“You’re In Charge of Your Learning”: Field Trips and Intensive Delivery Programs Enriching the Preservice Teacher Experience

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"You're in Charge of Your Learning": Field Trips and Intensive Delivery Programs Enriching the Preservice Teacher Experience

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Abstract This article explores a case study that presents the integration of field trips within an intensive delivery mode to enhance preservice teachers' engagement and learning in STEM education. Using a design thinking and structured learning cycle approach, the collaboration between Victoria University and Wyndham Tech School offered applied learning opportunities through tutorials, field trips, and assessments embedded in VU's Block Model®. The impact of this collaborative framework is presented with qualitative research of 35 preservice teachers' perceptions of their learning through focus groups and reflective assessment submissions. Thematic analysis identified five key themes, exploring both benefits and challenges of the unit, including enriching the student experience, the role of design thinking in learning, the transformative impact of the field trip, perceptions of future teaching practice, and engagement barriers. This case study discusses curriculum design, unit structure, pedagogy, and the impact of the program on student experience, while addressing logistical challenges associated with intensive learning programs.

Résumé Dans cet article, nous abordons une étude de cas qui décrit comment intégrer des excursions scolaires dans un mode de prestation intensive en vue d'améliorer l'engagement et l'apprentissage des enseignants en formation initiale dans le cadre de l'enseignement des STIM. Grâce à une approche axée sur la réflexion conceptuelle et un cycle d'apprentissage structuré, la collaboration entre la « Victoria University » et la « Wyndham Tech School » [toutes deux situées en Australie] a permis d'offrir

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des occasions d'apprentissage appliqué par le biais de tutoriels, d'excursions scolaires et d'évaluations intégrées au modèle d'études « en bloc » de la « Victoria University ». On décrit l'impact de ce cadre collaboratif par le biais d'une recherche qualitative portant sur les perceptions de 35 enseignants en formation initiale quant à leur apprentissage, recueillies lors de groupes de discussion et au moyen d'évaluations réflexives. Une analyse thématique a permis de cerner cinq thèmes principaux, explorant à la fois les avantages et les défis liés au module, notamment l'enrichissement de l'expérience des étudiants, le rôle de la réflexion conceptuelle dans l'apprentissage, le caractère transformateur des excursions scolaires, les perceptions sur les pratiques pédagogiques futures et les facteurs qui freinent l'engagement. Cette étude de cas porte sur le design curriculaire, la structure du module, la pédagogie et les effets du programme sur l'expérience des étudiants, tout en abordant les défis logistiques associés aux programmes d'apprentissage intensifs.

Keywords STEM education · Field trip · Block model · Intensive delivery mode · Student experience

Introduction

To address the need for more flexible, engaging, and immersive learning experiences in higher education (Zhang & Cetinich, 2022), many institutions—including the context of this study—have adopted intensive delivery modes, such as the Block Model. In the Block Model, students study one unit at a time over a condensed period, replacing the traditional semester-based structure. These models provide students with focused learning experiences, facilitating active participation, and promoting engagement through concentrated study periods (Muscat & Marland, 2025). When applied thoughtfully in teacher education, these models can also enhance the development of preservice teachers (PSTs) by providing more immersive and practice-oriented learning experiences.

There is growing recognition that traditional models of teacher education often fail to adequately prepare teachers for the complexities of practice, prompting calls for reimagined, practice-based approaches that are context-responsive and grounded in authentic school settings (Nesterenko et al., 2024). This is particularly urgent in STEM education, which must keep pace with the rapid advancements of the fourth industrial revolution (Schwab, 2015) and address the shortage of qualified teachers. Reliance on out-of-field teaching, especially in disadvantaged schools, remains a key barrier to delivering high-quality STEM education (Shah et al., 2020). Addressing this issue is crucial for equipping PSTs with the disciplinary knowledge and pedagogical skills needed to prepare students for emerging career pathways in a knowledge-based economy (Kotsiou et al., 2022).

Innovative approaches to teacher preparation can play a critical role in addressing these systemic issues. This paper examines a case study of a collaboration between Victoria University (VU) and Wyndham Tech School, which integrated design thinking (DT) to create immersive educational experiences. Through structured field trips, hands-on workshops, and assessments aligned with VU's Block Model®, PSTs engaged in authentic STEM learning experiences by working on problem-based, real-world scenarios and using high-tech technologies, aiming to build their pedagogical and content knowledge. Situated within the university's Block Model, this study examined the underexplored role of field trips in intensive delivery modes, through this university and Tech School collaboration. It investigated the question: What impact does the unit design and field trip have on the PSTs' experience within the block delivery mode?

Higher Education Student Experience

The higher education student experience has evolved significantly, shaped by societal expectations, technological advancements, and a globalised academic landscape (Benckendorff et al., 2009; Tan et al., 2016). While the literature presents varied definitions (Tan et al., 2016), the student experience is now widely understood as a dynamic, multifaceted concept that encompasses academic, social, and institutional factors impacting engagement, satisfaction, and success (Benckendorff et al., 2009), with teaching and learning recognised as central components (Matus et al., 2021). High engagement levels correlate with improved outcomes (Lei et al., 2018), supported by factors such as peer social interactions (Redmond et al., 2018) and strong student-teacher relationships (Snijders et al., 2020). Active learning approaches, such as problem-based learning and hands-on activities, further deepen engagement by promoting critical thinking and applied learning (Mizokami, 2017). The Block Model naturally supports active learning approaches, with its immersive structure and departure from traditional lecture formats enabling more interactive and student-centred activities (Muscat et al., 2025). In the present study, these Block Model features are treated as enabling conditions that support how the unit was designed and experienced.

Intensive/Block Model Learning

Although intensive and Block Models in higher education vary, they typically deliver one unit at a time, thereby providing an immersive experience that enhances student engagement (Muscat & Marland, 2025). This structure allows students to fully immerse themselves in a single unit, supporting greater focus and reducing cognitive load by limiting the volume of competing demands (Buck & Tyrell, 2021). Research has shown that these models enhance students' academic outcomes, engagement, satisfaction, and retention (e.g., Goode et al., 2024). Students have reflected on the benefits of flexibility in course structure (Male, Baillie et al., 2016), allowing time for extracurricular activities (Muscat & Marland, 2025). However, intensive delivery can also present challenges, including the fast pace of learning, limited time for consolidating knowledge, and reducing opportunities for extended practice, which may impact knowledge retention (Lutes, 2014; Zhang & Cetinich, 2022). A key feature of intensive programs is the prioritisation of student learning that often incorporates active learning experiences and enhanced peer-to-peer and student-teacher relational connections (Muscat & Marland, 2025). Intensive and block formats have also been discussed as facilitating authentic learning experiences by having a schedule that allows for connections to real-world contexts and professional environments (Male et al., 2016). Additionally, Fedesco et al. (2020) noted that the model's extended sessions make field trips more feasible, enabling practical, real-world learning without competing coursework.

Pedagogical Foundations of Field Trips in Higher Education

Within the Block Model's active learning framework, field trips offer a powerful means of extending learning beyond the classroom. Field trips are a valuable part of school science education, offering inquiry-based learning experiences that connect theory with real-world practice (Behrendt & Franklin, 2014). In higher education, they enhance applied knowledge, develop social skills (Larsen et al., 2016), and support student transition into higher education for first-year cohorts (Kamen & Leri, 2019). They also boost motivation and engagement in ways traditional classrooms often cannot (Fedesco et al., 2020). Grounded in Dewey's philosophy of learning through active and experience-based engagement (Dewey, 1938) and experiential learning theory (Kolb & Kolb, 2005), field trips help bridge theoretical and pedagogical knowledge (Djonko-Moore & Joseph, 2016). Fedesco et al. (2020) argue that field trips in higher education satisfy the basic psychological needs of autonomy, competence, and relatedness. Additionally, field trips have been suggested to support the development of problem-solving through inquiry-based learning experiences (Kamen & Leri, 2019), and lifelong learning skills (Larsen et al., 2016). However, the pedagogical impact of field trips can be constrained by factors such as large group logistics, financial pressures, legal considerations, scheduling difficulties, and travel distances (Behrendt & Franklin, 2014; Fleischner et al., 2017; Jones & Washko, 2022). Despite their documented benefits in schools, research on field trips in intensive higher education models and their impact remains limited. In our study, the immersive Block Model structure provided conditions for integrating the DT framework to support and extend the impact of the field trips on the PST STEM education learning experiences.

Framing Design Thinking in Education

Originating in product development and business, DT has evolved to address complex, real-world challenges by focusing on user-centred, collaborative problem-solving (Giacomin, 2015). DT promotes creativity via structured phases of ideation, prototyping, and iteration (Tschimmel, 2012) and is increasingly used in education to foster creative engagement and innovative thinking (Henriksen et al., 2020). The blend of divergent and convergent thinking in DT approaches (Brenner et al., 2016) supports inclusive and interdisciplinary collaboration suited to today's educational contexts (Liedtka et al., 2017).

DT in education repositions teachers as facilitators who design inclusive, learner-centred experiences (Henriksen et al., 2017). It assists educators in building confidence and develops creative solutions to teaching challenges (Liu et al., 2024). DT is grounded in constructivist pedagogy, which emphasises learning through doing and reflecting (Noweski et al., 2012). DT supports collaborative, real-world learning (Culén & Gasparini, 2019) and strengthens curriculum design through problem-based approaches (Shively & Paliolonis, 2018). Building on these findings that highlight DT's capacity to strengthen collaboration, problem-solving, and innovative curriculum design, the research integrates DT within the Block Model context, allowing PSTs to engage in field trips and reflective assignments that aim to develop a DT mindset.

Case Study Context

STEM education is defined and enacted in varied ways across the literature (Martín-Páez et al., 2019). In this study, we draw on Sanders' (2009) and Bybee's (2013) understanding of STEM as a set of assimilated disciplines integrated through real-world problems, taught using interdisciplinary, applied approaches. While some aspects of the unit addressed the disciplines separately, the overall emphasis was on integration, with learning experiences designed to connect them in authentic contexts, which Erdogan et al. (2016) identify as essential for effective STEM education.

STEM education requires well-prepared teachers capable of delivering curricula that advances innovation and problem-solving (Department of Education, 2016). However, many PSTs lack the knowledge and assurance needed to confidently teach STEM subjects (Shahat et al., 2022). To address this issue, VU collaborated with Wyndham Tech School to integrate a DT approach into the Block Model delivery of a science-focused STEM education unit. This collaboration involved field trip workshops where PSTs engaged in hands-on, problem-based learning activities in a Tech school setting. These workshops aimed to develop PSTs' confidence and skills to effectively implement future-focused STEM curricula.

Unit Structure and Pedagogical Approaches

The 4-week STEM unit was designed based on the “backward design” guiding principles (McTighe & Thomas, 2003), which prioritise desired outcomes—in this case, enhancing PSTs’ confidence, engagement, and learning. Learning activities were developed to build PSTs’ STEM knowledge, problem-solving skills, and capacity to design effective teaching and learning experiences, while also enabling them to experience and apply both the 5E model and DT. Based on the BSCS model (Bybee et al., 2006) and widely adopted in Victorian schools, the 5E Instructional Model provides a structured framework of five phases: Engage, Explore, Explain, Elaborate, and Evaluate (Department of Education, 2019; Polanin et al., 2024). Supporting inquiry, reflection, and skill development at each stage (Polanin et al., 2024), the unit incorporated the 5E model to give students firsthand experience and prepare them to apply it in their future classrooms.

DT was integrated as a complementary approach to the 5E model, emphasising collaboration, adaptability, and creative confidence. While the 5E model offered a structured pedagogical sequence, DT provided a flexible problem-solving framework applicable across contexts to enrich lesson design. Over 4 weeks, PSTs engaged in tutorials at VU, scaffolded assessments, and two interactive field trip workshops at Wyndham Tech School. These activities integrated science content knowledge, STEM problem-solving, and lesson planning, with DT applied as a framework for addressing complex challenges. Tutorials presented science concepts linked to Big Ideas in Science (Harlen, 2010), which served as unifying concepts to contextualise STEM education, and modelled collaborative strategies, interactive discussions, and problem-based activities linked to DT. The assessment program was scaffolded to align with tutorial content and field trip experiences, supporting incremental skill development and reflective practice. Figure 1 illustrates the unit structure and assessment program.

The two field trips to Wyndham Tech School, in weeks 1 and 3, provided PSTs with hands-on experience with emerging technologies and collaborative problem-solving tasks, linking theory with practice. The second trip, positioned before the final assessment, aimed to consolidate learning and support learning transfer of DT strategies into assessment tasks. Students attended the excursions with their allocated class group, allowing them to work with the same peers and facilitator across activities.

The Wyndham Tech School Program and Field Trip

Victoria’s new Tech School model addresses national STEM and digital skills gaps by offering programs tailored to local community needs (Victorian State Government, 2024). Hosted by tertiary institutions and co-located with secondary partner schools, these Tech schools serve as hubs for STEM learning and teacher professional development. Hosted by VU, Wyndham Tech School offers an education model organised around the themes of an industry-driven curriculum, industry-inspired teaching spaces and technologies, project-based learning, innovative methodologies (such as DT, systems thinking, business thinking, and computational thinking), and high-impact teaching strategies. As part of their unit, PSTs visited Wyndham Tech School for two immersive field trips facilitated by VU staff. The experience allowed them to engage firsthand with student-centred STEM learning in a purpose-built setting, where learning programs emphasised the application of DT through a case-study approach.

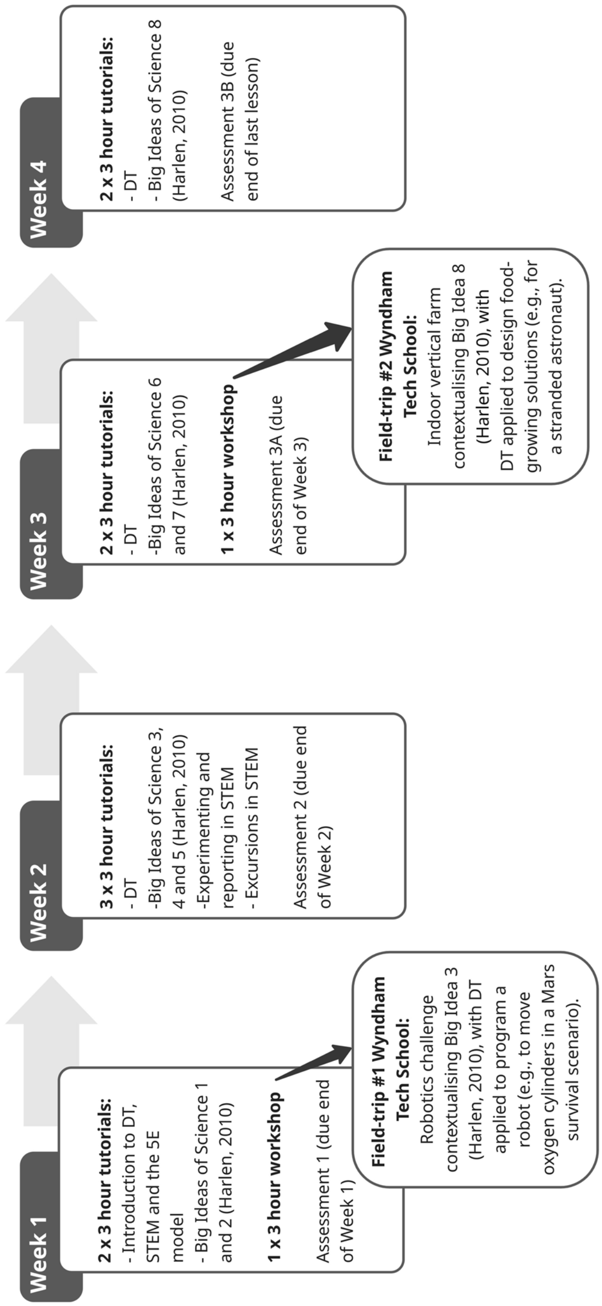

Fig. 1 Overview of the STEM education unit

Method

This study adopts a case-study approach (Flyvbjerg, 2006), framed within social constructivist views (Creswell & Poth, 2018), to explore the PST learning experience and participation in field trip experiences in the VU Block Model®. To capture participants' perceptions, qualitative data were collected through focus groups and assessment submissions. Understood as effective for exploring shared experiences (Krueger & Casey, 2015), each participant took part in one focus group held on campus at the conclusion of their final lesson in the unit; across all cohorts, resulting in a total of seven separate focus groups.

Sample

The convenience sample included PSTs enrolled in a first-year STEM education unit within an education course. In 2024, the unit was delivered across three consecutive teaching blocks, comprising five classes in total. All 194 PSTs enrolled were invited to participate in a focus group at the conclusion of the unit. They were also invited to consent to the use of deidentified excerpts of their reflective assessment submissions, downloaded from the university Learning Management System and deidentified for analysis. Thirty-five PSTs (~18%) gave their written consent and agreed to participate in both parts of this research. Ethics approval was obtained from the Low-Risk Human Research Ethics Committee at Victoria University (HRE23-184).

Data Collection

Focus groups were conducted on campus at VU after the completion of the last session of the unit by a researcher not teaching into the unit. Focus groups were voice recorded with permission and transcribed. Questions focused on exploring the transferability of STEM skills, the potential use of DT in their future teaching practice, and confidence with respect to teaching STEM. Assessment submissions were downloaded after the course concluded. Two key written prompts in the assessment were analysed: (1) personal reflections on their own learning journey, including a discussion of challenges faced and problems solved; and (2) self-learnings and reflections on their future role as educators, the application of DT, and problem-solving skills developed in the unit.

Data Analysis

Reflective thematic analysis (Braun & Clarke, 2022) was used to analyse the qualitative data from the two data sources. After familiarisation and reviewing the transcripts in detail to gain an in-depth understanding of the data, deductive coding was used to analyse the data in alignment with the research question, focusing on pre-defined themes related to the unit design's impact on the PSTs' experience, including the field trip experiences. Throughout the analysis, codes were systematically applied to the data, grouping similar ideas and identifying patterns that addressed how the unit design and field trip influenced PSTs' experiences. Researchers independently coded the data and met to compare decisions, resolving any differences through discussion. Agreed-upon codes were then collated into potential themes, refined through an iterative process to ensure coherence and alignment with the research focus. Themes were articulated through a narrative synthesis. Reflexivity was central, acknowledging the researchers' interpretative role in theme development. Peer debriefing enhanced analytical rigour and trustworthiness (Nowell et al., 2017).

Findings

Five key themes emerged from the thematic analyses and explored both benefits and challenges of PSTs' experiences within the unit. The themes centred around aspects that enriched the PST experience, the role of DT in learning, the transformative impact of the field trip, perceptions of future teaching practice, and engagement barriers.

Enriching the Preservice Teacher Experience

PSTs reported that the hands-on, active learning approach enhanced their engagement and understanding of STEM. Interactive activities, including robotics and engineering simulations, made learning more tangible and relevant, particularly for mature-aged students unfamiliar with STEM tools. As one participant reflected, engaging in practical tasks reshaped their perspective on STEM:

> I'm a mature-aged student, and those types of things were not around when I was at school... It's changed my outlook altogether (Focus group, Block 1, Class 2).

Experiential learning played a key role in encouraging engagement and understanding, with PSTs often describing the unit as "fun", cultivating curiosity and teamwork. PSTs noted that by "forgetting about learning" during activities, they felt more invested in the material. One PST shared how immersion in hands-on learning led to personal growth:

> By actually throwing myself into it, I learnt more. I was a bit nervous to start with, but I ended up doing really well because I just threw myself into it and develop[ed] an understanding (Focus group, Block 1, Class 2).

The Block Model structure was praised for its clarity and focus, allowing students to engage deeply with content without being bombarded:

> While it's super intense... I've been able to grasp concepts, and I just focus on this one area at a time without being overwhelmed and overstimulated by everything else (Focus group, Block 1, Class 1).

Design Thinking as a Catalyst for Preservice Teacher Learning

Some PSTs identified DT as a transformative, interactive learning framework. The iterative "trial-and-error" nature of DT resonated strongly, which encouraged problem-solving, exploration, and "constant improvements". Participants appreciated the shift away from passive, theory-driven instruction toward more active learning experiences. DT was widely appreciated as a pedagogical and problem-solving tool, with several PSTs reflecting on DT's versatility beyond STEM, envisioning its application across disciplines such as arts, sports, and English literature.

DT emerged as an approach to tackling challenges systematically and creatively. For some, these challenges were directly related to STEM problem-solving tasks set during the unit, while for others, the problems they addressed were pedagogical, such as identifying ways to engage learners or adapt to different learning styles. One PST shared:

> After attending Wyndham Tech School I was able to come to a solution to my problem by applying a design thinking approach... firstly, by empathising with myself and others on how I think they

would like to be taught...to cater to each peer learner's learning styles (Assessment submission, Block 1, Class 1).

DT also boosted confidence in lesson planning, with some noting it enhanced their ability to design engaging, teachable moments across subjects. Many embraced DT as a mindset, not just a method, suggesting it would positively influence their cross-disciplinary teaching. One PST particularly valued DT for encouraging creative, engaging lesson planning:

[DT] will force me as a teacher [to] think outside the box... so I can be creative with my lesson to keep learners engaged (Focus group, Block 2, Class 3).

DT was also identified as an effective mechanism for self-reflection and improving teaching practice, with its role in overcoming teaching challenges, such as student engagement or differentiation. The iterative process, particularly its emphasis on feedback, was seen as central to refining teaching practices and developing more sustainable instructional solutions.

Transformative Impact of the Field Trip

The visit to Wyndham Tech School was a unit highlight for many PSTs. Consistent with the unit's focus, they valued the hands-on, real-world active learning connections to STEM undertaken during the field trip, such as the "stranded astronaut" scenario in which DT was applied to solve engineering challenges, including restoring an oxygen supply to a Martian habitat and a planting schedule for a vertical farm. The field trip's emphasis on student-centred immersive learning was particularly impactful:

We weren't being... spoon fed. We weren't just being told... 'This is what we're learning about. We need to learn this.' It was like, 'Let's do an activity to learn it. We're going to pretend we're astronauts' (Focus group, Block 2, Class 3).

This experience not only reinforced content knowledge but also helped PSTs envision how to apply similar strategies in their own classrooms. One participant remarked:

I loved Wyndham... the whole story-based [approach]. That's one [teaching method] I'm going to be using... I'm [going to] have a story [in] my pedagogy... In my teaching toolkit (Focus group, Block 2, Class 3).

The alignment between the learning activities earlier in the unit reinforced the field trip's impact, with the integration of theory and practice making STEM concepts more tangible and applicable. The field trip provided an opportunity for PSTs to experience learning as their future students might. One participant reflected on the significance of this shift in perspective:

The way that it put us into the student's perspective was really helpful (Focus group, Block 3, Class 5).

Firsthand use of STEM tools also boosted their confidence. One PST highlighted the benefits of this direct engagement:

Physically, to handle things, like the use of the micro bits and those kind of experience[s] where you get to see that you're in charge of your learning... you're in charge of your understanding (Focus group, Block 1, Class 2).

The physical and interactive nature of the learning process was a defining feature of the field trip's transformative potential. Unlike traditional lecture-based instruction, this experience blurred the lines between learning and play, encouraging deeper engagement. One participant shared:

> It kind of feels like you're not learning... and you're just having fun... You know, when you forget you're learning, I think that's the best time and the most engaging part (Focus group, Block 2, Class 3).

The enjoyment of the field trip enhanced its lasting impact, with emotional and social dimensions of learning particularly evident. Shared experiences fostered stronger connections and reinforced understanding. One participant reflected:

> We all remember the winter visit [to Wyndham Tech School]... all of us. And we'll remember it for ages… you could ask us in 20 years, and we'll still remember (Focus group, Block 1, Class 1).

Shaping Future Teaching Practice

> Many PSTs re-evaluated their perceptions of STEM teaching as a result of the unit, recognising the importance of making STEM more approachable and engaging. For some, this involved shifting student mindsets around flexibility and experimentation:
> You're [going to] have those kids that are, like, 'But I have to get it right'... if you go back... to prototype...it can be flexible and find out how it actually works (Focus group, Block 3, Class 5).

For some, the unit sparked a renewed passion for science and STEM education, reinforcing its potential to transform classroom practice. PSTs reflected on past experiences where learning "was literally, here's the book. Do it… Copy it. Word for word." (Focus group, Block 2, Class 3).

A recurring theme among PSTs was their recognition of the importance of helping their future students develop resilience and adaptive mindsets. One PST reflected:

> [In this unit] I have learnt that not everything will always go to plan. I have discovered that this isn't a negative thing either, these errors promote further learning and growth in both the students and within myself as their teacher (Assessment submission, Block 1, Class 1).

Some PSTs shifted from viewing mistakes as setbacks to embracing them as integral to the learning process. By modelling this mindset, they recognised they could cultivate similar attitudes in their future students, making STEM more accessible. The unit also changed how they would promote STEM engagement, highlighting the value of real-world problem-solving—"actually know why you're learning what you're learning" (Focus group, Block 2, Class 3). PSTs began to view STEM not as a standalone subject but as an integrated approach applicable across disciplines.

Preservice Teacher Perceptions of Engagement Barriers

Despite positive experiences, some PSTs identified several challenges while undertaking the unit. While the Block Model structure was seen as positive for some, others felt the condensed nature limited their ability to deeply process scientific concepts. The impact of external disruptions on PSTs' ability to maintain momentum in the Block unit also posed a challenge. The Block Model structure was less flexible when unexpected circumstances arose. One PST shared their experience:

> I had... three family emergencies in the last two weeks... I'm so behind (Focus group, Block 3, Class 5).

A few PSTs expressed concerns about the pacing of assessments and the breadth of topics covered, suggesting a preference for fewer topics explored in greater depth. Some PSTs recommended that assessments be spread more evenly throughout the unit to reduce cognitive overload and provide more time for reflective learning.

While participants gained confidence in teaching primary-level STEM, many felt unprepared for advanced content or implementing DT due to school constraints like limited time and curriculum demands. A related challenge was the perceived relevance of the Wyndham Tech School field trip. Although linked to assessments, two PSTs with competing commitments questioned its necessity. Despite alternative sessions offered, they opted to "catch up" with the educator rather than engage in the learning activities. A small number also cited travel to the Tech School as a barrier, expressing concerns of perceived travel difficulties, even when the location was relatively accessible.

Discussion

The findings of this study highlight the complex interplay between experiential learning, PST engagement, and the opportunities and challenges of block delivery. This discussion explores the factors that enhanced the PST experience, the role of field trips and learning, the broader skills developed beyond STEM, and the pedagogical implications for teacher education.

Linking Active Learning, Design Thinking, and Experiential Practice

A central finding of this study was the positive impact of student-centred learning approaches on PSTs' engagement and confidence in STEM education. Interactive activities and field trips threaded throughout the unit, including hands-on tasks and real-world applications, enriched learning and support research demonstrating active learning boosting engagement through practical, authentic tasks (Prince, 2004). Active learning has also been linked to problem-solving development (Coenen et al., 2019) and develops critical thinking and self-directed learning (Cochran-Smith & Lytle, 2009), sentiments echoed by PSTs undertaking the unit. The alignment with the 5E instructional model (Bybee et al., 2006; Polanin et al., 2024) further structured these experiences, providing a clear framework for engaging students and exploring STEM and science concepts. Active learning is well aligned with the immersive structure of Block Model programs, with Muscat (2025) highlighting how teacher educators deliberately employ such approaches in initial teacher education. Similarly, Chau et al. (2023) found that while active learning strategies are highly effective in Block Model contexts, they require careful scaffolding to ensure deep engagement and conceptual understanding.

PSTs in this research frequently reflected on how the skills gained in the unit extended beyond STEM disciplines. Many reflected on the transferability of DT as a problem-solving approach, recognising its relevance across disciplines and its iterative nature as essential for adaptability in classroom settings. This is echoed in Henriksen et al.'s (2017) research that explains DT as a prompt for students to reflect on the adaptive nature of the process, which is essential for future educators. While the sentiment around DT in education is broadly positive, reviews also flag implementation frictions: DT's iterative, less-structured nature can feel ambiguous for non-design specialists and may not translate cleanly into tightly scheduled school contexts without explicit supports (Bathla et al., 2025). Participants emphasised that the challenge lies not in DT's efficacy, but in knowing when, how, and where to implement it amid curricular and resource constraints. This highlights the imperative for comparative approaches that are tailored to real-world classroom conditions (Bathla et al., 2025), for which informed, context-sensitive decisions can be made about how to integrate it.

Experiential learning was central to PSTs' engagement in this study, where activities offered concrete experiences that, when coupled with reflection, supported the development of new understandings about teaching STEM and its pedagogical application (Kolb & Kolb, 2005). Consistent with constructivist theories, which emphasise active knowledge construction (Chand, 2023), many PSTs valued the hands-on, problem-based opportunities to connect theory with practice and to envision how such approaches could shape future teaching (Cavadas et al., 2022). The field trip to Wyndham Tech School was especially highlighted as an immersive and interactive experience, reflecting that field trips enhance engagement by situating learning in authentic settings (Behrendt & Franklin, 2014). PSTs described these experiences as confidence-building and creativity-enhancing, yet some questioned the feasibility of transferring these strategies into classrooms constrained by time and curriculum demands. This tension reflects Djonko-Moore and Joseph's (2016) argument that field-based learning requires structured reflection and scaffolding and echoes Nesterenko et al.'s (2024) call for situated learning experiences that help preservice teachers make explicit links between theory and practice in STEM education.

Program Challenges

The integration of field trips within an intensive delivery mode posed several challenges that influenced the student experience, aligning with broader concerns in higher education regarding field-based learning (Fleischner et al., 2017; Jones & Washko, 2022). A key issue was the difficulty in aligning the field trip with the existing timetable structure, particularly given the mismatch between Block Model delivery and the traditional semester-based program at the Tech School. Similar structural constraints have been noted in previous research, where scheduling conflicts limit the feasibility of field learning opportunities (Behrendt & Franklin, 2014). In this study, university teaching staff mitigated these challenges through collaborative platforms and team-teaching with Tech School staff, affirming the importance of coordination in effective field-based learning (Kisiel, 2013).

Travel logistics complicated engagement, as some perceived the field trip location as difficult to access despite being within a 30-min drive and close to public transport. This reflects broader challenges in field-based learning, where perceived travel barriers (regardless of actual distance) can negatively impact student participation and engagement (Djonko-Moore & Joseph, 2016; Fleischner et al., 2017). Institutional barriers such as funding, resourcing, and time constraints on staff for organising such activities further exacerbate these challenges, reinforcing findings that field trips require substantial planning and institutional support to maximise their effectiveness (Fleischner et al., 2017). Addressing these challenges requires not only logistical adjustments but also pedagogical strategies that explicitly articulate the value of field-based learning in ways that align with students' academic and professional goals.

Findings reveal that, despite the experiential nature of the field trip, many students prioritised meeting assessment requirements over fully engaging with the deeper learning opportunities offered by the program. This reflects a well-documented tendency in higher education, where assessment directs student learning behaviours (Biggs & Tang, 2011). While assessment serves as a critical driver of student engagement and academic growth, it does not always foster intrinsic motivation for learning (Winstone et al., 2020). Future iterations of the program may benefit from assessment structures that more explicitly integrate reflective or inquiry-based components, ensuring that students connect their field experiences with meaningful learning rather than viewing them as merely assessment tasks.

Some participants in this study faced challenges associated with the intensive delivery mode, particularly time constraints, assessment pacing, and external disruptions. One participant noted that the condensed 4-week structure limited opportunities for iterative learning and deeper exploration of complex STEM concepts. This aligns with research suggesting that students may require more time to assimilate content and critical thinking skills than intensive timetables typically allow (Lutes & Davies, 2018), a challenge noted in STEM education where key concepts can require consolidation time (Jackson et al., 2022). However, many participants valued the focused nature of the unit, reporting enhanced engagement, consistent with other Block Models shown to support time management (Goode et al., 2024), promote active and deep learning (Zhang & Cetinich, 2022), and improve satisfaction and engagement (Walsh et al., 2019). As a first-year unit, its primary contribution was to build PSTs' engagement and confidence in STEM education, laying the groundwork for more advanced learning and pedagogical integration in subsequent years.

Outcomes, Implications, and Recommendations

This study contributes new insights by demonstrating how DT, when embedded as an applied learning approach, can strengthen PST preparedness for STEM education. A distinctive feature of this work is the partnership between the university and Wyndham Tech School, which illustrates how deliberate secondary/tertiary collaborations can create impactful, practice-oriented learning opportunities. Based on these findings, the following recommendations are proposed for effectively planning and implementing field trips in block and intensive delivery modes:

- Align field trips with learning objectives and pedagogical models. To maximise their educational impact, field trips should be carefully planned and aligned with learning objectives. Learning models, such as DT, can be used to structure activities that directly support curriculum goals. It is essential to ensure that PSTs recognise how these experiences contribute to their STEM teaching preparedness.
- Prioritise logistics, communication, and preparation. Successful field trips require structured scheduling, clear communication, and thorough preparation for both students and staff. As Fedesco et al. (2020) noted, "logistics play an important role in the successfulness of a field trip" (p. 78). Advance planning is essential to ensure trips align with assessment timelines, avoiding scheduling conflicts. Providing students with expectations may assist in accessibility and minimising uncertainty.
- Strengthen the explicit connection between field trips and assessment. Strategic integration of field trips and assessment design is important for PST's perceived relevance. Field trip activities should be explicitly linked to assessment criteria and reflective practice tasks, ensuring the purpose is clearly understood and reinforced at multiple stages of the program.

Limitations and Future Research

This qualitative study is focused on a single university in Victoria, Australia, limiting the generalisability of the findings. Additionally, while focus groups provide valuable insights into collective student experiences and perspectives, they can sometimes create an environment where discussions lean toward negative views (Carlsen & Glenton, 2012). This study also did not examine whether challenges disproportionately impacted particular cohorts, such as mature-aged students or those with carer responsibilities. Despite these limitations, this study contributes to ongoing research on Block Model innovations, responding to Lodge and Ashford-Rowe (2024) call for a deeper understanding of the learning processes facilitated by intensive teaching. Future research should also explore long-term impacts of intensive delivery and field trips on PSTs' future teaching practice. Longitudinal studies are needed to assess knowledge retention and growth, and the influence of intensive learning experiences on career trajectories into STEM teaching.

Conclusion

This study highlights the value of field trips in intensive teaching modes, demonstrating their capacity to enhance the PST experience and bridge theory with practice within immersive Block Models. Field-based experiences offer transformative learning opportunities, particularly in STEM education, where hands-on exploration develops problem-solving skills and confidence in teaching. STEM programs in teacher education play a key role in preparing future educators to integrate inquiry-driven approaches like DT, fostering confident, adaptable teachers capable of engaging students in authentic, applied learning experiences. Continued investment in field-based learning, cross-sector partnerships, and innovative STEM education initiatives will be essential in strengthening teacher preparation and enhancing student outcomes in STEM fields.

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Data Availability Reasonable requests for deidentified supporting data may be considered on a case-by-case basis and are subject to institutional ethics approval.

Declarations

Ethical Approval and Consent to Participate This study received ethical approval from Victoria University Low-Risk Human Ethics Committee (HRE23-184) and was conducted in accordance with the National Statement on Ethical Conduct in Human Research (National Health and Medical Research Council, 2023). All participants provided written informed consent to participate in this study, in accordance with institutional ethics guidelines. All participants provided written consent for the use of their anonymised assessment excerpts and focus group contributions in publications arising from this research. Identifying information has been removed to ensure confidentiality.

Conflict of interest The authors declare no competing interests.

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