

Design and Classroom Implementation of Integrated Learning Situations for Grade 5 Geometry and Measurement: Evidence from Vietnamese Primary Schools

Duong Lam Thuy¹, Ha Duong Thi Thu²

¹Faculty of Primary Education, Thai Nguyen University of Education, Thai Nguyen, Vietnam.

²Binh Son I Primary School, Tan Cuong Commune, Thai Nguyen Province, Vietnam.

ABSTRACT: Integrated learning has become an important pedagogical approach in competency-based mathematics education because it enables students to apply mathematical knowledge in meaningful and authentic contexts. However, empirical evidence regarding the design and classroom implementation of integrated learning situations for specific mathematical content in primary education remains limited, particularly in the context of Vietnamese schools. This study aimed to design and examine the classroom implementation of integrated learning situations for Grade 5 Geometry and Measurement in Vietnamese primary schools. A classroom implementation research design was employed in two public primary schools in Thai Nguyen Province, Vietnam. Data were collected through a survey of 30 primary school administrators and teachers, classroom observations, students' learning products, lesson documents, and teacher reflective notes. The findings indicate that teachers generally perceived integrated teaching as necessary and valuable for promoting students' mathematical competence and knowledge application. Nevertheless, challenges remained in selecting integrated content, designing authentic learning tasks, and supporting students in transferring mathematical knowledge to contextualised problems. The implementation evidence demonstrates that the proposed integrated learning situations were feasible within regular classroom conditions and promoted students' engagement, mathematical communication, collaboration, and application of Geometry and Measurement concepts in authentic contexts. The study contributes a practical framework for designing and implementing integrated learning situations in primary mathematics education, providing implications for teacher professional development and competency-based curriculum implementation in Vietnam and similar educational contexts.

KEYWORDS: integrated learning; mathematics education; Geometry and Measurement; primary education; learning situations; competency-based curriculum

1. INTRODUCTION

Contemporary educational reforms increasingly emphasize competency-based learning, authentic problem solving, and the meaningful integration of knowledge across disciplines. Rather than acquiring isolated concepts, primary school students are expected to apply mathematical knowledge in real-life situations, connect ideas across learning domains, and develop transferable competencies for lifelong learning. This educational orientation has led integrated learning to become one of the major pedagogical approaches adopted in many countries, as it enables learners to construct knowledge through meaningful contexts instead of memorizing fragmented content (Beane, 1997; Jacobs, 1989).

Within primary mathematics, Geometry and Measurement provide particularly favorable opportunities for integrated learning because their content is closely associated with observation, measurement, spatial reasoning, design, construction, and everyday applications. Concepts such as perimeter, area, volume, geometric figures, and measurement naturally emerge in activities related to school environments, homes, gardens, engineering, environmental protection, and artistic design. Consequently, learning situations situated in authentic contexts allow students to recognize mathematics as a practical tool for understanding and solving problems encountered in daily life. Previous studies have shown that integrated mathematics learning not only strengthens conceptual understanding but also enhances students' engagement, motivation, and ability to transfer mathematical knowledge to practical situations (Furner & Kumar, 2007; Goos et al., 2023). These characteristics make Grade 5 Geometry and Measurement an appropriate domain for implementing integrated learning through carefully designed classroom learning situations.

In Vietnam, the 2018 General Education Curriculum identifies integrated teaching as an important orientation for developing students' competencies and promoting meaningful connections between school learning and real-life contexts. In primary mathematics, teachers are encouraged to organize learning activities that enable students to mobilize mathematical knowledge

Design and Classroom Implementation of Integrated Learning Situations for Grade 5 Geometry and Measurement: Evidence from Vietnamese Primary Schools

together with knowledge from related subjects when solving authentic problems. Geometry and Measurement, because of their practical and visual nature, offer considerable potential for this pedagogical approach. However, classroom implementation remains challenging. Many teachers continue to organize lessons through traditional content transmission or simple contextual examples rather than designing integrated learning situations that require students to actively connect mathematical knowledge with interdisciplinary contexts. As a result, opportunities for developing mathematical problem-solving competence and knowledge application remain limited.

Existing research has established important theoretical foundations for integrated learning by explaining curriculum integration, interdisciplinary teaching, STEM-oriented mathematics education, and competency-based instructional design. Previous studies have also examined different forms and levels of integration and highlighted the educational benefits of connecting mathematics with authentic contexts. Nevertheless, relatively few studies have focused specifically on the systematic design of integrated learning situations for particular mathematical content in primary education. Even fewer investigations have proposed practical procedures for implementing such learning situations in classroom teaching while preserving mathematical rigor and curriculum requirements. Moreover, empirical evidence concerning the effectiveness of integrated learning situations for Grade 5 Geometry and Measurement remains limited, particularly within the context of Vietnamese primary schools. These limitations indicate the need for research that moves beyond general discussions of integrated teaching toward designing, implementing, and evaluating integrated learning situations for specific mathematical topics (Panqueban & Henríquez-Rivas, 2025; Wei et al., 2022). This research direction is also consistent with the research gap identified in the present study, namely the limited availability of studies addressing the exploitation and design of integrated learning situations for Grade 5 Geometry and Measurement together with evidence from classroom implementation.

Accordingly, this study aims to design integrated learning situations for Grade 5 Geometry and Measurement, develop an approach for their classroom implementation, and examine their effectiveness in Vietnamese primary schools. Specifically, the study addresses the following research questions:

RQ1. How can integrated learning situations be systematically designed for Grade 5 Geometry and Measurement?

RQ2. How can integrated learning situations be effectively implemented in primary mathematics classrooms?

RQ3. What evidence from classroom implementation supports the feasibility and educational value of integrated learning situations in Grade 5 Geometry and Measurement?

This study makes three contributions to the literature. First, it proposes a systematic approach for designing integrated learning situations that connects mathematical knowledge with authentic interdisciplinary contexts while maintaining the central role of mathematics. Second, it provides practical guidance for classroom implementation, offering teachers pedagogical procedures for organizing integrated learning in Grade 5 Geometry and Measurement. Third, it presents empirical evidence from a pedagogical experiment to demonstrate the effectiveness of integrated learning situations in improving students' learning outcomes, thereby contributing to the growing body of research on integrated primary mathematics education and providing implications for implementing competency-based mathematics teaching in Vietnam and similar educational contexts.

2. LITERATURE REVIEW

2.1. Integrated Learning in Primary Mathematics

Integrated learning has become an important pedagogical approach in primary mathematics because it enables students to construct mathematical understanding through meaningful connections among mathematical concepts, other subject areas, and authentic life experiences. Rather than treating mathematical knowledge as isolated procedures, integrated learning encourages learners to apply concepts in contexts that require observation, reasoning, communication, and problem solving. This approach aligns with competency-based education by emphasizing the meaningful use of knowledge instead of the reproduction of fragmented content. In primary classrooms, integrated learning therefore extends beyond combining different disciplines; it creates coherent learning experiences in which mathematical ideas are explored through authentic situations while maintaining mathematics as the central domain of learning.

Within mathematics education, effective integration requires careful alignment between curriculum objectives, mathematical concepts, and contextual learning tasks. Mathematical knowledge should remain the primary focus, whereas interdisciplinary elements are incorporated only when they enrich conceptual understanding or provide meaningful contexts for application. Consequently, integrated learning is characterized by purposeful task design, authentic problem contexts, active student participation, and opportunities for learners to connect prior knowledge with new experiences. Such learning environments promote conceptual understanding while simultaneously developing mathematical reasoning, communication, collaboration, and knowledge transfer. Recent studies have also emphasized that successful integration depends largely on teachers' ability to design learning experiences that preserve disciplinary rigor while encouraging meaningful interdisciplinary connections rather than superficial contextualization (Drake & Reid, 2020; Fraser, 2021). These characteristics provide the theoretical foundation for designing

Design and Classroom Implementation of Integrated Learning Situations for Grade 5 Geometry and Measurement: Evidence from Vietnamese Primary Schools

integrated learning situations in primary mathematics, which constitute the central focus of the present study and underpin the subsequent discussion of Grade 5 Geometry and Measurement.

2.2. Integrated Learning in Grade 5 Geometry and Measurement

Geometry and Measurement constitute one of the most contextually relevant strands of primary mathematics because they enable students to explore mathematical concepts through observation, visualization, measurement, and interaction with real-world objects. In Grade 5, students are expected to develop increasingly sophisticated understandings of two-dimensional and three-dimensional figures, perimeter, area, volume, and measurement relationships while applying these concepts to practical situations. Unlike computational topics that are often practiced through symbolic exercises, Geometry and Measurement naturally lend themselves to contextual learning in which mathematical reasoning is closely linked to everyday experiences. This characteristic makes the strand particularly suitable for integrated learning, as authentic contexts can enrich conceptual understanding without diminishing the rigor of mathematical thinking.

Effective integration in Grade 5 Geometry and Measurement requires learning experiences that preserve mathematical accuracy while encouraging students to connect mathematical ideas with phenomena encountered in science, technology, environmental studies, engineering, and daily life. Rather than introducing interdisciplinary knowledge for its own sake, integration should support students in recognizing how geometric and measurement concepts function as analytical tools for investigating and solving authentic problems. Research has shown that contextualized geometry learning enhances students' spatial reasoning, conceptual understanding, and mathematical communication when learning activities are carefully aligned with curriculum objectives and learners' cognitive development (Clements & Sarama, 2014; Jones & Tzekaki, 2016). Consequently, integrated learning in Grade 5 Geometry and Measurement is not simply the inclusion of real-life examples but the deliberate organization of mathematical learning through authentic situations that require students to mobilize mathematical knowledge in meaningful contexts. This pedagogical orientation provides the immediate theoretical basis for designing integrated learning situations, which is the primary focus of the present study.

2.3. Designing Integrated Learning Situations for Grade 5 Geometry and Measurement

Designing integrated learning situations is a central component of integrated mathematics instruction because it transforms curriculum objectives into meaningful learning experiences situated in authentic contexts. An integrated learning situation is not merely a contextualized activity or a real-life example; rather, it is a pedagogically structured learning environment in which students engage with meaningful problems that require the application of mathematical concepts while drawing upon relevant knowledge and experiences from related domains. Within Grade 5 Geometry and Measurement, effective learning situations should be designed around authentic contexts that naturally involve geometric reasoning and measurement, enabling students to investigate, represent, and solve practical problems without compromising the integrity of mathematical content.

The quality of integrated learning situations depends on the coherence between curriculum objectives, mathematical concepts, contextual authenticity, and students' cognitive characteristics. Learning tasks should encourage learners to explore mathematical ideas actively through observation, discussion, measurement, modelling, and problem solving, while teachers provide appropriate guidance to support conceptual development. Authentic contexts function as vehicles for mathematical thinking rather than as instructional objectives in themselves. Consequently, well-designed learning situations promote conceptual understanding, mathematical reasoning, collaboration, and the transfer of knowledge to unfamiliar situations. Previous studies have emphasized that meaningful task design is fundamental to successful mathematics learning because carefully structured tasks create opportunities for students to construct knowledge through inquiry and purposeful interaction (Sullivan et al., 2015; Watson & Ohtani, 2015). These principles provide the theoretical foundation for the design framework adopted in this study and directly inform the classroom implementation and pedagogical experiment presented in the following sections.

3. METHODS

3.1. Research Design

This study employed a classroom implementation research design to examine the design and implementation of integrated learning situations for teaching Grade 5 Geometry and Measurement in Vietnamese primary schools. A classroom implementation approach was considered appropriate because the research was conducted in authentic educational settings where teaching activities were organized under normal school conditions. This design enabled the researchers to investigate the feasibility and educational value of the proposed integrated learning situations while preserving ecological validity and minimizing disruption to routine classroom practices.

The study focused on the systematic development and classroom implementation of integrated learning situations in Grade 5 Geometry and Measurement. The learning situations were designed in accordance with the objectives of the Vietnamese General Education Curriculum and implemented in regular mathematics lessons. Throughout the implementation process, particular

Design and Classroom Implementation of Integrated Learning Situations for Grade 5 Geometry and Measurement: Evidence from Vietnamese Primary Schools

attention was paid to the organization of learning activities, students' participation, mathematical communication, problem-solving processes, and teachers' instructional practices. Evidence from classroom observations, teacher reflections, and students' learning products was used to examine the practicality and educational value of the proposed learning situations in authentic classroom contexts. Such classroom-based implementation research has been widely recommended in educational research because it enables researchers to investigate pedagogical innovations under real teaching conditions while generating evidence to support instructional improvement (Creswell & Creswell, 2018; Shadish et al., 2002). This methodological framework provided the foundation for selecting participants, implementing the instructional intervention, and examining evidence from classroom implementation, as described in the following sections.

3.2. Participants and Research Context

The study was conducted in two public primary schools in Thai Nguyen Province, Vietnam, where Grade 5 mathematics is implemented according to the 2018 Vietnamese General Education Curriculum. These schools were selected because they shared comparable educational conditions in terms of curriculum implementation, school management, teacher qualifications, and student characteristics, thereby providing an appropriate context for implementing integrated learning situations in authentic classroom settings. Conducting the study under regular school conditions also enhanced its ecological validity by ensuring that instructional activities reflected routine classroom practice rather than artificially controlled educational environments.

Participants consisted of Grade 5 students and their mathematics teachers who were involved in the classroom implementation of the designed integrated learning situations. Existing classrooms were maintained throughout the implementation process to preserve the natural learning environment and ensure that teaching activities reflected authentic school practice. The participating teachers implemented integrated learning situations within the regular Geometry and Measurement lessons following the objectives and requirements of the national curriculum. During the implementation, classroom activities, students' participation, and teachers' instructional practices were documented to examine the feasibility and educational value of the proposed learning situations. This approach is widely recommended in school-based educational research because classroom-based implementation preserves educational authenticity while providing meaningful evidence for evaluating pedagogical innovations under real teaching conditions (Fraenkel et al., 2019; Cohen et al., 2018). The participant characteristics and research context therefore provided an appropriate foundation for implementing and examining the integrated learning situations described in the following section.

3.3. Development and Implementation of Integrated Learning Situations

The classroom implementation was developed through a systematic process of designing and implementing integrated learning situations for the Grade 5 Geometry and Measurement strand. The design process was guided by the objectives of the Vietnamese General Education Curriculum and the theoretical principles of integrated learning discussed in the preceding section. Each learning situation was constructed around an authentic context that enabled students to investigate mathematical concepts through meaningful activities while maintaining the central role of mathematical reasoning. Real-life contexts were selected not as independent learning goals but as pedagogical vehicles through which students could explore geometric relationships, measurement concepts, and mathematical problem solving. The learning situations were therefore designed to promote active participation, inquiry, discussion, and collaborative learning while ensuring alignment with curriculum requirements and students' cognitive characteristics.

The designed learning situations were implemented throughout the Geometry and Measurement instructional unit in regular Grade 5 mathematics classrooms. Teachers organized classroom activities according to the proposed pedagogical procedures, encouraging students to observe, discuss, measure, represent, and solve contextualized mathematical problems through cooperative learning and guided inquiry. Throughout the implementation process, teachers functioned primarily as facilitators who supported students' mathematical thinking rather than relying on direct knowledge transmission. Classroom implementation emphasized active student engagement, mathematical communication, collaborative learning, and the application of mathematical knowledge in authentic contexts while maintaining consistency with curriculum objectives and routine teaching practice. Such systematic development and classroom implementation are regarded as essential for establishing the validity of classroom-based educational research and generating evidence to support pedagogical innovation in authentic educational settings (Bell, 2010; Reeves, 2006). The implementation process therefore provided the basis for examining the feasibility and educational value of the proposed integrated learning situations through the research instruments described in the following section.

3.4. Research Instruments

To examine the classroom implementation of the proposed integrated learning situations, the study employed multiple qualitative research instruments to collect evidence from authentic teaching and learning activities. The principal sources of evidence consisted of classroom observations, students' learning products, lesson documents, and teacher reflective notes. These instruments were selected because they enabled the researchers to capture both the implementation process and students' learning experiences within regular classroom settings.

Design and Classroom Implementation of Integrated Learning Situations for Grade 5 Geometry and Measurement: Evidence from Vietnamese Primary Schools

Classroom observations focused on students' engagement, participation, mathematical communication, collaboration, and problem-solving behaviours during integrated learning activities. Students' learning products, including worksheets and task outputs, were analysed to examine how mathematical knowledge was applied in authentic learning situations. Teacher reflective notes provided additional evidence regarding the practicality of the designed learning situations, the organization of classroom activities, and students' responses throughout the implementation process. The integration of these complementary sources of evidence enabled methodological triangulation, thereby strengthening the credibility and interpretability of the research findings (Cohen et al., 2018; Creswell & Plano Clark, 2018). Collectively, these research instruments provided comprehensive evidence for examining the feasibility, educational value, and classroom implementation of the proposed integrated learning situations. The procedures for collecting and analysing these data are described in the following section.

3.5. Data Collection and Analysis

Data collection was conducted throughout the classroom implementation process using a systematic procedure to ensure consistency and reliability. The integrated learning situations were implemented during the Grade 5 Geometry and Measurement instructional unit in regular mathematics classrooms. Throughout the implementation, classroom observations were conducted to document students' engagement, participation, mathematical communication, collaborative learning, and problem-solving processes. Students' learning products were collected as evidence of their mathematical understanding and application of knowledge in authentic contexts. Teacher reflective notes and lesson documents were also collected to document instructional implementation, classroom organization, and the practicality of the proposed learning situations. All data were gathered within the normal instructional timetable to preserve the authenticity of classroom practice and minimize disruption to routine teaching and learning activities.

Qualitative data obtained from classroom observations, students' learning products, lesson documents, and teacher reflections were analysed using thematic analysis to identify recurring patterns related to classroom participation, mathematical reasoning, collaborative learning, and the implementation of integrated learning situations. Documentary evidence from students' work was examined to complement observational findings and provide additional insights into students' mathematical learning processes. The integration of multiple qualitative data sources enabled a comprehensive interpretation of classroom implementation and strengthened the credibility of the findings through methodological triangulation (Field, 2018; Braun & Clarke, 2022). The findings derived from these analyses are presented in the following Results section.

4. RESULTS

4.1. Teachers' Perceptions of Integrated Teaching in Grade 5 Mathematics

A preliminary survey involving 30 primary school administrators and teachers was conducted to investigate perceptions of integrated teaching in Grade 5 Mathematics. Four aspects were examined: the perceived necessity of integrated teaching, its principal educational objective, its contribution to students' mathematical competence, and the mathematics strand considered most suitable for integrated instruction. The results are summarised in Table 1.

Table 1. Teachers' perceptions of integrated teaching in Grade 5 Mathematics (n = 30)

Aspect	Main response	n	%
Perceived necessity	Very necessary	18	60.0
Educational objective	Applying mathematics to real-life situations	21	70.0
Contribution to mathematical competence	Very significant	15	50.0
Most suitable mathematics content	Geometry and Measurement	17	56.7

The findings reveal that teachers held consistently positive perceptions of integrated teaching in Grade 5 Mathematics. A substantial majority (93.3%) regarded integrated teaching as necessary or very necessary, indicating broad professional support for this instructional orientation. Furthermore, 70.0% identified the application of mathematical knowledge to authentic situations as the primary objective of integrated teaching, reflecting an emphasis on meaningful learning rather than procedural memorisation. Teachers also recognised its contribution to developing mathematical competence, with 50.0% reporting that integrated teaching had a clear or very clear influence on students' mathematical development. Among the curriculum strands, Geometry and Measurement was considered the most suitable for integrated instruction (56.7%), primarily because it naturally connects mathematical concepts with measurement, spatial reasoning and everyday problem-solving contexts. Collectively, these findings

Design and Classroom Implementation of Integrated Learning Situations for Grade 5 Geometry and Measurement: Evidence from Vietnamese Primary Schools

demonstrate that teachers possess favourable perceptions of integrated teaching while recognising the particular suitability of Geometry and Measurement for contextualised learning. The results provide an empirical rationale for the instructional design proposed in this study and support the selection of Geometry and Measurement as the focus of classroom implementation. These findings are consistent with Beane, J. A. (1997), who argued that integrated curricula promote meaningful learning by connecting disciplinary knowledge with authentic contexts.

4.2. Current Practices of Implementing Integrated Teaching in Grade 5 Mathematics

To examine how integrated teaching has been implemented in primary mathematics classrooms, the survey investigated teachers' instructional practices, including the frequency of implementation, the forms of integration adopted, lesson design approaches, classroom organisation, and students' learning behaviours. The findings are summarised in Table 2.

Table 2. Current practices of implementing integrated teaching in Grade 5 Mathematics (n = 30)

Aspect	Dominant response	n	%
Frequency of implementation	Frequently	12	40.0
Common integration approach	Real-life situations	12	40.0
Lesson design starting point	Mathematics learning objectives	13	43.3
Most common classroom activity	Hands-on measurement/drawing/calculation	10	33.3
Students' classroom participation	Participate with teacher guidance	12	40.0

The survey indicates that integrated teaching has been incorporated into Grade 5 mathematics classrooms, although its implementation remains uneven. While 56.7% of teachers reported implementing integrated teaching frequently or very frequently, a considerable proportion still used it only occasionally, suggesting that sustained classroom application has not yet become routine. Teachers most commonly integrated mathematics with authentic real-life situations (40.0%) and typically designed lessons by first identifying the mathematics learning objectives (43.3%), indicating that curriculum requirements remained the primary consideration when planning integrated instruction. In classroom practice, hands-on activities involving measurement, drawing and calculation were the most frequently adopted instructional format (33.3%), reflecting the practical nature of the Geometry and Measurement strand. Nevertheless, 40.0% of teachers reported that students still depended substantially on teacher guidance during integrated activities, suggesting that opportunities for independent inquiry and collaborative problem solving could be further strengthened. Overall, the findings demonstrate encouraging progress in classroom implementation while revealing the need for more systematic instructional guidance and well-designed integrated learning situations. This pattern is consistent with the work of Beane (1997), who argued that successful curriculum integration requires coherent instructional design rather than occasional contextual connections.

4.3. Challenges in Implementing Integrated Teaching in Grade 5 Mathematics

To identify the factors that hinder the effective implementation of integrated teaching, the survey examined teachers' difficulties in selecting integrated content, designing integrated lessons, and students' challenges when participating in integrated learning activities. The results are presented in Table 3.

Table 3. Challenges in implementing integrated teaching in Grade 5 Mathematics (n = 30)

Aspect	Dominant response	n	%
Selecting integrated content	Difficult/Very difficult	22	73.3
Lesson design	Lack of teaching resources and authentic tasks	10	33.3
Student learning	Difficulty selecting mathematical knowledge to solve problems	11	36.7

Design and Classroom Implementation of Integrated Learning Situations for Grade 5 Geometry and Measurement: Evidence from Vietnamese Primary Schools

The findings indicate that, despite teachers' positive perceptions of integrated teaching, several barriers continue to limit its effective classroom implementation. The greatest challenge concerned the selection of appropriate integrated content, with 73.3% of respondents reporting that this task was difficult or very difficult. Teachers also identified the lack of suitable teaching resources, authentic examples and contextualised mathematical tasks as the most significant obstacle when designing integrated lessons (33.3%). In addition, 36.7% reported that students often experienced difficulty in selecting appropriate mathematical knowledge to solve authentic problems, suggesting that learners still require structured guidance to transfer mathematical concepts across contexts. These findings complement the results presented in Sections 4.1 and 4.2, demonstrating that favourable teacher perceptions alone are insufficient to ensure effective classroom implementation. Rather, teachers require systematic instructional support, practical design frameworks and high-quality learning materials to translate integrated teaching into classroom practice. These findings are consistent with Drake and Burns (2004), who emphasised that successful curriculum integration depends not only on teachers' beliefs but also on the availability of coherent instructional resources and carefully designed learning experiences.

4.4. Classroom Implementation of Integrated Learning Situations

The integrated learning situations developed in this study were implemented in Grade 5 Geometry and Measurement lessons to examine their feasibility and educational value in authentic classroom settings. Evidence was collected through classroom observations, students' learning products, lesson documents and teacher reflective notes. Rather than evaluating learning through experimental comparison, the analysis focused on how the designed learning situations functioned during classroom implementation.

Table 4. Evidence from the classroom implementation of integrated learning situations

Implementation aspect	Observed evidence
Student engagement	Students actively participated in learning tasks and classroom discussions.
Application of mathematics	Students used geometrical and measurement knowledge to solve contextualised tasks.
Collaboration and communication	Students discussed, shared ideas and explained solution strategies.
Teacher reflection	The designed learning situations were practical and supported the organisation of learner-centred activities.

Classroom observations indicated that the integrated learning situations were implemented successfully in regular mathematics lessons and created favourable conditions for active student participation. Students engaged in measuring, drawing, discussing and solving practical problems related to Geometry and Measurement, thereby connecting mathematical concepts with authentic situations. Learning activities encouraged collaboration and mathematical communication as students exchanged ideas, justified their reasoning and presented different solution strategies. Analysis of students' learning products further suggested that the contextualised tasks supported the application of mathematical knowledge rather than isolated procedural practice. Teacher reflections also confirmed that the proposed instructional process was feasible for classroom use and provided practical guidance for organising integrated learning activities while maintaining curriculum objectives. Overall, the classroom evidence demonstrates that the proposed integrated learning situations are pedagogically feasible and support meaningful mathematics learning in primary classrooms. These findings are consistent with Beane (1997), who argued that curriculum integration becomes educationally meaningful when learning activities are organised around authentic problems that connect school knowledge with students' lived experiences.

5. DISCUSSION

5.1. Teachers' Perceptions and Current Practices of Integrated Teaching

The findings indicate that primary school teachers generally hold positive perceptions of integrated teaching in Grade 5 Mathematics, particularly regarding its contribution to developing students' ability to apply mathematical knowledge in authentic contexts. Most participating teachers considered integrated teaching both necessary and educationally valuable, suggesting that they recognize its potential to connect Geometry and Measurement with meaningful real-life situations. These perceptions provide an important foundation for curriculum innovation because teachers' beliefs strongly influence their instructional decisions and their willingness to adopt learner-centred pedagogical approaches. At the same time, the results reveal a noticeable gap between teachers' positive attitudes and the frequency of classroom implementation. Although many teachers reported using integrated teaching regularly, implementation remained inconsistent and was often limited to familiar activities rather than systematically designed

Design and Classroom Implementation of Integrated Learning Situations for Grade 5 Geometry and Measurement: Evidence from Vietnamese Primary Schools

integrated learning situations. This finding suggests that positive perceptions alone are insufficient to ensure sustained pedagogical change without adequate professional support and instructional resources. Similar conclusions were reported by Romanian primary teachers, who expressed strong support for curriculum integration while emphasizing the need for coherent instructional planning and coordination across learning activities. Likewise, research in mathematics education has shown that teachers' intentions to adopt integrated approaches are shaped not only by their beliefs about educational benefits but also by their confidence, pedagogical knowledge and access to appropriate teaching resources, all of which affect classroom implementation. Therefore, the present findings reinforce the argument that successful implementation of integrated teaching requires both favourable teacher perceptions and sustained professional development. In the context of Vietnamese primary education, strengthening teachers' capacity to design authentic integrated learning situations may help transform positive educational beliefs into consistent classroom practice, thereby improving the quality of mathematics teaching and supporting competency-based curriculum reform.

5.2. Challenges and the Educational Value of Integrated Learning Situations

The findings demonstrate that although teachers generally recognized the educational benefits of integrated teaching, they continued to encounter considerable challenges in selecting integrated content, designing authentic learning activities and supporting students in applying mathematical knowledge to real-world situations. These challenges are consistent with the current transition toward competency-based education, where effective implementation requires teachers not only to possess sound subject knowledge but also to design learning experiences that meaningfully connect mathematics with students' everyday lives. The classroom implementation presented in this study suggests that the integrated learning situations proposed in Grade 5 Geometry and Measurement provide a practical response to these challenges. By organising learning around authentic contexts, students were encouraged to measure, investigate, discuss and justify mathematical solutions rather than simply perform routine calculations. Such learning experiences promoted active participation, collaborative problem solving and mathematical communication while enabling students to apply conceptual knowledge in meaningful situations. These findings support previous research indicating that contextualised mathematical tasks increase students' engagement by demonstrating the relevance of mathematics and encouraging them to explore multiple solution strategies rather than relying solely on procedural knowledge. Furthermore, studies on authentic mathematical task design have shown that well-designed integrated activities foster higher-order thinking, reasoning and knowledge transfer because they require students to interpret realistic situations before selecting appropriate mathematical concepts and procedures. Therefore, the classroom evidence from this study suggests that carefully designed integrated learning situations not only address teachers' reported implementation difficulties but also create learning environments that support the objectives of Vietnam's competency-based primary mathematics curriculum by strengthening the connection between mathematical understanding and authentic problem solving.

5.3. Implications for Primary Mathematics Education

The findings of this study have several important implications for improving the implementation of integrated teaching in primary mathematics. First, the positive perceptions expressed by teachers and the successful classroom implementation suggest that integrated learning should become a more systematic component of mathematics instruction rather than being used only in isolated lessons. This requires curriculum developers and school leaders to provide practical guidance, instructional exemplars and teaching resources that help teachers design integrated learning situations aligned with curriculum objectives. Second, professional development programmes should place greater emphasis on developing teachers' competence in designing authentic mathematical tasks that connect Geometry and Measurement with everyday contexts. Such training should move beyond introducing the concept of integration and instead provide opportunities for teachers to collaboratively design, implement and reflect upon integrated lessons in authentic classroom settings. Third, classroom assessment should also be aligned with integrated learning by evaluating students' ability to apply mathematical knowledge, communicate their reasoning and solve contextualised problems rather than focusing exclusively on procedural accuracy. These implications are consistent with international evidence indicating that meaningful curriculum integration requires coherent support across curriculum design, teacher professional learning and classroom assessment. Research has shown that sustainable implementation of integrated curricula depends on teachers' opportunities to engage in collaborative planning, reflective practice and continuous professional learning rather than relying solely on individual teaching experience (Darling-Hammond et al., 2017). Likewise, effective mathematics instruction is strengthened when students regularly encounter authentic learning experiences that encourage reasoning, problem solving and the application of mathematical concepts across different contexts (National Council of Teachers of Mathematics [NCTM], 2014). Therefore, the present study contributes practical evidence that carefully designed integrated learning situations can support the implementation of Vietnam's competency-based primary mathematics curriculum while providing a feasible pedagogical model that may be adapted for other mathematical topics and primary school contexts.

6. CONCLUSION

This study investigated teachers' perceptions and current practices of integrated teaching while examining the classroom implementation of integrated learning situations in Grade 5 Geometry and Measurement in Vietnamese primary schools. Drawing upon survey findings and evidence collected during classroom implementation, the study provides a comprehensive understanding of both the opportunities and the challenges associated with implementing integrated teaching within the competency-based primary mathematics curriculum. The findings indicate that teachers generally recognized the educational value of integrated teaching and acknowledged its contribution to promoting students' ability to apply mathematical knowledge in authentic contexts. Nevertheless, classroom implementation remained constrained by difficulties in selecting integrated content, designing meaningful learning activities and supporting students in applying mathematical concepts to solve contextualised problems.

To address these challenges, the study designed and implemented integrated learning situations that connected Geometry and Measurement with authentic learning contexts. Evidence from classroom observations, students' learning products and teacher reflections suggests that these learning situations were feasible for regular classroom use and encouraged active participation, collaboration, mathematical communication and the application of mathematical knowledge in meaningful situations. These findings demonstrate that carefully designed integrated learning situations can serve as an effective pedagogical approach for supporting competency-oriented mathematics teaching in primary education.

The study makes both theoretical and practical contributions. Theoretically, it extends the literature on integrated teaching by providing empirical evidence from Vietnamese primary mathematics classrooms, where research on integrated learning remains relatively limited. Practically, it offers a systematic framework for designing and implementing integrated learning situations that may support teachers in organising learner-centred mathematics instruction while maintaining curriculum objectives. The findings may also inform teacher professional development and curriculum implementation aimed at strengthening integrated teaching in primary schools.

Several limitations should be acknowledged. The classroom implementation was conducted within a limited educational context and focused exclusively on Grade 5 Geometry and Measurement; therefore, the findings should not be generalised to all mathematical content or educational settings. In addition, the study primarily relied on classroom observations, learning products and teacher reflections rather than long-term measures of students' learning outcomes. Future research could examine the application of integrated learning situations across other mathematical domains, educational levels and school contexts, while incorporating longitudinal or mixed-method approaches to provide a more comprehensive understanding of their impact on students' mathematical learning and competency development.

REFERENCES

- 1) Beane, J. A. (1997). *Curriculum integration: Designing the core of democratic education*. Teachers College Press.
- 2) Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 83(2), 39–43. <https://doi.org/10.1080/00098650903505415>
- 3) Braun, V., & Clarke, V. (2022). *Thematic analysis: A practical guide*. SAGE Publications.
- 4) Clarke, D., & Roche, A. (2018). Using contextualized tasks to engage students in meaningful and worthwhile mathematics learning. *Journal of Mathematical Behavior*, 51, 95–108. <https://doi.org/10.1016/j.jmathb.2017.11.006>
- 5) Clements, D. H., & Sarama, J. (2014). *Learning and teaching early math: The learning trajectories approach* (2nd ed.). Routledge.
- 6) Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge.
- 7) Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- 8) Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.
- 9) Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.
- 10) Drake, S. M., & Burns, R. C. (2004). *Meeting standards through integrated curriculum*. Association for Supervision and Curriculum Development.
- 11) Drake, S. M., & Reid, J. L. (2020). Integrated curriculum as an effective way to teach 21st century capabilities. *Asia Pacific Journal of Educational Research*, 3(1), 31–50.
- 12) Field, A. (2018). *Discovering statistics using IBM SPSS Statistics* (5th ed.). SAGE Publications.
- 13) Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2019). *How to design and evaluate research in education* (10th ed.). McGraw-Hill Education.

Design and Classroom Implementation of Integrated Learning Situations for Grade 5 Geometry and Measurement: Evidence from Vietnamese Primary Schools

- 14) Fraser, S. P. (2021). Pedagogical content knowledge for integrated STEM: A systematic literature review. *International Journal of STEM Education*, 8(1), 1–22.
- 15) Furner, J. M., & Kumar, D. D. (2007). The mathematics and science integration argument: A stand for teacher education. *Eurasia Journal of Mathematics, Science and Technology Education*, 3(3), 185–189. <https://doi.org/10.12973/ejmste/75397>
- 16) Goos, M., Carreira, S., & Namukasa, I. K. (2023). Mathematics and interdisciplinary STEM education: Recent developments and future directions. *ZDM–Mathematics Education*, 55(6), 1199–1217. <https://doi.org/10.1007/s11858-023-01533-z>
- 17) Jacobs, H. H. (Ed.). (1989). *Interdisciplinary curriculum: Design and implementation*. Association for Supervision and Curriculum Development.
- 18) Jones, K., & Tzekaki, M. (2016). Research on the teaching and learning of geometry. In A. Gutiérrez, G. C. Leder, & P. Boero (Eds.), *The second handbook of research on the psychology of mathematics education* (pp. 109–149). Sense Publishers.
- 19) Măță, L., Clipa, O., & Tzafilkou, K. (2014). Perception of teachers on curriculum integration: Integration patterns practice. *Procedia – Social and Behavioral Sciences*, 127, 728–732. <https://doi.org/10.1016/j.sbspro.2014.03.344>
- 20) National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. National Council of Teachers of Mathematics.
- 21) Panqueban, D., & Henríquez-Rivas, C. (2025). Interdisciplinary mathematics education: A systematic review. *European Journal of Educational Research*, 14(3), 873–895. <https://doi.org/10.12973/eu-jer.14.3.873>
- 22) Paredes, S., Cáceres, M. J., Diego-Mantecón, J. M., Blanco, T. F., & Chamoso, J. M. (2020). Creating realistic mathematics tasks involving authenticity, cognitive domains, and openness characteristics: A study with pre-service teachers. *Sustainability*, 12(22), Article 9656. <https://doi.org/10.3390/su12229656>
- 23) Reeves, T. C. (2006). Design research from a technology perspective. In J. van den Akker, K. Gravemeijer, S. McKenney, & N. Nieveen (Eds.), *Educational design research* (pp. 52–66). Routledge.
- 24) Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin.
- 25) Sullivan, P., Clarke, D., Clarke, B., & O’Shea, H. (2015). *Teaching mathematics: Using research-informed strategies*. Australian Council for Educational Research.
- 26) Watson, A., & Ohtani, M. (Eds.). (2015). *Task design in mathematics education: An ICMI study 22*. Springer. <https://doi.org/10.1007/978-3-319-09629-2>
- 27) Wei, Y., Zhang, Q., & Guo, J. (2022). Can mathematical modelling be taught and learned in primary mathematics classrooms? A systematic review of empirical studies. *Education Sciences*, 12(12), Article 923. <https://doi.org/10.3390/educsci12120923>
- 28) Yang, D. C., Sianturi, I. A. J., Chen, C. H., Su, Y. W., & Trakulphadetkrai, N. V. (2022). Taiwanese primary school teachers’ perceived enablers for and barriers to the integration of children’s literature in mathematics teaching and learning. *Educational Studies in Mathematics*, 110(1), 125–148. <https://doi.org/10.1007/s10649-021-10115-3>



There is an Open Access article, distributed under the term of the Creative Commons Attribution – Non-Commercial 4.0 International (CC BY-NC 4.0) (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits remixing, adapting and building upon the work for non-commercial use, provided the original work is properly cited.