

Perpectives of primary pre-service teachers on integrated teaching

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Abstract

Integrated teaching has been implemented in many educational systems across the world. In order to organize integrated teaching effectively, teachers need to be equipped with integrated teaching knowledge and skills from the time they are studying at a teacher training program. This study aims to evaluate the viewpoints of primary school pre-service teachers on integrated teaching in Mathematics at the primary education level. The research used a quantitative method by surveying 354 students from five universities across the main regions of a developing country in Asia. The results show that participants were aware of the important role of integrated teaching and the necessity of skill training in designing and using activities in Mathematics integrated teaching. However, their current skills in designing and using activities in Mathematics integrated teaching are only at or below the average level. Moreover, they have not often been trained or guided to design integrated teaching situations in primary education Mathematics. It is suggested that primary school pre-service teachers should be trained to be able to comprehend the integrated teaching concepts, processes and implement them in real teaching situations.

Keywords: Integrated teaching, primary education, Mathematics, pre-service teachers, pedagogical institutions

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1. Introduction

The globalization and internationalization have placed new requirements on education and training in many countries around the world. Accordingly, teaching not only provides separate skills in each subject, each field, but more importantly trains learners the ability to effectively solve problems in life, especially complex problems that require general knowledge and skills of many subjects and fields. One of the solutions to innovate education towards competence development for students is teaching from an integrative perspective. Integrated teaching plays an important role in educating students in the direction of competence development as this approach is thought to foster self-studying, logical thinking competencies, and problem-solving, deep learning capacities (Vashe et al., 2019).

With integrated teaching, instead of providing students with isolated knowledge and skills, teachers help students realize the connection and synthesis of knowledge in different fields in a systematic way; help students realize the meaning of knowledge, improve their ability to apply that knowledge to their work; thereby contributing to the formation and development of their competence. Ghosh (2015) emphasizes that integrated teaching entails coordination and cooperation among teachers of various disciplines to teach important core topics as a combined activity. The main objective of integration is to improve the benefit and efficiency of the teaching-learning procedure. Learning is assisted in integrated classes by the capability of analyzing knowledge from many angles, with students having the opportunity to gradually add new meanings to it. Students are encouraged to make connections between concepts, facts, and processes from diverse domains, as well as to evaluate data acquired from multiple sources (Popa et al., 2020).

In Vietnam, a less developed country located in the Southeast Asia, integrated teaching in general and integrated teaching in Mathematics in particular have been implemented in general education and received certain positive results in recent years (D. T. Do & Do, 2016; T. D. Do & Tran, 2019). In the current Mathematics curriculum and textbooks, there are many contents giving opportunities for integrated teaching (N. G. Nguyen, 2019). However, the reality of teaching shows that not many teachers have fully exploited the integrated capabilities to organize integrated teaching in Mathematics in primary schools. In other words, teachers still lack ideas in designing integrated teaching situations and do not know how to use integrated teaching activities to organize integrated teaching effectively. The main reason is that when they were studying in a teacher training program, teachers were not fully equipped with the necessary knowledge and integrated teaching skills, making their career preparations lacking when they graduated (Chi & Ha, 2021). Obviously, to organize integrated teaching effectively, teachers need to be equipped with integrated teaching knowledge and skills from the time they are still studying in their teacher training program. This paper explores the views of Vietnamese pedagogical students on integrated teaching. Specifically, this research surveyed pre-service teachers on their awareness, knowledge and skills about designing and using integrated teaching activities in Mathematics in primary schools.

2. Literature review

2.1. *Concepts of integrated teaching*

The associated literature points out a variety of concepts regarding integrated teaching. First of all, according to Ciolan (2008, cited in Tudor, 2014), integrated teaching is the act of creating a connection between different fields to build a harmonious whole, at a higher level, a higher level integration, an integration leading to a result that exceeds the synthesis of the part. At the level of research and program development, Drake (2012) defines an integrated curriculum in the simplest sense as connection: connecting between subjects, connecting teaching content with practice or connecting

teaching content based on knowledge and skills. Moreover, Huber and Hutchings (2004) argue that the term "integrated teaching" describes a method of applying information and skills from many contexts and sources, as well as linking them. It simply refers to creating a link between theoretical understanding and actual application. Similarly, Anghelache and Bențea (2012) point out that because it assumes the connection to the actual world and enables the coverage of a bigger curriculum, integrated teaching is both more effective and more realistic. Additionally, acquiring knowledge is a process of integration. Obviously, integrated teaching is one of the useful methods that improves the quality of education and produces more effective learning outcomes than conventional education (Davoodi et al., 2022).

In the Vietnamese context, integrated teaching is approached in the direction of determining how to organize teaching to form the necessary qualities and competencies for students. For example, H. C. Nguyen (2006) states that integrated teaching is to organize and guide students to mobilize knowledge and skills in many different fields to solve learning tasks, through which new techniques and skills are formed; integrated teaching helps develop the necessary skills, especially the ability to solve problems in learning and in real life. Similarly, Ha and Dang (2015) argue that integrated teaching is a teaching concept aimed at forming in students competencies to help them effectively solve practical problems based on the mobilization of content, knowledge, and skills in many different fields. This ensures that each student knows how to apply the knowledge learned in school in new and unexpected situations, thereby becoming a responsible citizen, a competent worker. Additionally, H. T. Do (2015b) points out that integrated teaching is a pedagogical point of view in which learners need to mobilize all resources to solve a complex problem - in order to develop abilities and personal qualities.

2.2. The role of integrated teaching in education innovation

Nowadays, to meet the goals of socio-economic development, many countries in the world have viewed and selected the integrated teaching as an inevitable trend to equip students with the necessary skills to solve problems in life, especially complex problems that require knowledge and skills of many fields. Obviously, integrated teaching has an important role for the current educational innovation. First of all, integrated teaching helps create opportunities to form and develop learners' competence. To solve practical problems, people not only use the knowledge and skills that are limited to one branch or field, but they must be associated with others. This requirement poses a task for today's education that is to provide learners with interdisciplinary knowledge and skills, the ability to apply them to practice, thereby aiming to form and develop learners' competence (Basu et al., 2015; Vashe et al., 2019). In integrated teaching, teachers often organize teaching around experiments containing complex problems, associated with practice. To solve it, students need to mobilize and effectively apply the knowledge and skills of many subjects (H. T. Do, 2015a; Ha, 2015). Therefore, integrated teaching creates many opportunities for students to form necessary competencies.

Second, integrated teaching takes advantage of students' experience and create excitement for students in the learning process. Specifically, integrated teaching is usually organized around topics associated with practice, closeness and stemming from students' needs. This helps students feel confident, actively mobilize their own knowledge and practical experience to solve learning tasks. Moreover, when placed in a practical context, students will see the essence of scientific knowledge. Thereby, creating an internal motivation to promote the learning process, reduce pressure and increase learning interest for students (T. T. H. Nguyen et al., 2022). Integrated teaching enables students to experience positive emotions and promote their creativity. Therefore, teachers have to choose attractive, practical, and open topics to stimulate students to come up with many accurate and

valuable solutions in particular circumstances. This develops students' capacity, promotes positivity, and increases students' interest (T. D. Nguyen & Pham, 2021).

Third, integrated teaching establishes the relationship between knowledge, skills and methods of subjects. Integrated teaching requires that teaching needs to be organized in the direction that comes from the relationship and unity between scientific subjects. This helps to create a connection in learning by connecting different subjects, emphasizing the dependence and relationship between the knowledge, skills and methods of those subjects. In the learning process, through the explanation and prediction of real-life things and phenomena, students will realize the relationship between the sections of the knowledge of different subjects (Harr et al., 2015; T. T. H. Nguyen et al., 2022). Consequently, integrated teaching establishes the relationship between the concepts, skills and methods of the subjects according to a logical and close structure with each other.

2.3. Approaches of integrated teaching

There are two main approaches of integrated teaching: horizontal integration and vertical integration. Horizontal integration is the merging of the educational identities of two or more units that are simultaneously teaching. Vertical integration combines the subjects that are typically taught in the various stages of the curriculum (Basu et al., 2015).

Specifically, horizontal integration is “an innovative discipline-specific teaching-learning strategy for facilitating interactive learning and achievement of quality student learning outcomes” (Daniel & Joseph, 2019, p. 284). The term “horizontal integration of curriculum material” refers to the blending of several academic levels and knowledge areas within the same phase of a curriculum (International Bureau of Education, n.d.). Particularly, the horizontal integration is a cutting-edge teaching-learning approach that can help students achieve their academic goals. These consist of increased participation in class, interactive learning among students, course grades, interest in the subject matter, and general satisfaction with the course's learning objectives (Daniel & Joseph, 2019).

Whereas, vertical integration is a purposeful educational strategy that supports a steady growth in student involvement in the professional world by increasing knowledge-based engagement in practice with graduated responsibilities in their area in a stepwise manner (Wijnen-Meijer et al., 2020). Vertical integration brings more relevance and excitement in learning. Vertical integration improves motivation, enhances deep learning, prepares for lifelong learning and facilitates curricular reforms (Rafique, 2014). In addition, Wijnen-Meijer et al. (2020) stress that “the aim of vertical integration is to support meaningful learning” (p. 2), and “vertical integration merges learning and practice, which does not stop at licensing or certification (p. 4).

In conclusion, Horizontal integration aids in the resolution of notions that occur in the context of multidisciplinary disciplines. Vertical integration, on the other hand, allows for the study of more complicated instances, which are especially predicated on the systematic learning and application of concepts from previous horizontally linked coursework in an integrated curriculum. The horizontal and vertical integration of a curriculum offers pupils with a learning environment that is aligned with adult learning principles and is expressly stated. (Hassan, 2013).

3. Methods

3.1. Research design

This study employed a quantitative research method that involved the administration of a survey questionnaire to primary school teacher candidates studying at different higher education institutions running teacher training programs in Vietnam.

3.2. Participants

The survey participants were 354 students from five universities across main regions of Vietnam including: Thai Nguyen University, Vinh University, Hong Duc University, Dong Thap University and Sai Gon University. These higher education institutions are considered to be good at teacher training and represent the three major regions of Vietnam: the North, the Central and the South. We distributed questionnaires directly to students via their email address and printed forms. The data collection process was random and 354 responses out of 400 surveys distributed, with the response rate of 88.5%.

3.3. Data collection tools

The questionnaire was designed to measure teacher students' viewpoints on integrated teaching in Mathematics at primary schools. The first section focuses on the role of skills in designing and using integrated teaching. The second section was developed to understand the status of applying skills in designing and using integrated teaching. The third section asks pre-service teachers about the necessity of learning integrated teaching. The last section asks participants about the frequency of being trained or guided skills in integrated teaching.

3.4. Data analysis

The research data were analyzed with IBM SPSS version 24. Specifically, the calculations of means and percentage were the focus.

4. Results

4.1. Pre-service teachers' viewpoints on the role of activity design and implementation skills in integrated teaching

The first question asked the primary school pre-service teachers to evaluate the role of skills in designing and using activities in Mathematics integrated teaching with four options: Not important, Slightly important, Important and Very important. The table below highlights their answers (Table 1):

Table 1. The role of skills in designing and using activities in Mathematics integrated teaching

Options	Answers	
	Number	Percentage
Very important	108	31%
Important	211	60%
Slightly important	35	9%
Not important	0	0%
Total	354	100%

It can be seen that the majority of pre-service teachers believe that the skills of designing and using integrated teaching situations in Mathematics in primary schools is important for students in primary education (91%). This will positively affect the practice of designing skills and using integrated teaching situations in Mathematics in primary schools. Besides, there are still some students who think that the skills of designing and using integrated teaching situations in Mathematics in primary schools is "slightly important" (9%). This reflects the slow participation of some students with the current trend of educational innovation, when the integrated teaching is a requirement to be implemented in teaching subjects in primary schools.

4.2. Current status of using skills in designing and implementing integrated teaching activities

To survey the participants about the status of skills in designing and using integrated teaching activities in Mathematics in primary schools, questions with 5-point Likert scale (1 = Weak, 2 = Average, 3 = Fair, 4 = Good, 5 = Excellent) were conducted. The results are presented in Table 2.

Table 2. Current status of skills in designing and using activities in Mathematics integrated teaching

No.	Skills in designing integrated teaching activities	Mean score	Rating
1	Skills in determining lesson objectives	2.03	Average
2	Skills in exploits integration capabilities according to the lesson content	1.73	Weak
3	Skills in selecting integration capabilities and constructing a situation compatible with the selected possibility	1.47	Weak
4	Skills of testing situations in teaching practice	1.94	Average
5	Skills in organizing integrated teaching through the situations	2.15	Average

The survey results show that all skills in designing and using integrated teaching situations in Mathematics in primary schools are only assessed at the level of "Average" or below. Specifically, the two skills that were assessed the weakest were the skills in selecting integration capabilities and constructing a situation compatible with the selected possibility (mean = 1.47), and the skills in exploiting integrated abilities according to the content of specific lessons in primary Mathematics (mean = 1.73). This result shows that students have not recognized the characteristics of integrated teaching situations in Mathematics in primary level; they do not know the manipulations to exploit the integrated capabilities and build integrated teaching situations in primary education Mathematics. Other skills were ranked at the level of "Average" but they had mean scores close to the level of "Weak" including Skills of testing situations in teaching practice (mean = 1.94), skills in determining lesson objectives (mean = 2.03), and Skills in organizing integrated teaching through the situations (mean = 2.15).

It can be seen that skills in designing and using integrated teaching situations are important to help students effectively organize integrated teaching situations in primary school Mathematics. However, these skills are currently weak and have not met the requirements of the integrated teaching situation. Many students do not know the processes to design and use integrated teaching situations in Mathematics in primary schools. There are students who have not yet recognized the characteristics, structure and types of integrated teaching situations in Mathematics in primary school. Therefore, in order to train this skill for students, teachers need to be fully equipped with theoretical basis, organizational practice and practical manipulations of designing and using integrated teaching situations in primary school Mathematics.

4.3. Pre-service teachers' viewpoints on the necessity of skill training in designing and using integrated teaching activities

The next question asked the participants to evaluate the necessity of skill training in designing and using activities in Mathematics integrated teaching with four options: Not necessary, Slightly necessary, Necessary and Very necessary. Table 3 presents their answers.

The results in Table 3 show that the majority of students have the right perception of the necessity of training in designing skills and using integrated teaching situations in Mathematics in primary schools (94%). However, a small number of students believe that training in designing skills and using integrated teaching situations in Mathematics in primary schools does not really help them improve their skills (6%).

Table 3. The necessity of skill training in designing and using activities in Mathematics integrated teaching

No.	Level of necessity	Number	Percentage
1	Very necessary	289	81%
2	Necessary	45	13%
3	Slightly necessary	18	5%
4	Not necessary	2	1%
Total		354	100%

4.4. Current status of skill training in designing and using integrated teaching activities

To evaluate the participants about the status of skill training in designing and using integrated teaching activities in Mathematics in primary schools, questions with 5-point Likert scale (1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Usually, 5 = Always) were conducted. The results are highlighted in Table 4.

Table 4. Current status of skill training in designing and using activities in Mathematics integrated teaching

No.	Activities	Answers					Mean
		Never (1)	Rarely (2)	Sometimes (3)	Usually (4)	Always (5)	
1	Students were trained on integrated teaching in Mathematics in primary schools	10	42	302	0	0	2.82
2	Students were guided to design integrated teaching situations in primary education Mathematics	55	146	153	0	0	2.28
3	Students were guided to use integrated teaching situations in primary education Mathematics	85	107	162	0	0	2.22
4	Students had chance to observe the sample of the activities of designing integrated teaching situations in primary education Mathematics	4	149	201	0	0	2.56
5	Students had chance to observe the sample of the activities of using integrated teaching situations in primary education Mathematics	44	112	302	0	0	2.44
6	Students did self-study and practice skills in designing and using integrated teaching	74	112	198	0	0	2.60

situations in primary education
Mathematics

The results in Table 4 show that the performance of training activities is mostly only at the "Rarely" level. In which, the activity "being trained on integrated teaching in Mathematics in primary schools" had the highest average score of 2.82. This shows that pedagogical institutions have been attentive to the issue of fostering integrated teaching theory for students. Nevertheless, the two activities "guiding to use integrated teaching situations in primary education Mathematics " and " observing the sample of the activities of using integrated teaching situations in primary education Mathematics" had the lowest level of implementation (mean scores of 2.22 and 2.44, respectively). It shows that most students are still not fully equipped with a theoretical basis for designing and using integrated teaching situations in Mathematics at primary schools. This is a great difficulty for students in meeting the requirements of integrated teaching. Even though they are equipped with a theoretical basis for integrated teaching, students still cannot design and use integrated teaching situations in Mathematics in primary schools if they have not been guided in the process and how to perform the tasks. In addition, the actual study of the design and use of integrated teaching situations in Mathematics in primary schools is rarely done, causing students to lack both theory and practice. Furthermore, the "self-study and practice skills in designing and using integrated teaching situations in primary education Mathematics" activity has not been paid attention to by students (with average score of 2.60). Specifically, up to 74 out of 354 students (accounting for 20%) said they had never done this activity before.

5. Discussion

Integrated teaching has now received the attention of many primary teachers and lecturers at pedagogical universities. Therefore, training and retraining teachers to meet the requirements of integrated teaching is an urgent issue. In particular, the practice of designing skills and using integrated teaching situations in Mathematics at primary schools for pre-service teachers is an important link in that process. The current study finds that Vietnamese primary school teacher candidates agreed on the important role of skills in designing and implementing integrated teaching activities in Mathematics in primary schools. This finding is consistent with that of T. D. Do and Tran (2019) who argue the decisive issue is still that teachers must be proficient in designing lessons as well as organizing teaching activities to meet the requirements of integrated teaching, towards the goal of developing learners' competencies. Additionally, students who get integrated teaching can better integrate their knowledge to solve problems, understand how Mathematics problems relate to real-world issues, and expand their capacity for thought, particularly creative thought (N. G. Nguyen, 2019; T. T. H. Nguyen et al., 2022).

In fact, the skill training in designing and using integrated teaching situations in Mathematics in primary schools conducted by pedagogical institutions is mainly in the form of integration through courses in the training curriculum and has gained some significant results. Some theoretical and practical content provided to students to conduct integrated teaching in Mathematics in primary schools have been implemented. However, the effectiveness of the training is still not high. The current research results show that pre-service teachers thought that their skills in designing and using integrated teaching activities in primary education Mathematics were weak, particularly the skills in selecting integration capabilities and constructing a situation compatible with the selected possibility. These findings are in agreement with those obtained by Le and Nguyen (2019) that integration in teaching is a contemporary teaching method fashion, but it is hardly frequently used in Vietnamese schools currently. Primary school teachers must update and cultivate new knowledge and abilities in

order to satisfy the needs of Vietnam's general education reform. Theory on the design and use of integrated teaching situations in Mathematics in primary schools that are equipped for students is still fragmented and lacks systematicity. There is still no sufficient theoretical content or topic on the design and use of integrated teaching situations in Mathematics in primary school to teach students.

In addition, the amount of time and content for activities to practice the design and use of integrated teaching situations in Mathematics in primary schools is still small, which is not enough to form the skills in designing and applying integrated teaching situations in Mathematics at primary schools. The current research shows that pre-service teachers have not often been trained or guided to design integrated teaching situations in primary education Mathematics. Furthermore, they sometimes or even rarely did self-study and practice skills in designing and using integrated teaching situations in primary education Mathematics. This finding echoes Vashe's et al. (2019) study that the students who were not exposed to integrated teaching did not show a significant increase in the deep approach. Moreover, in order to effectively use knowledge that must be examined concurrently, students must allocate and control their cognitive resources appropriately throughout learning (Harr et al., 2015). Nevertheless, the coordination between the pedagogical universities and primary schools in organizing the training and assessment of skills in designing and using integrated teaching situations in primary Mathematics for students has not yet been given proper attention. Therefore, pre-service teachers are still confused and in applying the knowledge they have learned to teaching practice.

6. Conclusion

From the perspective of active teaching, learning is the process by which students interact with the environment to adapt when encountering obstacles and difficulties. To create a learning environment, teachers need teaching situations. Accordingly, in order to organize integrated teaching in Mathematics in primary schools, teachers need to design integrated teaching situations and use those situations to organize teaching. Obviously, the skills of designing and using integrated teaching situations in Mathematics in primary school is one of the most important skills to ensure teachers can effectively implement integrated teaching in Mathematics in primary schools. The skills of designing and using integrated teaching situations in Mathematics in primary schools is an activity that is voluntarily performed based on the knowledge, experience and internal psychological conditions of the teacher in order to explore and adjust , create compatible situations based on exploiting integrated capabilities according to the content in teaching Mathematics in primary schools and use the acquired situations to teach Mathematics in primary schools in an integration approach.

In terms of structure, the skills to design and use integrated teaching situations in Mathematics in primary school are a combination of many component skills, each of which corresponds to each activity in the design and implementation process. Consequently, in order to provide the skills of designing and using integrated teaching situations in Mathematics in primary schools for students, it is necessary to identify the combination of component skills and organize the training of those component skills. Most of the time for pre-service teachers to study and practice takes place at the pedagogical university, so the practical experience in primary schools is still limited. Therefore, the design activities of students are mainly based on theoretical analysis without much analysis in practice. Activities using situations to organize integrated teaching are mainly performed on hypothetical subjects, but rarely on primary school children. Obviously, pre-service teachers should be trained to be able to comprehend the integrated teaching concepts, processes and implement them in real teaching situations.

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