expression Proficient reader who reads for enjoyment <p><i>Math's</i></p> <ul style="list-style-type: none"> Sound skills in numeracy Willing to ask questions to clarify understandings <p><i>General</i></p> <ul style="list-style-type: none"> Engaging and interesting Excellent questioning skills Good oral expression Well organised 	<p><i>Language</i></p> <ul style="list-style-type: none"> Imaginative writer Excellent ability to write poetry Loves reading magazines <p><i>Math's</i></p> <ul style="list-style-type: none"> Proficient in this area Excellent computational skills Problem solving skills outstanding Good participation/interaction in this group work Willing to double check equations Enjoys challenge of completing more challenging computations <p><i>General</i></p> <ul style="list-style-type: none"> Confident and articulate Excellent communication skills Well organised Keen to question & challenge information presented 	<p><i>Language</i></p> <ul style="list-style-type: none"> Articulate and confident speaker Sound reading and comprehension skills Good critical thinker Developed skills of analysis <p><i>Math's</i></p> <ul style="list-style-type: none"> Excellent mental arithmetic problem solving strategies Good worker in applying problem solving skills in task centre Sound computational & number skills Enjoys completing more challenging tasks <p><i>General</i></p> <ul style="list-style-type: none"> Dilligent, well organised Functions at a high level Seeks constant direction at times Very good research skills Able to apply previously learnt knowledge to new situation
Weaknesses	<p><i>Math's</i></p> <ul style="list-style-type: none"> Functioning well below age level Numeracy skills often confused Significant gaps exist in basic computations Inability to retain concepts, e.g. times tables Takes subordinate position in group problem solving activities <p><i>General</i></p> <p>Gap between him and his peers more evident in senior primary classes</p>	<p><i>Language</i></p> <ul style="list-style-type: none"> Comprehension skills are average possibly due to lack of practice <p><i>Math's</i></p> <ul style="list-style-type: none"> Often gives up easily Problem solving skills are sound but lack application 	<p><i>Language</i></p> <ul style="list-style-type: none"> Difficulty in reading orally Oral reading poor & stilted Does not read for enjoyment, comprehension skills suffer because of this 	<p><i>Language</i></p> <ul style="list-style-type: none"> Listening skills often lazy <p><i>Math's</i></p> <ul style="list-style-type: none"> Needs to develop strategies for double checking equations Tends to rush, makes silly mistakes

4.7 THE FOUR CASE STUDIES

Introduction

The following provides a summary description of the four students chosen for the case studies. It demonstrates the distribution of literacy skills, from below average to above average, of the four students selected for this research and, of course, the equal distribution of gender which was not an issue in this study.

Shane

Shane's academic results tended to reside below the class average with fairly low grades. His reading and comprehension skills were poor. He complained that he was unable to tackle the first TORCH Reading test and was issued with a younger level reading test when the second TORCH reading tests were administered. He still experienced difficulty with this test. He liked to take chances, though, and was always happy and willing to learn which displayed an interest in and an appreciation of his school work. However, it was apparent his literacy acquisition skills were lacking because he required extra assistance with his reading and writing. His mathematics skills were also below his age level which displayed a coherence in his general academic performance. He was therefore chosen as the case study at the weaker end of the academic scale. He was also a very co-operative student and was always obliging to others and this facilitated the data collecting on the researcher's behalf.

Naomi

Naomi's academic results were very much along the class average. This was reflected in her various class test results and the TORCH Reading test results. Her two TORCH reading test score ranges did not overlap and, even though a little discrepancy did exist between the two score ranges, they were consistent with the rest of the class scores in that a higher score was achieved in the second reading test as compared to the first. She possessed more strengths than weaknesses in her reading and writing skills but still needed some assistance in some areas. Lack of practice and application might have been the main cause of her weaker literacy acquisition skills so she made a good candidate for a semi-strong academically performing

student. She was also a generally good natured and co-operative student and was chosen as another case study.

Luke

Luke was an interesting student because his performance in the TORCH reading tests was very high, one of the highest score achievers in both tests and he had fairly high class test results. His two TORCH test score ranges did overlap which tended to show a fairly reliable reading level result. However, he had poor oral reading and written expression skills. Despite having a good imagination, some good language skills and being proficient in his mathematics skills he still had difficulty with fluency and reading orally. Because of the diverse nature in his literacy acquisition skills seeking out his learning styles would provide an interesting outcome. Having more strengths that outnumbered his weaknesses he was another appropriate choice for a stronger academically performing student. He also had an extremely polite and friendly outlook in the classroom.

Debra

Debra was also a high score achiever in nearly all her tests. She had one of the highest set of TORCH Reading test results which also overlapped displaying a good indication of her reading level. She had very few weaknesses in her reading and writing skills, any that did exist were more due to hastiness and not re-checking her work. Her reading and writing skills were of a high quality among her peers and she was generally a very able, co-operative and confident student. Her literacy acquisition skills were of a high standard and she fitted well into the higher end of the academically performing scale in the group of case studies.

4.8 LEARNING STYLE DATA RESULTS

Introduction

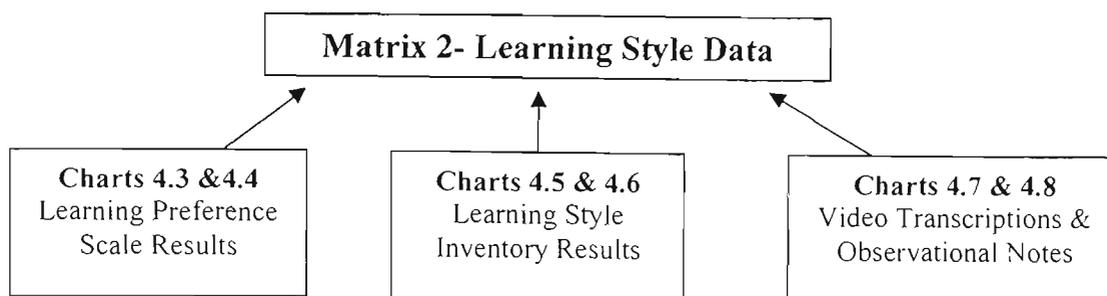


Figure 4.2 Data used in Matrix 2

Learning style and teaching style data was collected using the ACER Learning Preferences Scales, the Learning Style Inventory (Dunn & Dunn 1989) and video tape transcriptions and observational notes. Matrix 2 was used to handle all this learning style data accumulated in a systematic way in order to ascertain the learning styles and teaching styles and compare these results in a systematic way. Twenty-three charts were produced from all of the frequency data that resulted from the learning style measurement devices. The charts were a good form of graphical comparison of teaching styles' and learning styles' results but still there were a large number of charts that needed to be interpreted. Again, the Miles and Huberman matrix method helped to display all of the resultant charts' information in the final matrix, Matrix 2.1 Summary of Learning Style Data, page 80, by rearranging the results of the charts into a table format.

Matrix 2 Learning Style Data

Data	How can it be used?	What does this data show?
Learning Preference Scale Results	Charts of Learning Preference results, CHARTS 4.3 & 4.4 	Teacher and student's learning preferences in <ul style="list-style-type: none"> ▪ Cooperation ▪ Competition ▪ Individualism
Learning Style Inventory Results	Graph of Learning Styles results , CHARTS 4.5 & 4.6 	Teacher and student's 22 learning style results
Video Transcriptions & Observation notes	Graph of teaching style and learning style occurrences CHARTS 4.7 & 4.8 	Learning style occurrences and teaching style occurrences

The Matrix 2.1, page 80, displayed the comparisons of the teacher's learning styles to the students' learning styles and it also showed the comparison of teaching style to learning style occurrences. With this summary individual findings of each student case study were produced which enabled part of the conclusion to be reached regarding the question posed in the introduction of this research : *'Is there a match or mismatch between students' learning styles and the teaching styles in the classroom and is this affecting the learning progress of the students?'*

4.9 LEARNING PREFERENCE SCALE RESULTS

Refer to Charts 4.3 and 4.4.1 to 4.4.4

How it was used

These charts display the graphical results of the Barnes' Learning Preference Scales (1992) for each of the four students and the teacher. The final scores on Table 4.2 for the categories cooperation, competition and individualism had been standardised according to the Barnes' Reference Group data (1992) in the Handbook. Chart 4.3 compares the students' results for each category and Chart 4.4 compares each of the student's results to the teacher's preferences.

	Cooperation	Competition	Individualism
Debra	39	37	36
Luke	43	34	32
Naomi	35	37	35
Shane	34	32	33
Teacher	36	32	26

Table 4.2 Learning Preference Scale Results

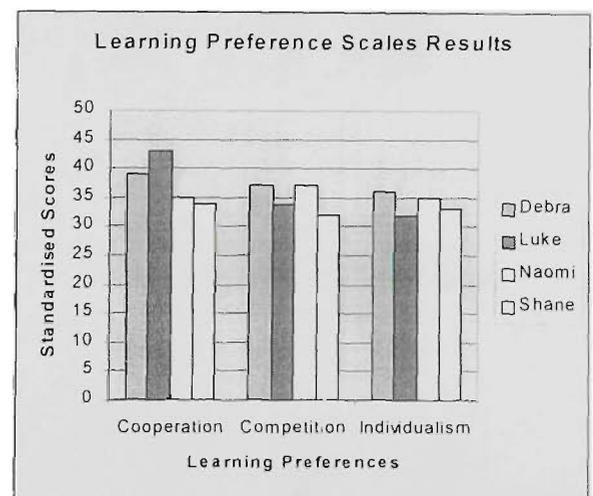


Chart 4.3

What this data displayed

Chart 4.3 displayed the comparison of learning preference results between the four students. This showed almost similar results in competition and individualism and apparent differences in cooperation. Luke and Debra had significantly higher results for cooperation while Shane and Natalie had lower results for this learning preference. Debra and Naomi had similar results in the competition learning preference while Luke and Shane had lower different results. This was similar with the individualism preference results. These results, though,

provided more useful and relevant information when compared with the teacher's learning preference results. What was being sought in this research was the matching or mismatching of learning styles.

Charts 4.4 displayed the comparison of learning preference scales between the teacher and the each of the four students. If the student's scores were within 2 points of the teacher's score they were considered similar. Luke shared a similar competition learning preference result with the teacher but his cooperation and individualism learning preference results differed substantially from the teacher's. Naomi and Debra also shared similar results with the teacher in only one learning preference result and that was cooperation. Shane was the only one of the four students that shared two similar learning preference results with the teacher and they were cooperation and competition.

Chart 4.4.1

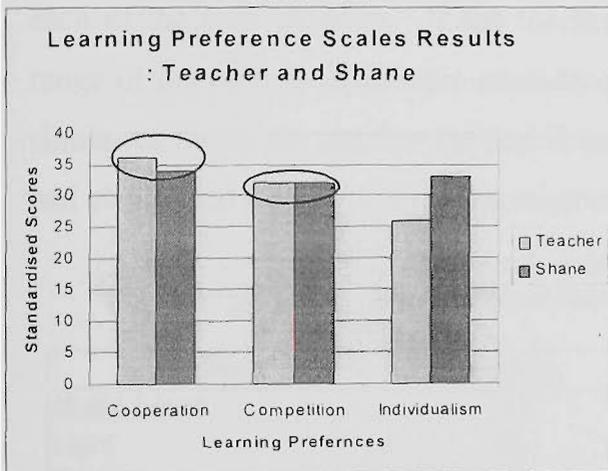


Chart 4.4.2

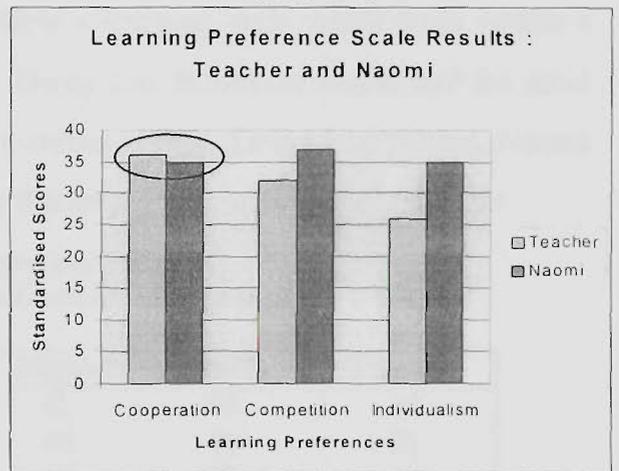


Chart 4.4.3

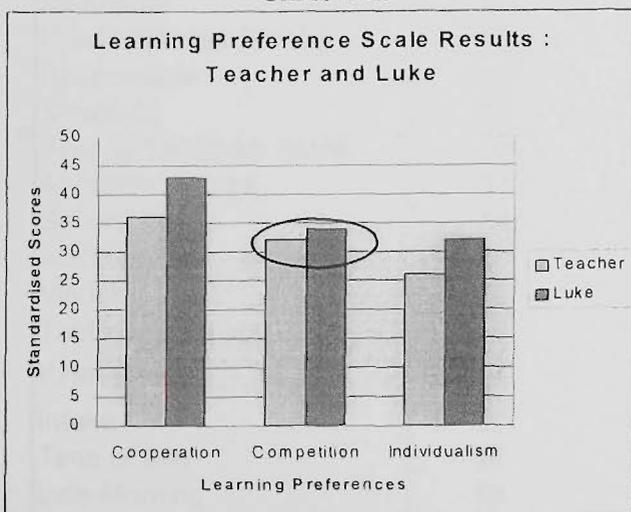
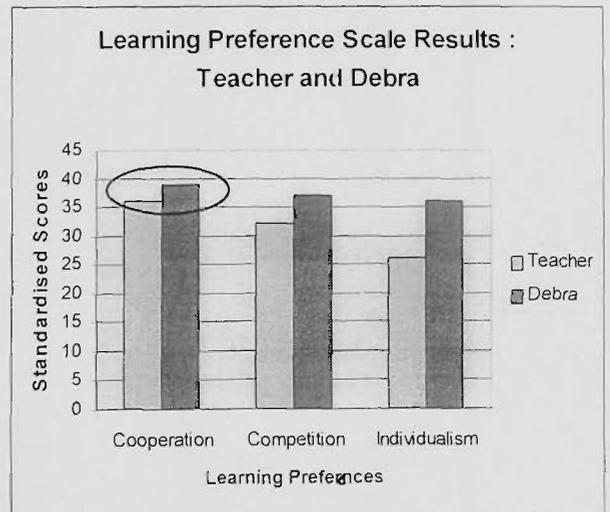


Chart 4.4.4



4.10 LEARNING STYLE INVENTORY COMPARISONS

Refer to Charts 4.5.1 to 4.5.4 and 4.6.1 to 4.6.4

How it was used

These charts show a graphical representation of the Dunn and Dunn Learning Style Inventory (1984) results from Table 4.3, below. These displayed twenty-two learning style results for each of the four students and teacher with learning style results ranging from zero to eighty. Charts 4.5.1 to 4.5.4 compared each learning style result for the four students. Charts 4.6.1 to 4.6.4 compared the teacher's and student's learning style results for each of the four students.

What this data displayed

The LSI results displayed in charts 4.5 indicated some similar learning styles between the students but generally they all varied a little. When each of the student's LSI results were compared with the teacher's LSI results there were similarities in some learning styles for each of the four students. If the teacher's and student's learning style result were within a range of ten or less these were considered similar. Using this definition Shane had the most similarities with the teacher; he had fifteen similar learning styles. Debra had twelve, Naomi had eleven and Luke had the least number of similar learning styles with a total of eight.

**Table 4.3 Learning Style Inventory Results
(Standardised Results from the Dunn & Dunn LSI)**

<i>Learning Styles</i>	Debra	Luke	Naomi	Shane	Teacher
Noise Level	36	36	52	49	40
Light	54	40	46	49	63
Temp	38	52	41	52	44
Design	41	73	50	56	64
Motivation	61	53	51	45	63
Persistent/Has Breaks	43	65	58	40	65
Responsible	54	63	48	42	57
Structure	67	34	61	61	55
Peer Or't'd/Works Alone	49	50	52	58	64
Authority Figures	51	38	58	61	64
Several Ways	63	63	51	57	63
Auditory	65	72	61	58	58
Visual	41	37	26	60	60
Tactile	62	67	47	47	54
Kinesthetic	55	72	46	60	50
Intake	53	40	55	55	55
Time of Day	55	42	48	42	46
Late Morning	64	42	39	49	53
Afternoon	59	68	47	62	71
Mobility	44	65	46	49	38
Parent Motivated	58	46	42	54	62
Teacher Motivated	62	43	37	49	65

Learning Style Inventory Results

Chart 4.5.1

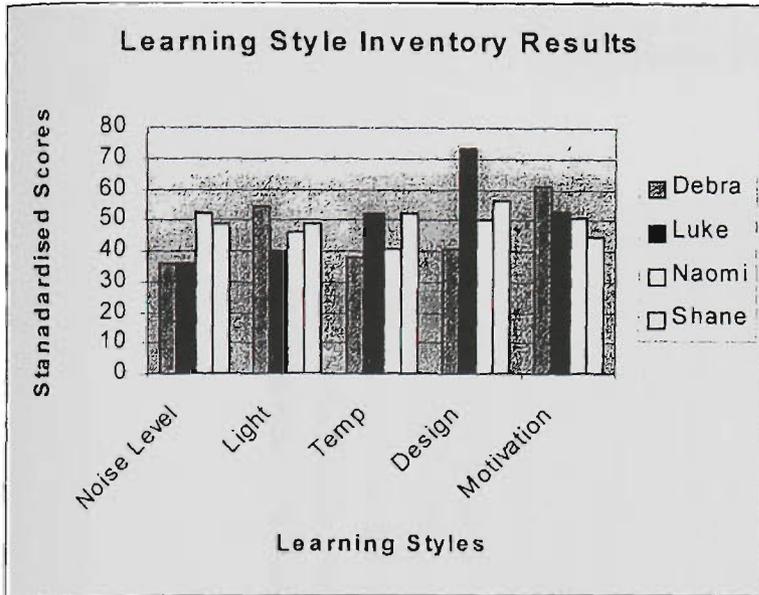


Chart 4.5.2

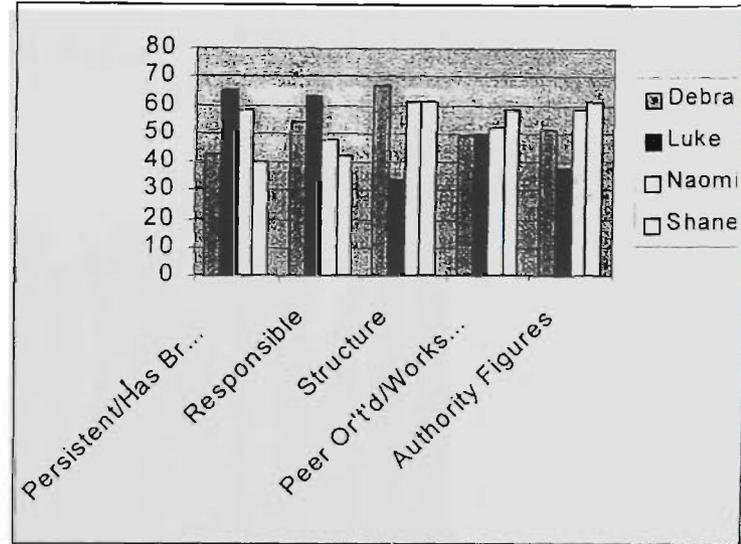


Chart 4.5.3

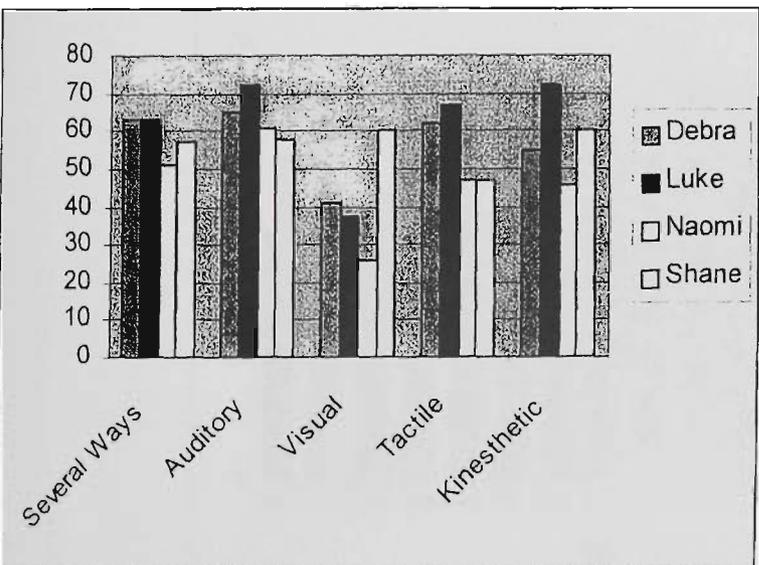
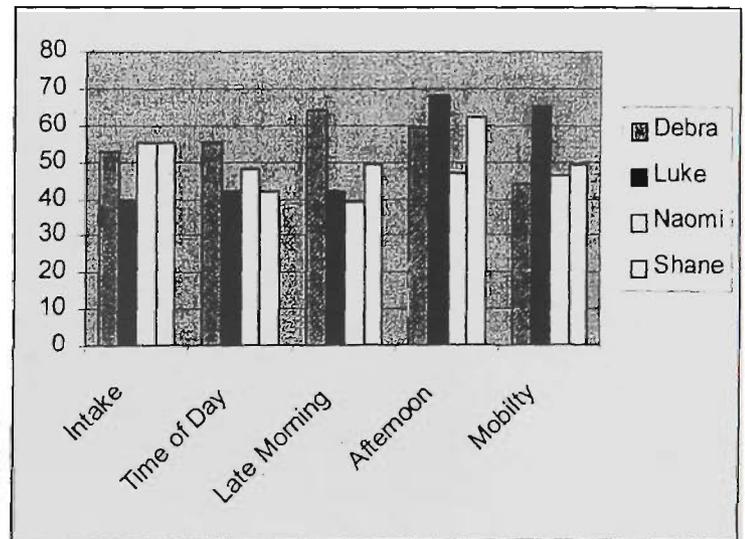


Chart 4.5.4



Note: The above four charts were used to display the data in Table 4.2 because of the large amount of data in this table.

Learning Style Inventory Comparison Results

Chart 4.6.1

Note 1: 15 similar or close LSI Scores

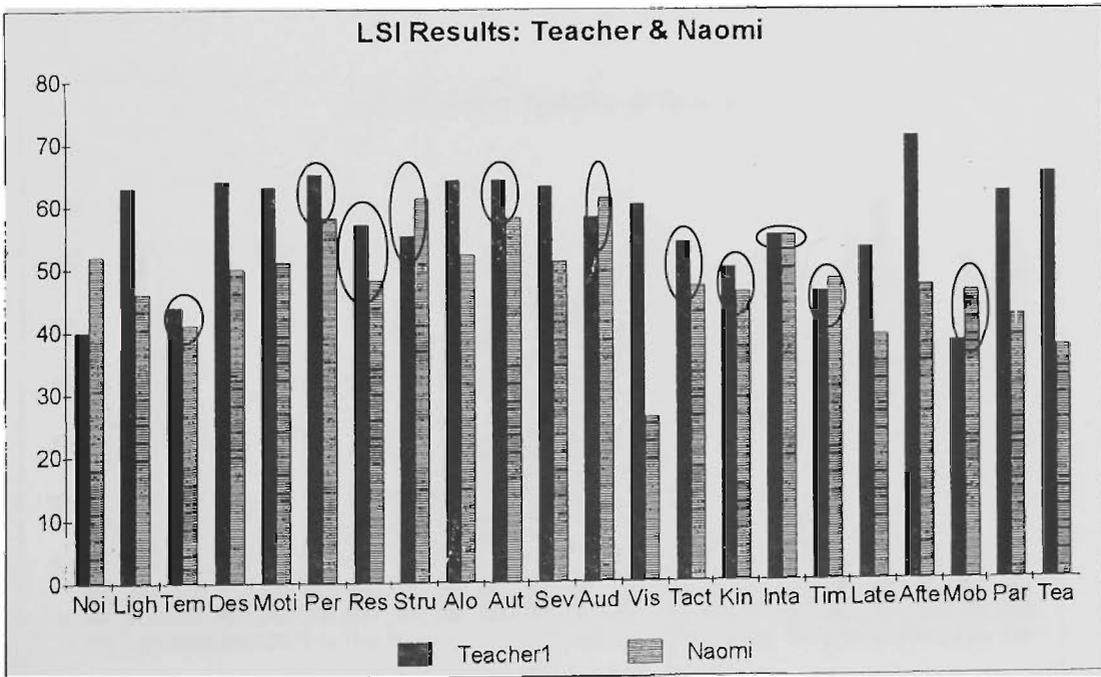
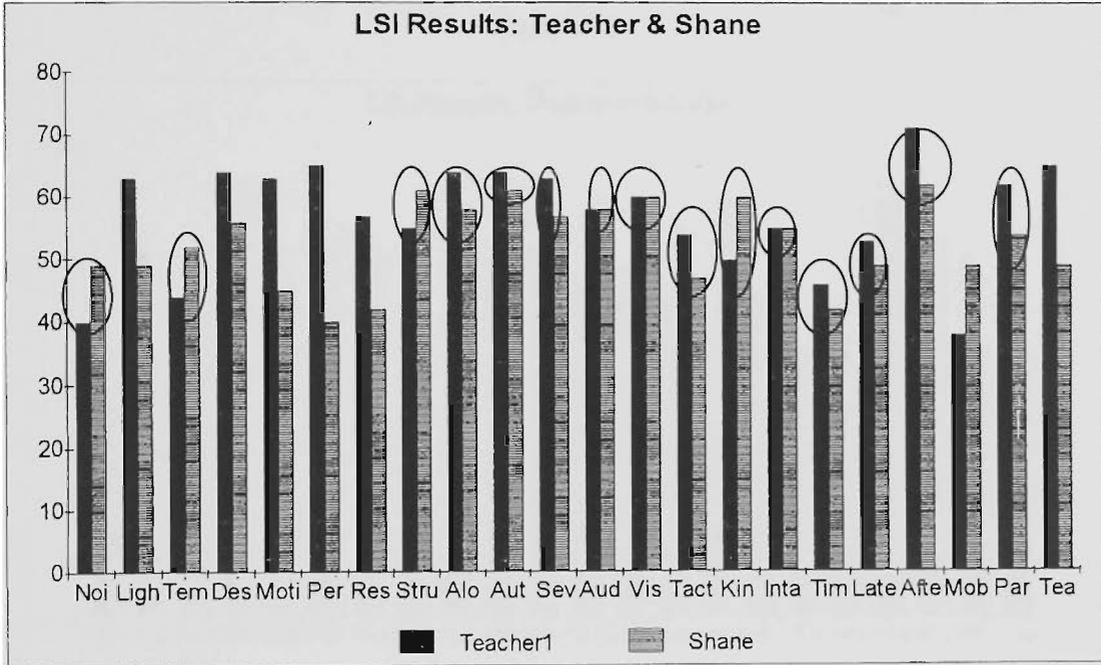


Chart 4.6.2

Note 2: 11 similar or close LSI scores.

Learning Style Inventory Comparison Results

Chart 4.6.3

Note 3: 8 similar or close LSI scores.

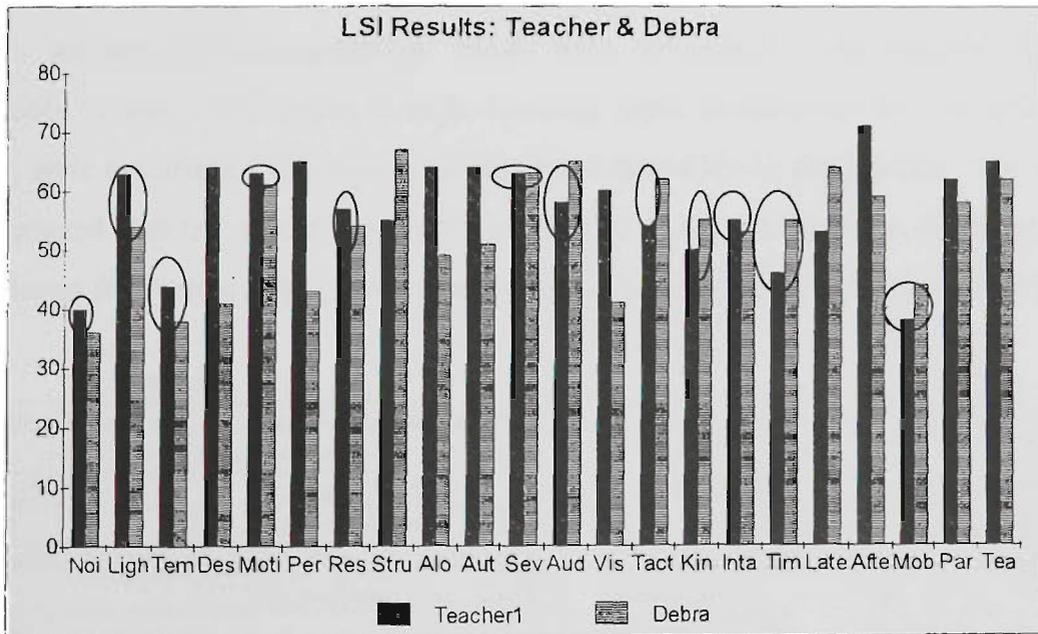
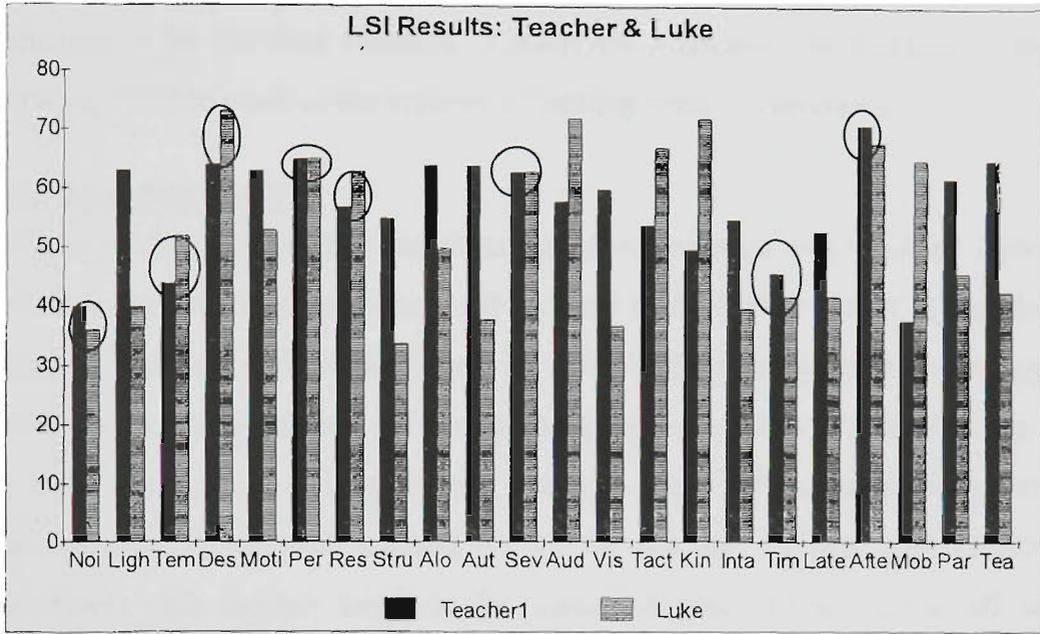


Chart 4.6.4

Note 4: 12 similar or close LSI scores.

4.11 LEARNING STYLE OCCURRENCES' COMPARISONS

Refer to Charts 4.7 and 4.8.1 to 4.8.5

How it was used

These charts displayed the learning style and teaching style occurrences in various time intervals, 70 minutes for each of the students and 15 days for the teacher. The occurrences of 11 different learning styles were monitored and chart 4.7 compared each of these learning style occurrences for the four students. Charts 4.8 displayed the teaching style occurrences and compared these to each of the student's learning style occurrences.

What this data displayed

Tables 4.4 and 4.5 below contain the frequencies of learning and teaching styles found from the video data, the information in these tables were then charted. Chart 4.7 displayed different frequencies in learning style occurrences for each of the four students, Luke appears to have the highest occurrence in almost all the learning styles. Charts 4.8 were better indicators of learning style - teaching style matching because they give a better idea as to whether particular learning styles were catered for by the teacher. There were seventeen possible teaching styles the teacher used in the observed time, fifteen days, all with different frequencies. The frequencies ranged from zero to just under forty-five. A high frequency was considered as catering for that particular learning style. Keeping this in mind each of the four student's learning style occurrences' charts were compared to the teacher's teaching style occurrences' chart. Whenever a high learning style occurrence was matched by a high teaching style occurrence this was considered as catered for by the teacher. The results of this data displayed that the teacher catered for nine out of eleven learning styles for Shane, eight out of eleven for Naomi, eight out of eleven for Luke and eight out of eleven for Debra.

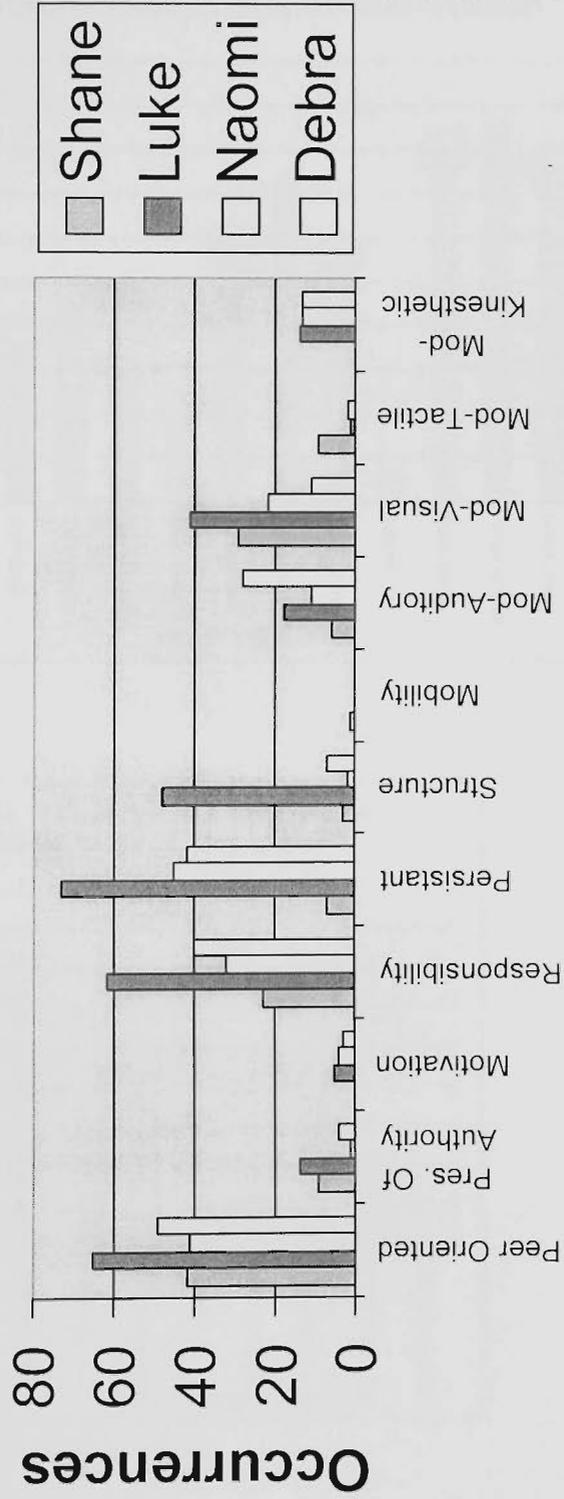
Table 4.4

The Class room Teacher's Teaching Style Occurrences - 15 Days of Observations			
Teaching Styles		Teaching Styles	
Peer Oriented	29	Learning Alone	33
Authority Present	17	Less Pres. of Auth.	21
Motivated	17	Unmotivated	20
Responsibility			15
Persistent	9	Non-Persistent	29
Structured	37	Non-Structured	28
Mobility	5	Non-Mobile	40
Modalities - Auditory			43
Modalities - Visual			38
Modalities - Tactile			9
Modalities - Kinesthetic			3

Table 4.5

Learning Style Occurrences - 70 Minutes of Tape				
Learning Styles	Shane	Luke	Naomi	Debra
Peer Oriented	42	65	41	49
Presence of Auth.	9	14	1	4
Motivated	0	5	4	3
Responsibility	23	62	32	40
Persist/Non-Pers.	25NP	73P	45P	42P
Structured	3	48	2	7
Mobility	1	0	0	0
Modalities - Audit.	6	18	11	28
Modalities - Visual	29	41	22	11
Modalities - Tactile	9	1	2	0
Modalities - Kinest.	0	14	13	13

Learning Style Occurrences for Students



Learning Styles

Chart 4.7

Teaching and Learning Style Occurrences' Comparisons

Chart 4.8.1

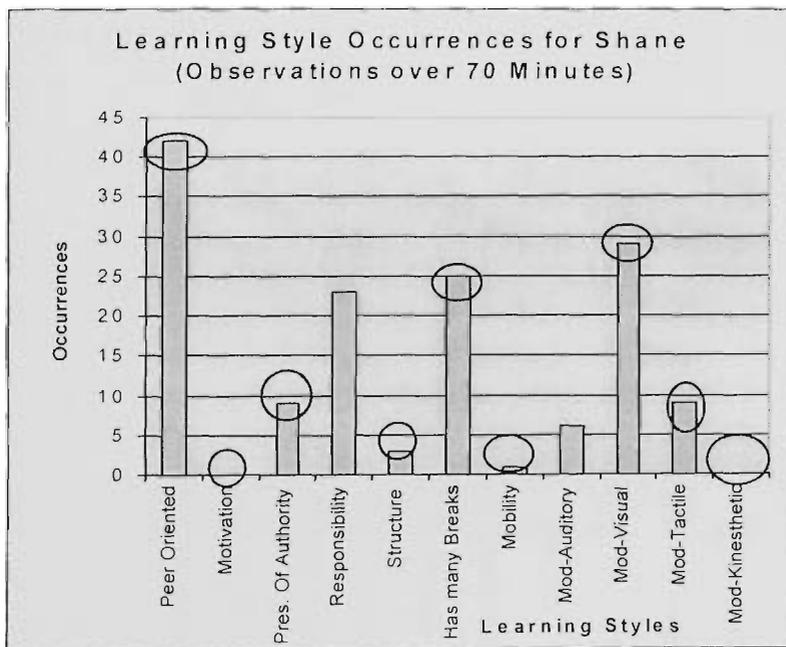
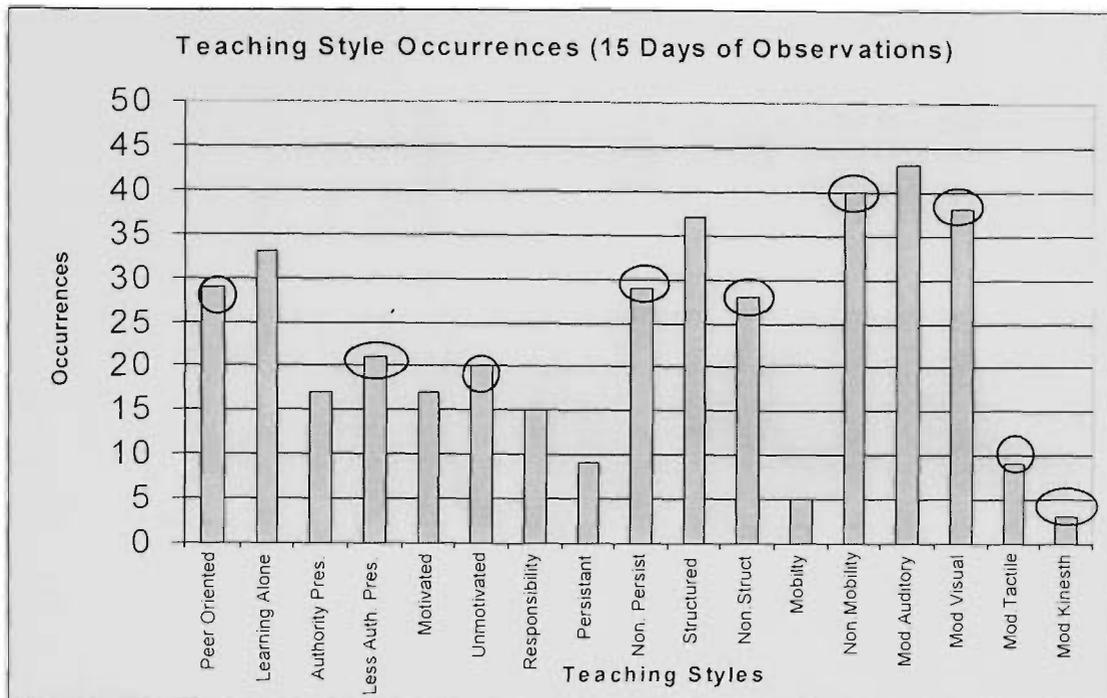


Chart 4.8.2

Note: Teacher catered for 9 of Shane's 11 learning styles, circled.

Teaching and Learning Style Occurrences' Comparisons

Chart 4.8.1

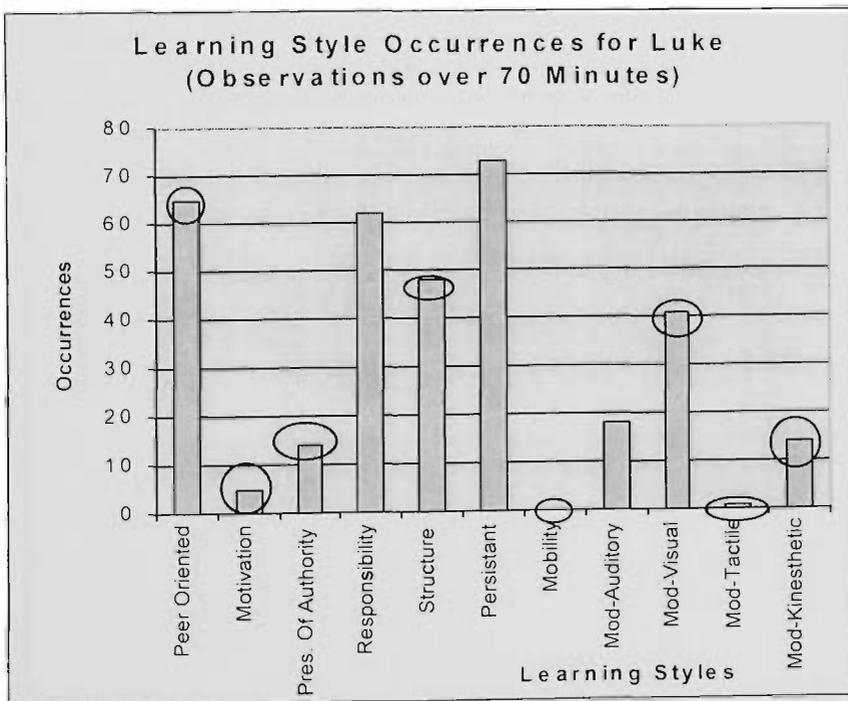
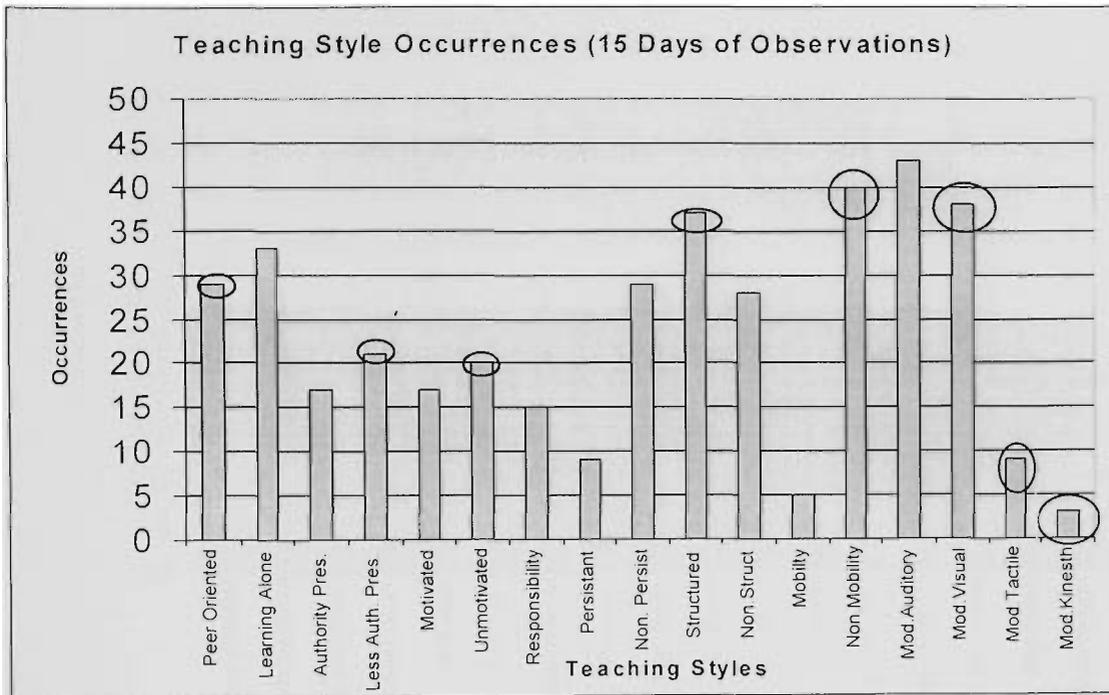


Chart 4.8.3

Note: Teacher catered for 8 of Luke's 11 learning styles, circled.

Teaching and Learning Style Occurrences' Comparisons

Chart 4.8.1

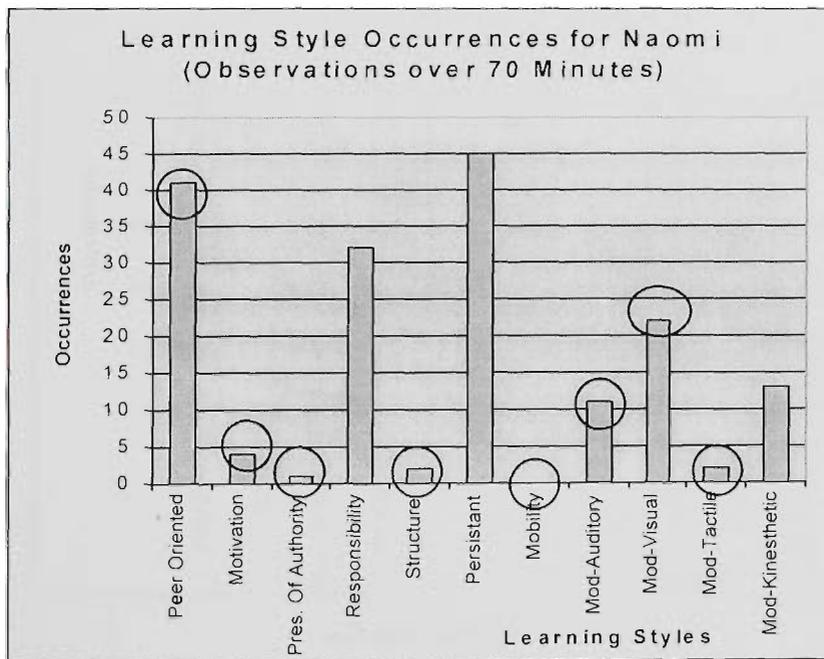
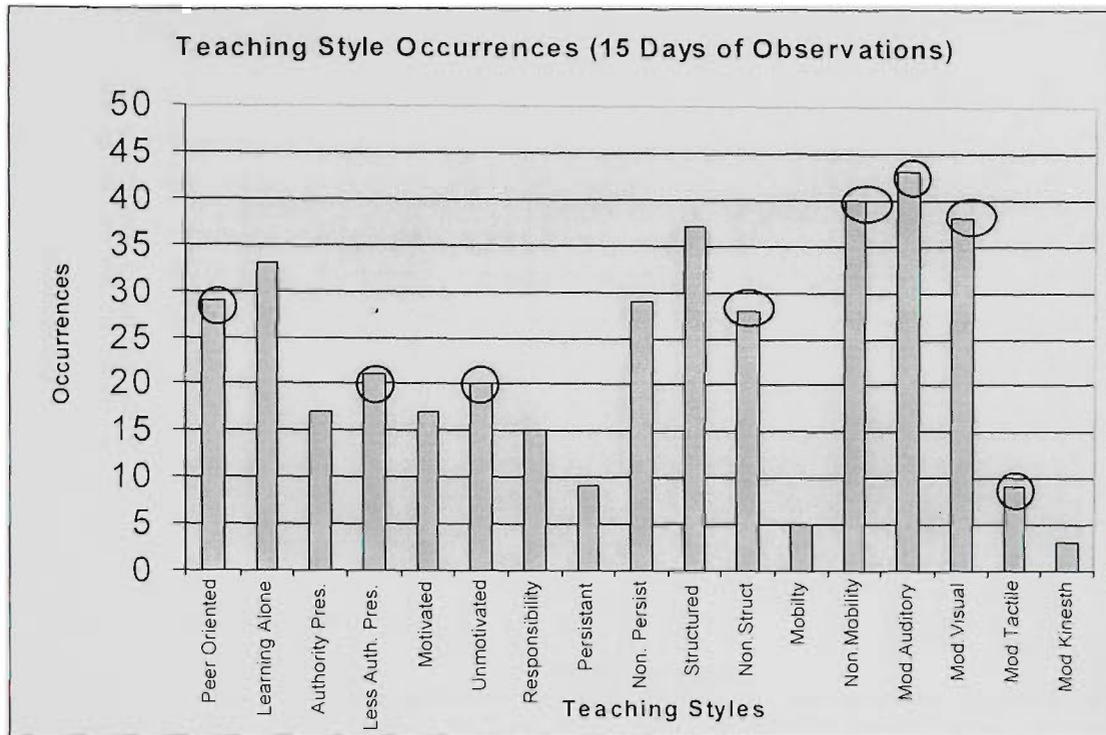


Chart 4.8.4

Note: Teacher catered for 8 of Naomi's 11 learning styles, circled.

Teaching and Learning Style Occurrences' Comparisons

Chart 4.8.1

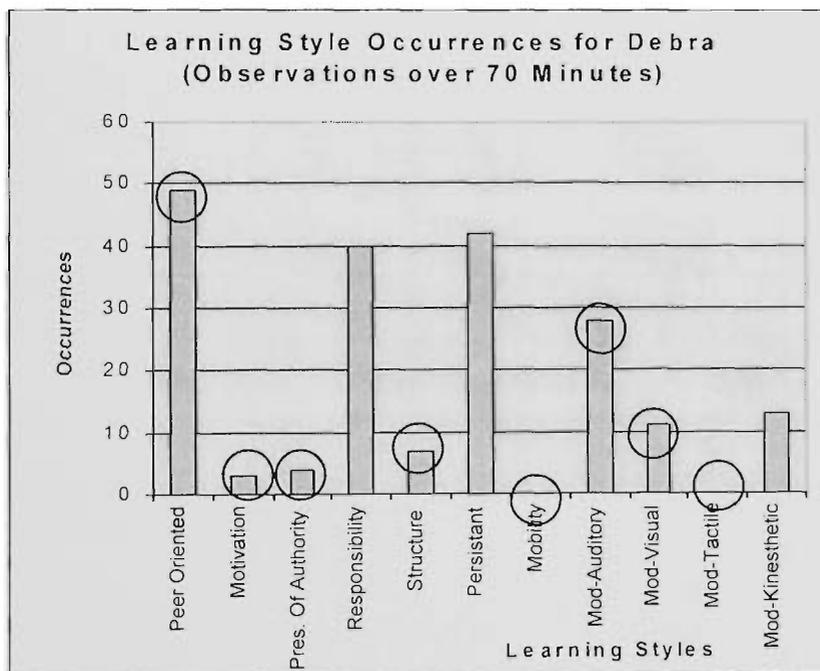
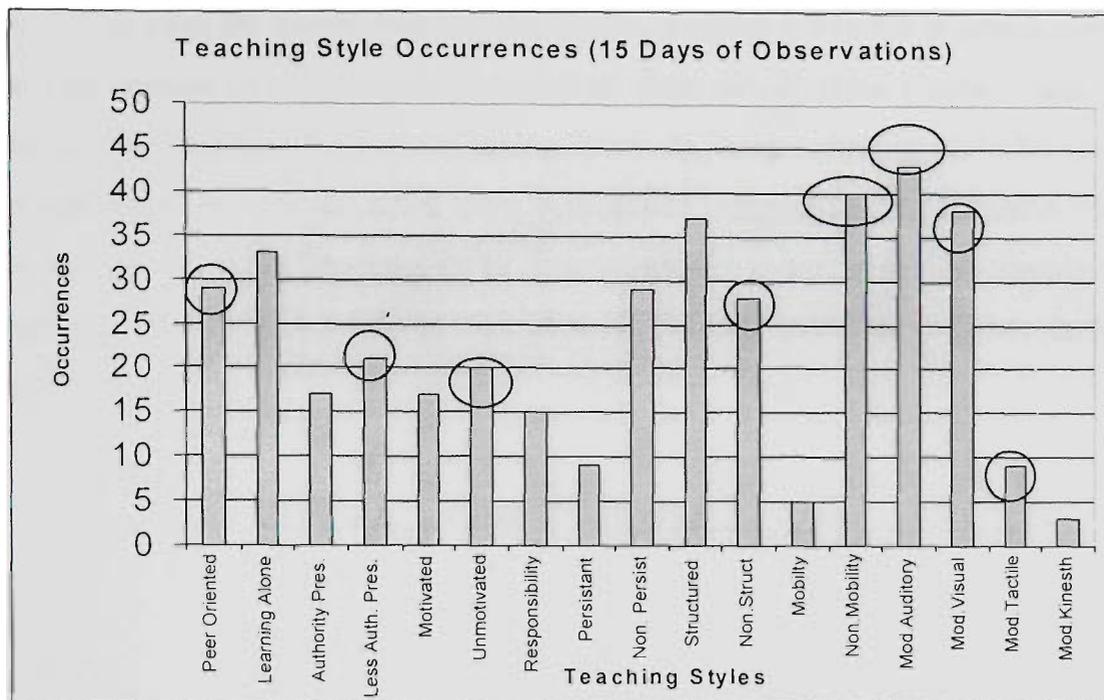


Chart 4.8.5

Note: Teacher catered for 8 of Debra's 11 learning styles, circled.

4.12 MATRIX 2.1 - SUMMARY OF LEARNING STYLE DATA

Matrix 2.1 on page 80 summarised all the results of charts 4.3 to 4.8 in a table format because of the vast amount of information portrayed in these twenty-three charts. Each of the totals for the ACER Learning Preference Scales, Dunn & Dunn Learning Style Inventory and the video tape and observational notes were highlighted in this table. This matrix facilitated the displaying of all three learning style measurement devices and the comparative results between learning styles, learning preferences and teaching styles for the four students and the teacher.

MATRIX 2.1 Summary of Learning Style Data														
Learning Style Measurement Devices			Shane			Naomi			Luke			Debra		
(I) BARNES : LEARNING PREFERENCE SCALES	Comparison to Teacher		Comparison to Teacher		Comparison to Teacher		Comparison to Teacher		Comparison to Teacher		Comparison to Teacher			
	Close or Similar	Different	Close or Similar	Different	Close or Similar	Different	Close or Similar	Different	Close or Similar	Different	Close or Similar	Different		
Cooperation	✓		✓		✓		✓		✓		✓			
Competition	✓			✓		✓			✓			✓		
Individualism		✓		✓		✓			✓			✓		
Total	2 out of 3		1 out of 3		1 out of 3		1 out of 3		1 out of 3		1 out of 3			
(II) DUNN & DUNN : LEARNING STYLE INVENTORY RESULTS	Comparison to Teacher		Comparison to Teacher		Comparison to Teacher		Comparison to Teacher		Comparison to Teacher		Comparison to Teacher			
	Close or Similar	Different	Close or Similar	Different	Close or Similar	Different	Close or Similar	Different	Close or Similar	Different	Close or Similar	Different		
Noise Level	✓		✓		✓		✓		✓		✓			
Light	✓		✓		✓		✓		✓		✓			
Temp	✓		✓		✓		✓		✓		✓			
Design	✓		✓		✓		✓		✓		✓			
Motivation	✓		✓		✓		✓		✓		✓			
Persistent/Has Breaks	✓		✓		✓		✓		✓		✓			
Responsible	✓		✓		✓		✓		✓		✓			
Structure	✓		✓		✓		✓		✓		✓			
Peer Oriented/Works Alone	✓		✓		✓		✓		✓		✓			
Authority Figures	✓		✓		✓		✓		✓		✓			
Several Ways	✓		✓		✓		✓		✓		✓			
Auditory	✓		✓		✓		✓		✓		✓			
Visual	✓		✓		✓		✓		✓		✓			
Tactile	✓		✓		✓		✓		✓		✓			
Kinesthetic	✓		✓		✓		✓		✓		✓			
Intake	✓		✓		✓		✓		✓		✓			
Time of Day	✓		✓		✓		✓		✓		✓			
Late Morning	✓		✓		✓		✓		✓		✓			
Afternoon	✓		✓		✓		✓		✓		✓			
Mobility	✓		✓		✓		✓		✓		✓			
Parent Motivated	✓		✓		✓		✓		✓		✓			
Teacher Motivated	✓		✓		✓		✓		✓		✓			
Total	15 out of 22		11 out of 22		8 out of 22		8 out of 22		12 out of 22		12 out of 22			
(III) VIDEO TAPE AND OBSERVATION RESULTS	Comparison of Teaching Style to Learning Style Occurrences			Comparison of Teaching Style to Learning Style Occurrences			Comparison of Teaching Style to Learning Style Occurrences			Comparison of Teaching Style to Learning Style Occurrences				
	High LS occs	Low LS occs	Catered for by Teaching Styles	High LS occs	Low LS occs	Catered for by Teaching Styles	High LS occs	Low LS occs	Catered for by Teaching Styles	High LS occs	Low LS occs	Catered for by Teaching Styles		
Peer Oriented	✓		✓	✓		✓	✓		✓	✓		✓		
Presence of Authority		✓	✓		✓	✓		✓	✓		✓	✓		
Motivation		✓	✓		✓	✓		✓	✓		✓	✓		
Responsibility	✓		✓	✓		✓	✓		✓	✓		✓		
Persistent/Non-Persistent	✓NP		✓	✓P		✓	✓		✓	✓P		✓		
Prefers Structure		✓	✓		✓	✓		✓	✓		✓	✓		
Mobility		✓	✓		✓	✓		✓	✓		✓	✓		
Auditory	✓		✓	✓		✓	✓		✓	✓		✓		
Visual		✓	✓		✓	✓		✓	✓		✓	✓		
Tactile		✓	✓		✓	✓		✓	✓		✓	✓		
Kinesthetic		✓	✓		✓	✓		✓	✓		✓	✓		
Total	9 out of 11			8 out of 11			8 out of 11			8 out of 11				

4.13 SUMMARY OF LEARNING STYLE DATA : INDIVIDUAL FINDINGS

The following summarises the results from all the learning style measurement devices and discusses the learning style and teaching style outcomes and compares these two for each of the students.

Shane

Shane's Learning Preference Scale results were not very different from the teacher's. Their 'Competition' scores were identical with a very slight difference in the 'Cooperation' scores. A noticeable discrepancy occurred in the 'Individualism' scores. These results tend to display similar attitudes were shared by Shane and the teacher towards their learning environment concerning competition and cooperation. Out of the four students Shane's Learning Preference Scales' results were the closest to the teacher's.

In contrast to this, the Learning Style Inventory results for Shane and the teacher show a different outcome with over two-thirds of the Learning Styles, fifteen out of twenty-two, being close or similar. This was the highest comparison, out of the four students, to the teacher's learning styles in this particular learning style device. The third measurement, The Video tape and Observations results show a more compatible learning -teaching situation. These last results demonstrate a compliant nature between Shane's learning styles and the teaching styles with ten out of the eleven catering for Shane's apparently displayed learning styles. It appeared that in Shane's case all three sets of results display an accord between his styles of learning and the learning preferences and teaching styles of the teacher.

Naomi

The outcome from the Learning Preference Scales displayed only one close match between Naomi's and the teacher's results and that was in the 'Cooperation' scores. The 'Competition' and 'Individualism' scores could be seen to differ significantly in the graph. Naomi's Learning Style Inventory results displayed that half of her learning styles, eleven out of twenty-two, were similar to the teacher's learning styles. This was less than the outcome of Shane's LSI results, otherwise the Video Tape and Observation results displayed a match in nearly all of Naomi's learning styles and the teaching styles, nine out of the eleven observed. This again exhibiting the teaching styles were catering for her learning styles.

Luke

Luke also had only one close Learning Preference Scale results' score with the teacher, that being the 'Cooperation' score. The Learning Style Inventory results showed that just over a third of the learning styles were similar or close to the teacher's, only eight out of the twenty-two. This was the lowest comparison, among the students, in this particular learning style measurement device. Luke's Video Tape and Observations results were very much like Naomi's in that there were nine out of eleven teaching styles catering for his learning styles according to this measurement device.

Debra

Debra's closest Learning Preference Scales results' score to the teacher's was in 'Cooperation', this being a similar result to Naomi's in this learning style measurement device. In the Learning Style Inventory results Debra had twelve out of twenty-two similar learning styles as the teacher's, this was just over half of the total number of learning styles that were tested. Finally, her Video Tape and Observations results were similar to Naomi's and Luke's in that she had nine out of eleven matching learning - teaching styles, again displaying an accordance in this tested learning situation.

Summary

The teacher shared only one learning preference with each of the students in this study except for Shane with whom he shared two. It was also revealed that the teacher shared about 50 % of learning styles' results with each of the student's learning styles' results. More importantly, the teaching styles in this class accommodated approximately all of the four students' learning styles. The teacher appeared to be eclectic in his styles of teaching and was therefore able to match the learning styles of the four students.

CHAPTER FIVE

Conclusion And Implications

5.1 SUMMARY OF RESEARCH QUESTIONS AND METHOD - FINDINGS FROM THIS RESEARCH

Before approaching the conclusions from the data analysis the conceptual framework of this research was recalled concerning the teaching styles and learning styles relationship and the questions that were being considered regarding these. *“Is there a match or mismatch between students’ learning styles and the teaching styles in the classroom and is this affecting the learning progress of the students ?”*

The first learning style measurement device, the Barnes Learning Preferences Scales, tested for three learning style areas. In this test all four students had at least one learning preference in common with the teacher. Possibly, the results were not so unusual because these three were broad learning style areas. The interesting outcome was that Shane, who was the academically weaker student, was the only one of the four students who shared two of the three learning preferences in common with the teacher.

The Dunn & Dunn Learning Style Inventory, which was more specific in its learning style definitions, further revealed Shane to have the greater number of close or similar learning styles as the teacher when compared to the other three students in the study. Luke, who had proficient literacy acquisition skills, had the lowest number of common learning styles with the teacher, Naomi and Debra had a few more than Luke.

The final learning style measurement device, which used observations of the students and the teacher in the classroom, looked at eleven learning styles and revealed that the teacher's styles catered for all four students' learning styles showing no fluctuations for the different literacy acquisition skills of the four students.

The implications of these results from the three measurement devices were that the teacher's learning styles were similar to about half the learning styles of the students. The teaching styles, though, in this particular classroom catered for just about all of the

students' learning styles. The teacher had a wide vary of teaching styles, whether he specifically used them for individual student learning cannot be confirmed but he did accommodate nearly all of the eleven learning styles for each of the four students. There is strong evidence to suggest, according to the results found in this research, that there was a match between teaching styles and learning styles in the classroom. Having found the answer to this the next part of the question was whether this matching of styles affected the learning progress of the students. To find this the academic results of the students throughout the year were to be consulted again to actually observe how these students progressed during the year. These results were plotted in Chart 5.1.

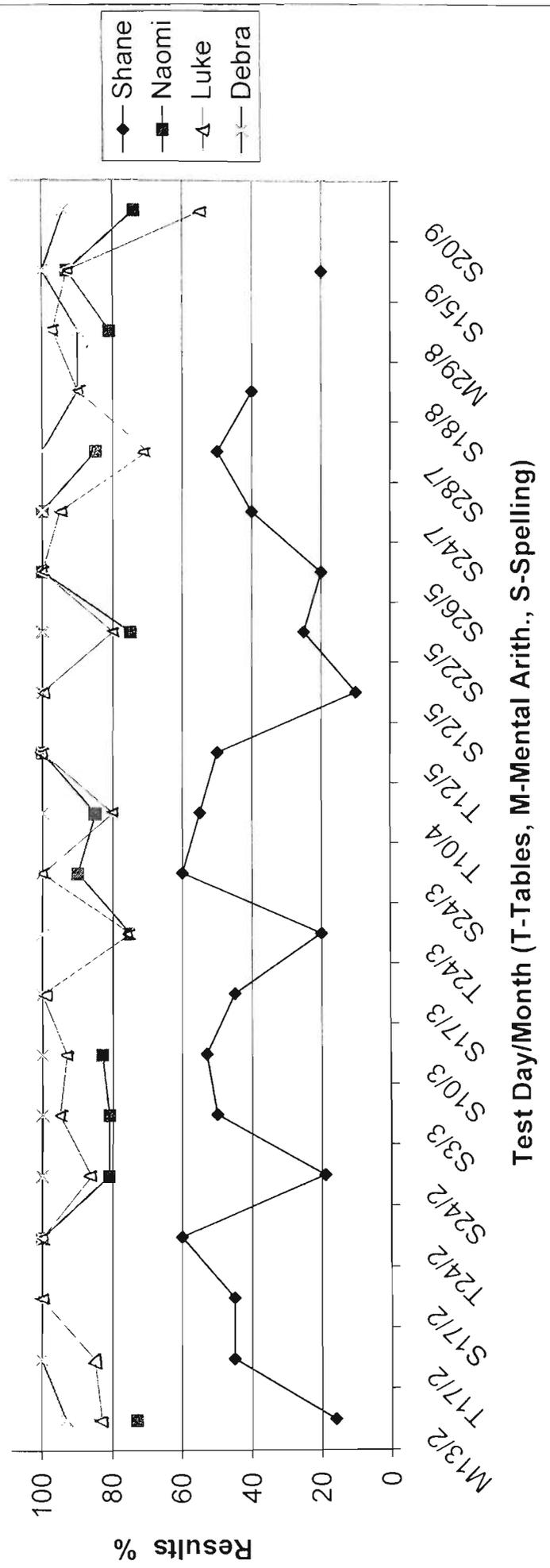
The chart displayed various academic results form February to September 1995. The TORCH reading results from Chart 4.1 also showed some similar results for each of the four students in October 1995. Debra's results were very consistent throughout this period always being between 90 and 100%, she kept up a very high level of academic performance. Luke's results tended to fluctuate during this time period, although he was capable of many high academic results, in the 100% level, he did get some lower results at times which were mostly in spelling tests and more towards the latter half of the year. This was observed and mentioned by his teacher in his evaluation.

Naomi's results also tended to fluctuate but her scores were always between 70 and 100%, displaying a high level of academic achievement during this period of time. Shane's results, during this period of time, were of a lower academic standard but he was able to achieve some results between 50 and 60%. His low scores were not always for one particular type of test, however, and they did reach as low as 10%. Most of his results were of a noticeably lower standard compared to the rest of the class, yet his results displayed a very erratic pattern on the chart. They would jump from low to high then low again, there was no gradual decline or increase throughout this time period as could be observed from this chart.

From the above observations it cannot really be concluded that the teaching styles-learning styles matching had a negative effect on the students in this research. Generally, the academic behaviour of these students seemed to be relatively consistent throughout the time period. How positive the matching was cannot really be concluded either because there was no obvious increase in academic performance from the beginning to the end of the period.

Chart 5.1 Various Academic Results

Various Academic Results - 1995



Note : No result indicates student was absent.

5.2 IMPLICATIONS OF THE RESEARCH AND LIMITATIONS OF THE STUDY

As discussed in the literature review, teaching styles and the learning styles of students are important when observing the wide variety of ways that learners differ and how these differences are affected by certain instructional methods or programs. However, it is difficult to accurately determine these learning styles in a format that would provide teachers and educators with valid information that would enhance students' learning. This information would have the potential to help all students with literacy skills ranging from below average to above average. The information that we can obtain presently is still useful and can be supplemental to other teaching methods and devices and can still enhance the learning of students with varied literacy acquisition skills.

Clearly there is some relationship between learning styles and teaching styles and the effects of their matching in the classroom. Further study, though, would need to be carried out to find an accurate relationship and the effects of its manifestation into the learning environment. Despite the amount of data collected, far more information needs to be ascertained and discussed.

Although a huge amount of data would be produced, a study beginning from the early school years that went to upper primary school years would present a rich scope of information relating to literacy acquisition skills and learning styles of students. Tracing patterns of these results overtime would certainly give a reasonable idea of the learning behaviour of a student. The validity of learning style instruments can also be questionable. As mentioned in chapter three factors like clarity of L.S.I. questions, honesty in students' responses and the reliability of the L.S.I. output must be considered when analysing results concerning learning styles.

5.3 LEARNING STYLES AND THEIR CHALLENGE IN THE CLASSROOM

Much has been discussed about the importance of understanding learning styles and their uses in the classroom. Research has found "...very significant levels of achievement following incorporation of learning style preferences" (Jordan, 1993, p.16). Some researchers would agree that this knowledge, while being useful to the teacher, would be

extremely beneficial for the students themselves. Guild (1994) agrees that “One focus that will make the learning experience more successful for all students is an understanding of learning styles” (p. 8). She also agrees that one of the major themes and concepts of learning styles are that “...a variety of ways exist for teachers to respond to style diversity in the classroom” (p. 8). Other researchers believe that this knowledge of learning styles would have a substantial impact on teaching. Giles (1995) states “Knowing how people learn and why they learn in a specific manner unlocks the mysteries of so called good teaching” (p. 2).

The problem that arises when working with learning styles is that they can be very difficult to measure correctly. Trying to discern students’ learning behaviour is not an easy task because of its complex and challenging nature. Most teachers would agree with Guild (1994) when she claims “Most of us have a hard time describing our own ways of learning, so trying to respond to learning style diversity of students or staff is indeed a challenge” (p. 13). Difficulties can arise like teachers or educators not always being able to identify certain aspects of style. They may misjudge behaviour patterns or fail to interpret symptoms because some learning styles are not that easy to recognise. The teacher’s personal learning and teaching experiences can also impede their judgement about students’ learning styles. The learning style inventories themselves and their output can also be questionable, as well as whether the input of the students can be assumed as totally understood and honest.

As well as these aspects above not all educators are totally convinced that the knowledge of learning styles and matching teaching styles are the significant factors in classroom achievement. Doyle and Rutherford (1984) conceded that “...existing research does suggest that there is an important practical interaction between the academic ability of students and the degree of structure provided by instruction” (p. 22). They mentioned that there were many different factors, though, that accounted for this. Factors such as the student’s individual ability and prior knowledge that are inherent in the student. Good and Stipek (1983) stated that the effect of learning style on achievement could be affected by the nature of the learning task, the relationship between teacher and student, the time of the year and other local conditions. They also discussed the quality of teaching instruction and the different variety of formats that teachers use to present information having an effect on this relationship. Knight and Pearl (2001) present some guidelines on

creating a democratic classroom. They state “The alternative to instruction organised to facilitate different learning styles is a theoretically grounded democratic classroom whose primary goal is to prepare an informed and responsible democratic citizen” (p. 13).

Due to all of these different and varied factors discussed it would possibly be an arduous task to predict a simple linear relationship between learning style and teaching style and the actual effects of the matching of the two. But the importance of knowledge and understanding of learning styles cannot be discounted and simpler ways of identifying learning styles need to be investigated and developed. Future research could examine different techniques for obtaining learning style data from students. As we move into the future, and technology becomes more sophisticated, there is the potential that learning style measurement devices will provide more revealing information and insight with less difficulty and conflicting opinion and this could produce a clearer picture and understanding of students’ learning styles. The time period for this type of research would take at least several years, as long as it would take to establish a learning pattern for the student. Many different types of data would need to be collected and ascertained for, possibly, large control groups of students.

While progress continues in the research of learning and teaching styles there is a need for teachers to be versatile in their teaching methods, as the teacher was in this study, and cater for the different varieties of learning styles that students possess. This can be time consuming since teachers’ work is already involved and full of activity. Giles (1995) tells us “Teachers constantly are making choices they hope will enable the greatest number of students to learn the greatest amount of material at the same time” (p. 2). Consequently, timelines and schedules in the classroom must be met and sometimes it is easier to use similar materials and instructional approaches more often. Yet to respond to the different learning styles of students Guild (1994) suggests “...we must challenge the status quo and seek to diversify school experiences” (p. 10). Guild, who is a director of an organisation with “...an eclectic approach to learning styles” (p. 13), promotes versatility in teaching methods and attitudes in accordance to individual learning differences. She explains “An understanding of learning styles would suggest it would be impossible for any program or technique to work for all individuals and, therefore, teachers should use a variety of strategies for learning in the classroom” (p. 11).

The eclectic approach means selecting from various different teaching methods and applying these in different learning situations for the student. An eclectic teacher would be able to cater for the variety of learning styles present in the classroom. As was found in this study matching teaching styles to learning styles did not hinder the learning achievement of any of the four case study students.

Teachers do need to be eclectic in their teaching styles to cater for the variety of the students' different learning styles, to use different methods that may work for those students when other approaches to learning do not. In the meantime, as it progresses, learning style and teaching style research would be of significant importance and relevance to educators because it would enhance their understanding of students' learning, and their differences in learning, and they could attempt to assist learners experiencing difficulties in the process of learning. This, ultimately, would mean extra time being spent on students on behalf of the teacher but the output though, in the long run, would be in the form of a promising and positive future for the student. Positive futures for students is a goal that all teachers and educators strive for. They do this, according to Miller (1999) "... when they spend a little extra time with a student who has trouble learning" (p. 1).

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Appendix 1 Extract from Observational Notes
 Used to locate Teaching Style Occurrences
 (Teacher represented by T)

	DAY 2	FRIDAY 31/3/95
	9:03 am	- Hand exercises for cold - finger waney "hard jumps"
Some sexy hair changed children in differe SPUs		=> prayers
	9:05	Talks by Students - Project Presentations Students get into groups & sit out the front.
* See yellow assessment form "EARTH AND BEYOND"		<u>Natalie</u> "Volcanos" talk & displayed model of volcano - explained the "type of volcano"
		Talk was read from paper but explanation is was from background knowledge.
		<u>Justine</u> "Volcanos + Poster." Talk (read) & demonstration + explanation of poster.
		<u>ANTIGONE</u> "Solar System" Talk & Model (very good) Demo + explanation of model • how she made model • explain of planets, position, Sun

	<p>Natalie "Earth" Talk + model of "earth" - layers, rotation, rock revolution, travel time distance from sun</p>
<p>9.20 Talking low level noise } quiet</p>	<p>Hand Writing Exercises "HAND WRITING MATTERS" Students - back to seats (continued from yesterday) <u>MATHS</u> When finished - Problem Solving Work "V.P.M." Set exercises Year 5 - p 29 + p 18 } All Year 6 - 32 + 111 } All</p>
<p>Work from VPM</p>	<p>Grade 5's on floor at front of class - lesson on "equations" What is an "equation" ? Explain^{ts} of exercises - eg's. • demo of example ques^{ts} from students • step by step expl^{ns} of tasks to be done First exercise is done together, question is put to students & explained by T. using chalk/talk. harder exercise question again to students Allocates extra work for those who finish. What is "operation" x + ÷ - Dismiss + back to seats</p>

Students watched
 - example
 - attempt to answer
 T's question
 - after one exercise
 go back to
 seats

T. keep eye on those that are
 working at their desk + keeps
 noise level low.

At board with those that remained
 behind: went over example - harder
 than before (an exercise that
 they were set to do)

Chalk talk at board - demo

$$490.50$$

$$128.65$$

questions each student
 remaining for individual
 unit subtractions

9:50
 - Students
 continue to
 work
 - low level noise
 → quiet

All asked to complete handwriting
 exercises + start on Math's Tasker.

T. reminds those to do talks on
 Monday

9:55
 - students
 work from VPM -
 books doing exercises

Roll Call: while the students
 work.

(T walks out for a sec but
 students continue to work quietly)

Student (Harry) goes to T's desk for
 help - assisted by T

Hands up to answer any question
 from T.

Students line up at desk to get help
 with problem.

T goes thru exercise on a piece of
 paper.

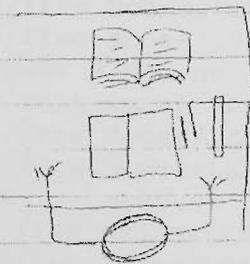
Students continue on maths work
- low level noise

T walks thru rows as students work & watches their workway

- not much talking in students at desk

Students take a lot of pride in writing & writing (distinguishing between red & blue pens)

- Finger calculators
- ~~text~~ book set out in front of them & work book directly in front



↑ in most cases

- T interprets problem to help "forget the word 'renaming'" rewards problem.

T. ~~is~~ re writes problem on a scrap paper.

T. Question: what to do for this afternoon art activities - gives students option of working on their projects. also.

- reminds them to date their work & always organize units in columns neatly to assist in their problem solving calculations

(- Walk out again for a sec. - no change in work style of class)

From T.
(First term is more structured, as more towards term 3 work will become more co-operative) (Students/T work towards this type of ~~work~~ learning environment)

[Margins, setting out, dating told to them by T.]

Minimal collaboration when they write together at table. So most talk is usually conversation. Any work related questions seem to be directed at T.

Appendix 2 One of the NUD*IST files used.
Shane – 10 minutes of Video

shtplss5.txt page: 1 8/01/9920:58:44
Q.S.R. NU .IST Power version, revision 4.0.
Licensee: VUT.
PROJECT: masters99, User Connie Galati, 8:56 pm, Aug 1, 1999
+++++
+++ ON-LINE DOCUMENT: shtplss5
+++Document Header:
*Session 5
*Maths Task Centre Shane and Robert
*Time: 14:00 ate: 25/10/95
+++ Retrieval for this document: 178 units out of 178, = 100%
++ Text units 1-178:

Rock-paper-scissors to see who goes first. -- ~
Shane throws dice first.

r 14:01 6
f s : Five , three urn, 7
~.R: You get fifty seconds, one minute each
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
S: For what? 9
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
R: Just to Find the... ..let me fix the dice 10
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
a Robert picks up the dice and holds them level and looks at them. 11
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
a Gives them to Shane to throw them. 12
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
S: Eleven ? 13
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
R: Ten. 14
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
S: Ten spaces ? 15
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
a Shane begins to move counter ten spaces but Robert stops him and
explains rules. 16
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
R: Ten spaces ? No, no You have to Find the sums of ten, you have to
Find sums that equal ten. 17
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
~) a Shane looks at the game then looks to the side thinking. 18
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
R: ..and actually get it in a row. 19
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
a Robert shows horizontal and vertical rows on the game sheet 20
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
S: oh, yeh 21

(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) I/Free Nodes/LEARNING STYLES/RESPONSIBILITY
R: Ten, ten. Find a sum for ten. You've got one minute. 22
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
A Shane looks at sheet and points and smiles. 23
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
S: Urn, two times five 24
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
A Shane looks at Robert . 25
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
F
shtplss5.txt page.2 8/01/9920:58:44
R:OOK put your thing 26
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
A Robert points to the sheet then rolls the dice 27
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
R.O Twelve ,thirteen, fifteen.. 28
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
S. Shivers. 29
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
A Robert looks for fifteen on the game sheet. 30
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
R: What was it ? 31
!! (F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
i S:Ofouten, fifteen I mean. "' 32
" (F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
I'j R: Fifteen, 33
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
'i A Robert keeps looking for a sum on sheet that equals fifteen, 34
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
S: Oh,.. 35
AOSharbell thinks he has found a sum and uses his fingers to count
something to himself. 36
A looks back at the sheet, 37
S. Hey,l think your times up. 38
(F 1 4) /IFree Nodes/LEARNING STYLES/RESPONSIBILITY
~ A Robert hurls the dice over to Shane . Shane rolls dice, happily,
One at a time. 39
A Shane looks at the dice, arranges them to them properly. 40
S' Um, seven,..makes seven 41
A Shane looks at the sheet for a couple of second s, points to the sum 42
S. One times seven. 43
A Shane looks at Robert smiling then places the counter on the sum for
seven. Robert rolls dice. 44
R: Eleven, thirteen, fourteen. 45
A Robert proceeds to Find fourteen. 46
S: He's getting all the hard ones,.., fourteen. 47
A Shane begins to read the instructions of the game while Robert
looks for his sum. 48
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
S: You have to use two, Robert ,... 49
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
AO Shane points to instructions. 50
(F 1 1) I/Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
S:OYou're suppose to use two dice 51

(F 1 1) /iFree Nodes/LEARNING STYLES/PEER ORIENTED
~ (F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
AO Shane shows one finger then two fingers. 52
(F 1 1) I/Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
R:oYou use three dice, 53
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
A Robert shows the dice 54
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
S:ONo, it says two 55
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
A Shane points to instructions re-reading them. 56
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
S: Oh, yeh, Three dice. 57
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
A Shane concedes and nods. 58
shtplss5.txt page.3 8/01/9920.58:44
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
AORobert gives up and gives the dice to Shane . 59
AO Shane picks up the dice and throws them one at a time saying 'Ah'
after each throw. 60
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
S:OSame one. 61
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
A Shane looks at Robert smiling. 62
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
R:OTwelve 63
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
A Shane looks for sum carefully. ~ 64
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
S:OWhat is it? Twelve? 65
(F 1 1) I/Free Nodes/LEARNING STYLES/PEER ORIENTED
AORobert no s, Shane looks again 66
(F 1 1) I/Free Nodes/LEARNING STYLES/PEER ORIENTED
S:OOh, no.67
(F 1 1) //Free Nodes/LEARNING STYLES/PEER ORIENTED
R:OOK, times up. 68
(F 1 1) IIFree Nodes/LEARNING STYLES/PEER ORIENTED
AORobert grabs dice and rolls. 69
AOTeacher walks up to them, "How are things going?" 70
S: Good Sir. 71
AO Shane concentrates on game. 72
AORobert has his turn, then gives dice to Shane .73
AO Shane rolls dice one at a time. 74
S:OThis is like, ah, what's it called ? Like, urn, Connect 4. Three, five,
eleven, eleven. 75
A Shane looks hard at this hand trying to work out a sum in his head ,
then no s no.76
S.OShit 77
AO In the meantime Robert grabs the dice. 78
AO Shane tries to work out another mental sum. 79

S:00h 80
A: Shane thinks he has worked one out. 81
S:00h, that's not mine, though, oh, here 82
A: Shane puts his counter own. Robert checks that Shane has got it Right. 83
R:0Yeh, that's right. 84
A: Robert throws the dice. 85
R:0Fifteen. 86
S:0You get all the hard ones 87
A: Shane looks at the game sheet. 88
S:00h no.89
"- " A Shane looks at the camera and begins to o a mental calculation using his fingers. 90
A: Robert quickly Finds a sum that equals fifteen and places the counter on it. 91
R:0There, I found it. 92
A: Robert gives dice to Shane . Shane throws dice one at a time. 93
S:0Four, five, urn, nine, nine. 94
A: Shane looks at the sheet carefully. 95
S:0What makes nine? 96
R:0Robert grabs the dice. 97
A: Shane looks at the sheet for a few seconds, he then looks at his fingers on both hands. 98
S:0Oh. 99
A: Shane grabs one of his counters and proceeds to Find the sum on the sheet. 100
S:0Where is it? Where is it? 101
A: Shane Finds the sum and puts counter down on it. 102
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
A: Robert checks it and sees that it is incorrect. 103
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
- .
shtpl ss5.txt page: 4 8/01/9920:58:44
R: What was the number? 104
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
S: Oh, no there it is. 105
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
A: Shane moves the counter own one sum to correct spot. 106
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
R: No, your time was up 107
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
A: Robert picks up Shane counter and gives it back to him. Robert rolls the dice. 108
(F 1 4) //Free Nodes/LEARNING STYLES/Responsibility
S: Oh my g 109
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
A: Shane gets upset at himself. Then read s the instructions. 110
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
S: Here it says twenty second s no one minute. 111
A: Shane watches Robert then the sheet to look for Robert sum J12
S: 1 and 12 make thirteen. 113
A: Robert keeps looking. Shane looks away at what others in class are going. 114
R: I've got seven seconds. 115
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
LS: Seven second s? What, a couple of seconds? 116
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY

S: Times up, no, no, actually two minutes, no two seconds. 117
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
R: Robert hands over the dice to Shane . 118
A Shane looks on the floor to Find one of his counters. He picks up
the dice and throws one at a time. 119
S: Um, eight. 120
A Shane looks at sheet for a while, whispers to himself. 121
S: How much time have I got left? 122
123
14:07 124
R: Times up. 125
A Robert rolls the dice. 126
R: Seven, seven 127
A Robert hands over the dice to Shane and quickly puts a counter on
game sheet. 128
A Shane rolls the dice and counts total with his fingers. 129
S: Six, seven, eight, nine, ten, ten 130
A Shane looks at the sheet. 131
S: Oh, five plus five, where is it? 132
A Shane Finds the sum and places counter on it. Robert checks it,
grabs dice and throws. 133
R. Twelve. 134
~ A: Shane looks around the class but seems to have his mind on the
game 135
(F 1 2) II Free Nodes/LEARNING STYLES/PRS OF AUTHORITY
S: What happens when you get three doubles? 136
(F 1 2) //Free Nodes/LEARNING STYLES/PRS OF AUTHORITY
R: Oh, yeh (inaudible) 137
(F 1 2) //Free Nodes/LEARNING STYLES/PRS OF AUTHORITY
A Shane looks away at class, then up at the camera, then up at Robert . 138
(F 1 2) //Free Nodes/LEARNING STYLES/PRS OF AUTHORITY
A Shane looks at his fingers doing mental calculation then looks at
class member & calls their name. 139
A Robert hands dice to him after not Finding a sum. Shane rolls one
at a time. 140
S: Seven. 141
A Shane looks for seven. Robert grabs dice in the mean time. 142
A Shane looks for a while, looks up and does a mental calculation. 143
(F 1 2) //Free Nodes/LEARNING STYLES/PRS OF AUTHORITY
S: How much do I have to make? 144
(F 1 2) //Free Nodes/LEARNING STYLES/PRS OF AUTHORITY
R. Seven. 145
shtplss5.txt page: 5 8/01/9920:58:44
(F 1 2) //Free Nodes/LEARNING STYLES/PRS OF AUTHORITY
S: How much do I have to make? 146
(F 1 2) //Free Nodes/LEARNING STYLES/PRS OF AUTHORITY
R: Seven. 147
(F 1 2) //Free Nodes/LEARNING STYLES/PRS OF AUTHORITY
S: Can't Find it. 148
(F 1 2) //Free Nodes/LEARNING STYLES/PRS OF AUTHORITY
A Robert rolls the dice. 149
S: Oh, ten, you've got sixteen to make. 150
A Shane smiles at Robert , looks at sheet then begins to look around
the classroom. 151
A Shane looks back at Robert 152
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
S: How much do you have to make? 153

(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
R: Sixteen. 154 ,
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
A Shane keeps looking at sheet. 155 1
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
S: Times up. 156
(F 1 4) //Free Nodes/LEARNING STYLES/RESPONSIBILITY
A Robert hands over the dice. 157
1A Shane picks up the dice and rolls one at a time. 158
-S: Two sixes, twelve, urn fourteen. Oh no.159 ,
A Shane looks carefully at sheet but is sure there isn't a sum and
shakes his head . 160
A Robert takes the dice and rolls. Robert looks for his sum and so does
Shane . 161
S. Ah, yes... 162
A Shane works out a mental calculation. looks at Robert and laughs
with him. 163
14.11 164
S: Times up. 165
A Robert gives him the dice. Shane rolls 166
S: Eight, urn, eleven, hold on, 167
A Shane uses his fingers to total dice. 168
S: Yeh, eleven, Oh, no.169
A Shane looks at the sheet, looks up and tries to mentally calculate a
sum. 170
S: Oh,yes. 171

Appendix 3 Classroom Lesson Transcription

Tape I Session 4

Classroom Shane ,Carl, Debra, Sally Time: 9:32 Date: 25/10/95

Teacher explains task to students. He draws up examples of the grids and details steps.

Task: Draw up 3 Grids with dimensions 1×10 , 10×10 , 10×100 and insert decimals that consecutively proceed from the first fraction of that grid up to 1.0.

Teacher's aim was to enforce understanding of decimal order and size,

Summary: Two sets of two students worked in pairs to carry out the above task. I Due to too much background noise the audio tape was turned off.

9.32 Debra and Sally prepare their pencils, pens etc. Debra looks at the board as she begins her first grid.

9.33 Shane has not yet begun any work but his partner Carl has begun to rule lines on his work sheet. Sally watches as Debra begins her grid.

9.34 Shane begins to rule on his sheet of paper.

9.35 Debra is still drawing on her paper while Sally watches. Shane is distracted and begins to look around the class. He talks to Carl about something, he gets out of his chair to go somewhere else in the class room. Carl continues to work on the exercise. Shane comes back with another sheet of paper .

9.36 Debra has completed part one of the exercise and prepares for the next part. Shane goes straight to part two of the task.

9.37 Teacher re-explains part one and part two of the task. Shane watches and listens to him for awhile then continues working. Debra is still working on part two, Sally watches but does no drawing.

9.38 Shane works on his own on part two, looks up at the camera then continues to work. Carl has gone from his chair.

9.39 Debra is still drawing on part two, Sra watches and talks to her. Shane is working on part two consistently. He looks up at someone in the class but then puts his head down again to work.

9.40 Teacher stops class for a while. Debra and Shane continue to do their work. Shane lifts his head and looks around the class. He then calls to teacher;

Shane :Sir, whose supposed to be my partner? Teacher :Beg your pardon?

Shane :Who's supposed to be my partner? Teacher :What part are you up to?

Shane :Two, (he lifts up and shows him two fingers) Teacher: Who was sitting there? Shane :Carl

Teacher :Carl, could you go work with Shane please?

9.41 Shane puts his head down and continues to work. Debra is still working away on grid two while Sally watches and talks to her. Carl returns to his seat next to Shane .Shane stops drawing and watches Carl draw.

9.42 Carl is drawing the second grid. Shane has stopped his drawing and is looking around the classroom.

Debra starts to talk to Sally. Shane begins to talk to Carl as Carl draws then he looks down at his own work and begins to draw again. Shane stops again and looks around the classroom, then talks to Carl, Carl continues to draw. Debra begins drawing again.

9.43 Shane looks at the camera. He then moves closer to Carl and talk\;) to him while Carl continues to draw.

9.44 Shane picks up Carl's pencil case and talks to Carl about it but Carl is not paying any attention he continues to draw. Shane puts it down and picks up his pen and continues to draw his own grid. Debra is drawing quietly while Sally looks through her pencil case.

9.45 Teacher :The thousand grid will be ten across and 100 down or vice-versa. Debra and Carl both look up at him as he talks. Shane looks at the camera and then puts his head down to work. Debra :Sir, what's that one then, 100? Teacher :That one's 10×10

Debra and Carl put down their heads again to work. Shane begins to talk to Carl again.

9.46 Debra picks up her grid and looks at it for a few seconds thinking. Sally talks to her. Shane stares off into the classroom. Carl continues to work on grid. Shane looks back at Carl's work paper and points to something. Shane then looks at the camera and begins to smile. He turns to Debra and says "hey the camera's on" .Debra keeps working and so does Carl.

9.47 Shane begins to sing and dance in front of the camera while the others work. He then picks up his pen and starts drawing on his paper. Debra finishes her grid and gives it to Sally and Sally begins to fill in the grid with decimals.

9.48 Spiro walks up to Shane and Carl and they begin to talk to him. He walks away and they return to ; their work. Debra and Sally continue to work, talk intermittently i

9.49 Shane looks as though he is complaining about something Carl has drawn, Shane points to Debra and Sally's work. Shane : Look at theirs. He then begins to write numbers on his grid.

9.50 Debra starts to fill in her grid now. Shane and Carl are working on their own grids. Shane begins to talk to Carl about Carl's grid.

9.51 Shane then looks around the classroom. He looks at Carl's work and talks to him about it then he looks at the blackboard.

9.52 Shane begins to play with his pencil, he asks the girls for something, then looks back at Carl' work. Debra is filling her grid.

9.53 Shane is distracted by someone in the classroom. Carl looks up. Debra continues to fill her grid as Sally talks to her. Shane and Carl look back down at their work. Shane looks up and calls to Harry to come over to him.

9.54 Shane begins calling to someone else and Carl continues to work. Shane puts his head down to work again. Teacher calls everyone's attention. Debra and Carl look up at Teacher as he speaks. Shane stares at the class then looks at Teacher.

9.55 Shane tries to grab Carl' pencil to continue to fill his grid while the teacher is talking but Carl tells him to stop and listen like the others. Shane looks up and listens to teacher.

9.56 Debra, Sally and Carl are looking at the teacher. Shane is biting his finger and looking at the class he then looks down at the desk. Teacher stops talking. The four students then continue on with their work. Carl continues to fill in the grid.

9.57 Shane takes over filling the grid. Debra stops filling the grid and gives the pen to Sally to take over. Shane looks up at the class but then continues to fill in the grid.

9.58 Carl takes over filling the grid. Shane looks at the camera and begins to sing, he then stares around the classroom.

9.59 Shane takes the pencil and begins to fill the grid as Carl watches him. Debra is filling her grid. 10.0 Shane is still filling the grid. Debra and Sally have stopped writing. Sally walks away.

10.01 Debra and Sally have finished the second grid. Carl continues to fill his grid. Sally returns with a large long sheet of white paper to draw the third grid. Shane and Carl look up at her and talk to her and Shane asks: What's that for ? Sally and Debra explain.

10.02 Carl is filling out his grid, Shane then begins to joke around with Carl. Sally begins to rule up the third grid.

10.03 Carl is still filling out the grid and Shane talks to him about it. Debra and Sally put up their hands to get the one metre ruler but have to wait. They sit there and wait. Debra calls out to teacher again for the ruler. Debra and Sally get up to go and get the ruler .

10.04 Teacher calls classes attention to a group who have completed their large grid. Shane looks up at the teacher and the group. Carl continues to work. Teacher tells class to alternate colour pens when filling the grid cells with the decimals.

10.05 Shane and Carl continue to fill their grid. Shane looks up and calls Sally. Someone comes to the door, Shane looks at the doorway and then turns and calls Harry .Debra and Sally return to their seat.

10.06 Shane gets up and walks away and then Carl follows him. Teacher gives the one metre ruler to Debra and Sally. They grab it and both try to use it at the same time trying to grab it away from one another. They stop and discuss what they have to do Carl returns and continues to fill the grid.

10.07 Shane returns with their large sheet of paper and places it on the desk and walks away. Carl continues to finish the second grid. Debra and Sally begin to draw their third grid. Carl walks away.

10.08 Shane and Carl return .Shane looks at the girls work. Shane tries to take the one metre ruler but Debra tells him she still needs it. Teacher gives Shane and Carl another ruler.

10.09 Shane and Carl begin to draw their third grid, Shane holds the ruler while Carl draws first line . Shane yawns. Debra looks up at the board while holding the ruler. Carl also looks at the board and gets up and walks away with the ruler. Shane picks up a pen off the floor.

10.10 Carl returns and begins to draw. Shane looks at the camera and makes a face. Debra and Sally continue to work. Shane and Carl look at the diagram on the board and talk about what they are doing. Shane looks around the class.

Shane : Yeh, 10 across, Sally, Sally do you do 10 across? Carl: 10 down
Shane :See, you do 10 across.

Debra looks across at them and tells them they need to do 10 down by 100 across. Shane looks confused and looks at Debra. Carl begins to draw.

10.11 Debra re-explains pointing at Carl' paper again. Shane looks at her and smiles. Shane still contends it is 100 down and 10 across and looks confused. Carl continues to draw and Shane continues to help him.

10.12 Shane counts the lines for Carl. Carl turns the whole paper over and begins again. Shane tells Carl to look at Debra and Sally' work and points to it.. Fiona is ruling up her lines.

Shane : 100 across and 10 down Shane looks at Carl

10.13 Debra tries to explain again to both of them what they should be doing. Shane points to the girls work and tells Carl to copy theirs. Carl and Shane continue to work and glimpse over at the girls' grid.

10.14 Both pairs work quietly on their grids without distraction.

10.17 Shane starts playing with his pen, tapping it. Carl continues to draw the grid on his own.

10.18 Shane talks to Carl as he draws. Shane looks over at the girls' grid, then looks at his and tells Carl how the girls have drawn theirs across.. Debra is still working on her grid. Shane looks up at the rest of the class and starts tapping his pen on the table. Shane looks over at the girls' work again. Shane asks Debra something about her grid. Carl continues to work on the grid.

10.19 Shane questions Carl about their grid. Shane starts to play with his pen again making bombing noises.

10.20 Shane does not do any more drawing, he just watches Carl work. Teacher calls all the students to the front of the class. They all get up and go. The teacher then goes over the task again and the results of the grids-

Appendix 4 NUD*IST Node Browser – “Peer Oriented” Learning Style (Shane)

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Node Browser: F 1 1) page: 1 10/06/9913:25:22 .
+++++ ON-
LINE DDOCUMENT: intervwl
*Session with Shane and Robert in the Maths Task Centre
+++++
[intervwl : 51- 51 ]
A Shane begins to read the instructions of the game while Robert
looks at his sum. Shane looks back at the game sheet to see if he can find Robert's
number.

[intervwl : 114- 116 ]
S: Here it says twenty second, no one minute.
A Shane watches Robert then the sheet to look for Robert's sum that can make thirteen.

[intervwl : 163- 165 ]
A Robert takes the dice and Throws. Robert looks his sum and so does Shane.
S: Ah, yes. ..
A Shane works out a mental calculation. Looks at Robert and laughs with him. I

+++++ ~ ON-LINE
DDOCUMENT: shtplssl
*Session 2
*MAB Blocks Maths Lesson Shane ,Henry, Molly, Sally M, Mike *Time:OI2.40pm O
Ate:OI9/10/95
+++++
[shtplssl : 27- 27 ]
ACTION:Shane shows the cardboard sheet to the teacher.

[shtplssl : 33- 33 ]
ACTION:Shane picks up the 10x10 block and shows the teacher.

[shtplssl : 39- 39 ]
ACTION: Shane points to the cardboard sheet again and looks at them.

[shtplssl : 50- 50 ]
ACTION: Shane looks at the blocks and helps Henry to create the fraction then looks back
at his work.

[shtplssl : 54- 54 ]
ACTION:O Henry looks at the girls. Shane asks Mike something and looks at Mike's work
then his own.

~ [shtplssl : 58- 58 ]
Shane :Twenty-seven hundredths. ...You just get that's it.

[shtplssl : 88- 88 ]
ACTION: Looks at the blocks then looks at Henry and the girls.

[shtplssl : 102- 105 ]
ACTION: Shane shows the cardboard sheet to the others. Mir: Because its three numbers
and there's three here. ACTION: Molly shows the boys. Shane :Yeh.

[shtplssl : 108- 108 ]
ACTION: Shane looks and points at Molly's work then Henry's.

[shtplssl : 118- 118 ]
ACTION:O Shane looks at the others and then back at his own work. ...
[shtplssl : 123- 125 ]
ACTION: Shane looks at Mike's work, Shane :Not like that.
ACTION: Shane then looks back at his own work.
```

[shtp1ss1 : 128- 128]

ACTION: Sharbel1 shows Mike how to complete the diagram.

[shtp1ss1 : 133- 133]

ACTION: Henry points to Shane 's paper and corrects him. Shane realises he has made a mistake and corrects himself.

[shtp1ss1 : 140- 1.40]

ACTION: Shane looks at Molly's work and shows Molly the work card again, looking at her work still.

[shtp1ss1 : 142- 142]

Shane : What's the number?

[shtp1ss1 : 161- 161]

ACTION: Shane shows Henry on Henry's work paper

[shtp1ss1.216-217]

Shane Just check with the other papers you'll get an answer there I'm sure.

- ACTION: Shane points to the pile of work papers.

[shtp1ss1 :219-219]

ACTION: Shane looks up at the camera. He then starts to sing and starts to pack up the blocks with the others.

+++++ ON-LINE DOCUMENT: shtp1ss2 *Tape 1
Session 4

*Classroom Shane ,Carl, Debra , Sue *Time: 09:320 Ate: 025/10/95

+++++ [shtp1ss2 .40 -41]

9.50 Debra starts to fill in her grid now. Shane and Carl are

working on their own grids. Shane begins to talk to Carl about Carl' grid.

9.51 Shane then looks around the classroom. He looks at Carl' work and talks to him about it then he looks at the blackboard.

[shtp1ss2 .49 -49]

959 Shane takes the pencil and begins to fill the grid as Carl watches him. Debra is filling her grid.

V[shtP1ss2: 51 -51]

10.01 0 Debra and Sue have finished the second grid. Carl continues to fill his grid. Sue returns with a large long sheet of white paper to
Raw the third grid. Shane and Carl look up at her and talk to her and Shane asks: What's that f R ? Sue and Debra explain.

[shtp1ss2 .53 -53]

10.03 Carl is still filling out the grid and Shane talks to him about it. Debra and Sue put up their hands to get the one metre ruler but
have to wait. They sit there and wait. Debra calls out to teacher again f R the ruler. Debra and Sue get up to go and get the ruler.

[shtp1ss2 : 59- 60]

10.09 Shane and Carl begin to Raw their third grid, Shane h L S the ruler while Carl draws first line. Shane yawns. Debra looks up at the board while
holding the ruler. Carl also looks at the board and gets up and walks away with the ruler. Shane picks up a pen off the floor.

10.10 Carl returns and begins to Raw. Shane looks at the camera and makes a face. Debra and Sue continues to work. Shane and Carl look at the
diagram on the board and talk about what they are doing. Shane looks around the class.

[shtp1ss2 .63 -63]

Shane See, you O 10 across

[shtp1ss2 .66 -66]

10.12 Shane counts the lines f R Carl. Carl turns the whole paper over and begins again. Shane tells Carl to look at Debra and Sue' work and points to it.
Debra is ruling up her lines.

[shtp1ss2 .72 -73]

10.18 Shane talks to Carl as he draws Shane looks over at the girls' grid, then looks at his and tells Carl how the girls have draw, theirs across.. Debra is
still working on her grid. Shane looks up at the rest of the class and starts tapping his pen on the table.

Shane looks over at the girls' work again. Shane asks Debra something about her grid. Carl continues to work on the grid.

10.19 Shane questions Carl about their grid. Shane starts to play with his pen again making bombing noises.

+++++ ON-LINE DOCUMENT: shtp1ss5

Session 5

*Maths Task Centre Shane and Robert *Time 14:00D Ate:D2511 0195

+++++ [shtp1ss5: 8- 34]

R: You get fifty seconds, one minute each

S:For what?

R: Just to find the let me fix the dice
a Robert picks up the dice and holds them level and looks at them. He gives them to Shane to throw them. S: Eleven ? R: Ten.
S: Ten spaces ?
a Shane begins to move counter ten spaces but Robert stops him and explains rules.
R: Ten spaces ? No, no You have to find the sums of ten, you have to find sums that equal ten.
a Shane looks at the game then looks to the side thinking.
R: and actually get it in a row.
a Robert shows horizontal and vertical rows on the game sheet
S: Oh, yeh
R: Ten, ten. Find a sum f R ten. You've g T one minute .
A Shane looks at sheet and points and smiles. ~
S: Um, two times five
A Shane looks at Robert.

R: OK put your turn.

A Robert points to the sheet then roLLs the dice

R: Twelve ,thirteen, fifteen..

S: Shivers.

AO Robert looks f R fifteen on the game sheet

R: D What was it ?

S: D Fourteen, fifteen I mean. R: D Fifteen.

A Robert keeps looking f R a sum on sheet that equals fifteen.

[shp1ss5 .49 -58]

S: You have to use two, Robert,...

A Shane points to instructions.

S: You're supposed to use two dice

A Shane shows one finger then two fingers.

R: You use three dice.

A Robert shows the dice

S: No, it says two

A Shane points to instructions re-reading them.

S: Oh, yeh, Three dice.

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\A Sharbel1 concedes and no S, [shp1ss5 ' 60- 68]

A Shane picks up the dice and throws them one at a time saying 'Ah" after each throw.

S' Same one,

A Shane looks at Robert smiling.

R: Twelve

A Shane looks f R sum carefully.

S:What is it? Twelve?

A Robert no S,

Shane looks again

Shane : Oh, no.

Robert: OK, time's up.

