Experiential Learning in Mathematics and the Need for Further Mathematics Teacher Education in Viet Nam

Nguyen Huu Chau*

Hanoi National University

DOI: https://dx.doi.org/10.47772/IJRISS.2026.1026EDU0031

Received: 25 December 2025; Accepted: 01 January 2026; Published: 15 January 2026

INTRODUCTION

Along with active learning methods, experiential learning plays a crucial role in forming and developing key qualities, general competencies, and core mathematical competencies in students. Through experiences students gradually develop independent thinking, the ability to proactively identify problems, and propose approaches and solutions not only in mathematics but also in real-life situations. Learning through experiences allows students to access knowledge through the "learning by doing" approach, linking theory and practice. This process not only helps students acquire knowledge and accumulate new experiences but also helps them understand the knowledge formation process, thereby enhancing their ability to apply and develop sustainable learning competencies. Experiential learning is a topic of great interest to educators, especially when Vietnam is implementing the new curriculum for general education. However, when implementing experiential learning in the mathematics curriculum, students and even teachers still face many difficulties.

This article presents a practical study on the understanding and organization of experiential teaching and learning in mathematics in some secondary schools in Vietnam, thereby suggesting some necessary issues for the futher training of mathematics teachers.

Keywords: Experiential learning; learning by doing; learning competencies; Training for mathematics teachers.

LITERATURE REVIEW

Mathematics has played a pivotal role in shaping scientific thinking and developing human intelligence. Not only does it help people cultivate logical and precise thinking, it is also a powerful tool for exploring, explaining, and controlling the world around us. In the digital age the role of mathematics becomes even more prominent as it forms the foundation for fields such as artificial intelligence, data analysis, automation, and space technology. Mathematics is present in every aspect of life – from managing personal finances to operating global-scale system. Therefore, many countries around the world have continuously innovated the way Mathematics is taught and learned, particularly focusing on connecting mathematics with real-world applications through experiential activities, project-based learning, discovery learning, and interdisciplinary integration.

The idea of humans learning through experience has been around for a very long time. In ancient times, around 350 BC, the Greek philosopher Aristotle (384–322 BC) [19] presented his view in Nichomachean ethics: “With things we must learn before we actually do them, we learn by doing them” – showing the close relationship between learning and experience.

Based on that ideology, modern experiential learning theory has been formed and developed over centuries, with important contributions from educators and psychologists such as (1938), Piaget (1950), Kurt Hahn (1957), Paulo Freire (1970), Vygotsky (1978), Kolb (1984), Javis (1987), among whom David Kolb is considered the father of the term " experiential learning" emphasizing that experience plays a central role in the learning process.

In 1916, John Dewey (1859 – 1952) [16] argued that human knowledge and education originate from inquiry, which creates experience. “I have implicitly accepted the solid basis of the principle that for education to achieve

its purpose both for the learner as an individual and for society, it must proceed from experience – that is, always the experience of the real life of some individual."

In 1960, J. Piaget (1896–1980) [15] clarified the origin and nature of human knowledge and intelligence. According to him, the development of thinking in an adult is the result of a continuous process between experience and concepts, between action and reflection. Through studying how humans interact with the environment and build knowledge from experience, Piaget laid the foundation for many modern theories on cognitive development in adults.

Bruner (1915-2016) [34], an American psychologist, had many valuable works on cognitive psychology and cognitive learning theory. In his work "Studies in cognitive growth, 1966," he argued that "knowledge is actively constructed by learners rather than passively received from the external environment" and "learning is an adaptive process based on human experience of the world and this system of experience is constantly supplemented and developed."

Lev Vygotsky (1896–1934) [22], a Russian psychologist, introduced the concept of the "Zone of Proximal Development" – a major contribution to modern education. According to him, the learning capacity of learners can be envisioned in three zones: (1) the developed zone, which includes tasks (including experiential learning tasks) that learners can perform independently without support from teachers or classmates; (2) the zone beyond current capacity, which includes tasks that learners cannot perform, even with help; and (3) the zone of proximal development, which lies between the two zones above, where learners can complete tasks with their own efforts and appropriate support from teachers or classmates to achieve learning goals [22].

The zone of proximal development can be seen as the learner's potential : with proper guidance and timely support, learners will gradually acquire knowledge and transition from dependence on assistance to independent self-reliance. The key technique for creating this transition is often referred to as "scaffolding." Scaffolding is not simply about providing assistance, but rather a purposeful support system that is flexibly adjusted to the level and needs of each student.

JA Comenxki (1592 – 1670) [25] was the earliest to put forward the theory and organize in practice a new form of teaching "class-lesson system", with the "view that teaching must ensure a relationship with life, education through games, activities outside the class, outside nature".

Suning Zhu, Yun Wu and Chetan S. Sankar (2016) [45] argue that incorporating experiential activities into secondary school mathematics teaching can improve students' learning outcomes and contribute to building a positive classroom atmosphere. In addition, when mathematics is integrated with fields such as science, engineering and art, learners will have more opportunities to access rich situations, thereby enriching their experiences and broadening their perspectives on knowledge. However, the authors also note that these activities need to be designed and implemented carefully and professionally to both support students' effective learning and ensure that the educational goals are met [45].

From this, it can be seen that the concept of "learning through experience" and organizing teaching and learning in connection with real-world environments has been mentioned and applied by many scholars quite early on, although initially in simple forms. These fundamental ideas gradually formed the basis for subsequent research in many fields, thereby contributing to the foundation for David Kolb to discover, systematize, and refine the theory of experiential learning.

In Vietnam, the idea of "learning by doing" emerged very early, reflected in viewpoints such as "learning goes hand in hand with practice" and "learning while working." These viewpoints emphasize the role of experience in education, especially in connecting knowledge with real-life situations.

The group of authors led by Tuong Duy Hai (2017) [14] compiled the book series "Creative Experiential Activities in Subjects" for students from grade 6 to grade 9 of lower secondary school. This book series is considered an effective tool, meeting the needs of applying and organizing experiential activities in a practical way in teaching practice. The book series mainly aims to support teachers in designing and implementing

experiential activities according to themes, ensuring close adherence to the curriculum of subjects. The content is presented in a fairly coherent and easy-to-follow structure, including : objectives, required achievements, activity content, forms and methods of organization, and also includes criteria for evaluating students' learning products. Not stopping at suggesting ideas, the book series also proposes a systematic organizational process, thereby contributing to promoting the effective application of experiential teaching in general schools.

Dao Thi Ngoc Minh and Nguyen Thi Hang (2018) [23] in the study "Experiential Learning - Theory and application in designing and organizing experiential teaching in subjects at secondary schools", the authors proposed steps to design experiential teaching based on D. Kolb's experiential process in subjects at secondary schools. Accordingly, the authors affirmed that designing experiential learning content includes the ability to learn from consequences, successes and failures, relationships and interactions are developed and nurtured, such as : students with students ; students with teachers; students with the surrounding world. Teachers and students will have the ability to experience successes, failures, explore and accept risks. The opportunities created will help students and instructors explore and test their own values. The fundamental role of teachers is to design appropriate learning experiences, raise and explore issues, establish necessary boundaries, support students in the process, and ensure their emotional and physical safety while creating favorable conditions to promote learning. Teachers need to recognize and promote natural opportunities that arise in the learning process; strive to be aware of biases, evaluate biases; and be conscious of biases. Despite differing opinions and some limitations, D. Kolb's experiential learning theory is still highly regarded. From a scientific perspective, it has shifted educational thinking from a teacher-centered to a learner-centered approach. With these positive contributions, experiential learning theory is still valued worldwide, continuing to be researched and applied not only in education from preschool to university, especially in teacher training, but also in many other fields. Simultaneously, it continues to be researched and developed by scientists. The application of experiential learning theory in the subject can be flexible but must ensure all steps are followed ; teachers will participate as guides, promoting the learning process ; students need to experience it themselves ; and from there, they can draw new experiences for themselves.

Nguyen Thi Lien (2016) [20] focused on researching measures to organize creative experiential learning in general schools to meet the innovation orientations of the 2018 General Education Program. This work clarifies the theoretical basis of experiential learning, especially applying D. Kolb's experiential learning cycle, and at the same time proposes some measures to organize students' learning in the direction of experiential learning in the form of extracurricular educational activities.

The significance of experiential learning

Experiential learning, based on John Dewey's (2012) "learning by doing" philosophy [16], is not simply a teaching method but a profound educational philosophy. The emergence and development of this learning method brings important meanings in many aspects, from developing individual capabilities to meeting the requirements of social innovation.

Experiential learning is of great importance in the comprehensive development of learners' abilities and qualities. Unlike the traditional approach which is heavily focused on transmitting theoretical knowledge, experiential learning creates opportunities for learners to develop knowledge, skills, and attitudes simultaneously. Through Kolb's (1984) four-step cycle [38]: from concrete experience, reflective observation, abstract generalization to active experimentation, learners not only grasp concepts but also develop critical thinking skills, problem-solving skills, and collaboration skills. Especially in the context of globalization, these abilities become essential tools, helping learners adapt and succeed in a constantly changing world.

Experiential learning creates a strong connection between theory and practice, making learning meaningful. Experiential learning emphasizes and develops the individual capabilities of each learner. Experiential learning acknowledges that each individual has a different learning style [39]. Through diverse activities, experiential learning provides opportunities for each learner to express and develop their individual strengths, whether it be keen observation skills, sharp logical thinking, or skillful practical skills.

This suitability is even more important in the context of implementing individualized education and differentiated teaching according to the new curriculum for general education in Vietnam. When participating in rich experiential activities, each student can choose and express their abilities through forms that suit their strengths and personal interests. This not only helps to discover and nurture special talents but also creates conditions for all students, including those with limited abilities in one area but strengths in another, to have the opportunity to develop according to their abilities. Thus, experiential learning becomes an effective means to realize the principle of "differentiated teaching" - one of the key orientations of current educational reform [10].

Experiential learning models in mathematics

According to Dewey's model [17] of the learning process, complex intellectual activities took place in the processes of this model, including :

1) Observation

2) Knowledge formation

3) Reflect on and clarify what has been observed and the knowledge gained.

4) Promote the learning process.

Piaget's learning model shows that experience plays a key role in the cognitive development of learners at this stage : new knowledge is formed on the basis of inheriting previous experiences, and is also the result of the process of combining and reorganizing existing cognitive structures. According to the model, cognitive development takes place in four consecutive steps : starting from concrete phenomena, then the process of reflection, then moving to abstract thinking and ending with active action.

Based on the above classical experiential learning theories, in 1984, David Kolb [38] proposed the theory of experiential learning, which was refined and supplemented in the following years.

Phase 1. Specific Experience

Phase 2. Reflection through observation

Phase 3. Generalization

Phase 4. Active Practice

A practical study in Vietnam

The authors of this paper conducted a practical study on experiential learning in mathematics in some secondary schools in Vietnam.

Survey objectives

Investigating the current state of organizing experiential learning in Mathematics for 9th-grade students.

Survey content

- Teachers' perceptions of experiential learning

- The organizational forms that teachers use

- The teaching methods used by teachers when teaching experiential learning.

- Students' responsiveness and cooperative attitude during experiential learning.

Sampling

- Survey area : 3 middle schools in Northern Vietnam

- Survey subjects : 32 math teachers and 450 9th-grade students from 3 junior high schools in the North of Viet Nam.

- Research methods :

+ Research methods include questionnaires, conversations, and interviews with teachers and students.

+ The observation method involved attending math lessons at 3 junior high schools

+ Analyzing student worksheets and tests.

Research results

Research findings on teachers

Regarding role of experiential learning

The research results show that the majority of teachers (72%) consider experiential learning in Mathematics at the junior high school level to be very important and crucial. This percentage reflects the practical need and urgency of incorporating experiential learning into Mathematics teaching in junior high schools today, in order to improve learning quality and develop students' competencies.

Through discussions with teachers, the majority shared the same view : "Experiential learning in mathematics not only increases the attractiveness of the subject but also sparks interest, strengthens confidence in learning, and fosters a love for mathematics through practical activities and direct contact with real objects, helping students appreciate the value and significance of mathematical knowledge in life."

The teaches agreed that experiential learning in mathematics encourages students to actively explore and experiment directly with new knowledge, thereby forming their own concepts, conducting analyses, and drawing their own conclusions. In this process, the teacher's role is primarily to guide and support the students.

Teachers believe that experiential learning helps students improve their ability to organize, mobilize, and apply knowledge flexibly; helps them monitor and measure their daily progress, self-assess, and assess their peers during the learning process; and creates opportunities for them to apply integrated knowledge from multiple subjects to practical contexts of experiential activities.

Regarding the space and location for experiential learning. :

Answer the question **"**Where do teachers usually conduct experiential learning in mathematics for students ?" most teachers said that for experiential learning, openness in the space for organizing teaching and learning activities is one of the points that teachers need to pay attention to. To create the most optimal learning environment for students and to positively enhance the quality of lessons, diversifying the locations for organizing teaching and learning activities is essential. Open spaces often provide students with experiences very different from simply sitting in a classroom. After investigating the current situation, the author obtained the following results :

Table1 : Space and location for experiential learning

No.	Location	Quantity	Ratio %
1	In the classroom	14	44%

2	Outside the classroom, inside the school	7	22%
3	Outside of school	11	34%

From the table above, it can be seen that teachers very frequently organize experiential activities in the classroom. Occasionally, students get to participate in activities on school grounds and outside the school.

Regarding experiential learning methods and the extent to which teachers utilize experiential learning methods for students in mathematics education.

The experiential learning method through practical situations is most frequently used by teachers because it fits the traditional lesson structure, requiring only 5-7 minutes for the introduction or practical activity, without the need for movement, special equipment, and ensuring safety. This allows teachers to easily complete the content as planned. The practical situation immediately answers the students' question, "Why are we learning ? " When students see that the knowledge helps them solve real-world problems, they shift from a passive listening attitude to actively participating in problem-solving. Problem-solving brings a sense of accomplishment, sparks interest, and promotes positive cooperation among group members.

Experiential learning through practical activities is also a method frequently implemented by teachers. These practical activities provide students with opportunities to develop many essential skills such as using tools and equipment, measuring, observing, and recording data. This gives students more opportunities to apply their learned knowledge to real-life situations. At the same time, practical sessions contribute to increased interest in learning mathematics, inspire a spirit of exploration and discovery, and initially foster a serious attitude towards learning and research.

Survey results on students

Regarding students' perceptions of the necessity of experiential learning in mathematics, the number of responses to the questions is as follows :

Table 2 : Students' perceptions of the necessity of experiential learning in mathematics

No.	Level	Quantity	Ratio %
1	Unnecessary	45	10
2	Normal	140	31
3	Necessary	188	42
4	Essential	77	17

The survey results show the following levels of necessity for experiential learning in Mathematics : 188 students (42%) rated it as necessary, 77 students (17%) rated it as very necessary, 140 students (31%) rated it as neutral, and the remainder rated it as unnecessary. This indicates that the majority of students feel a desire to participate in experiential learning in Mathematics.

Regarding the question " Do you enjoy experiential learning in Mathematics ?"

The research results show that students' level of interest in experiential learning in Mathematics is as follows : 56% of students liked it, 37% still had a neutral interest, and the rest disliked it. This reflects that the majority of students have positively embraced experiential learning in Mathematics, but some still do not truly enjoy it.

Regarding the appeal of experiential learning in mathematics.

Regarding the enjoyment of experiential learning in Mathematics, 55% of students rated it as enjoyable, while 38% rated it as average. This indicates that most students find experiential learning in Mathematics enjoyable.

Regarding the difficulties students often encounter when learning through experience in Mathematics.

The survey results show that 46% of students struggle with problem-solving skills in mathematics. When faced with new types of problems or unfamiliar situations, they often feel confused, not knowing where to start, leading to the mechanical application of formulas or giving up early. 47% of students have difficulty with group work, mainly due to a lack of cooperation among members and the group leader's inability to properly assign tasks according to each person's abilities. This makes group work chaotic, inefficient, and easily leads to disunity within the group. The remaining 7% of students reported a lack of necessary learning equipment, making it difficult to carry out experiential learning activities. These shortcomings not only affect learning outcomes but also reduce students' interest and confidence in the experiential learning process, leading to discouragement and a reluctance to participate deeply in the activities.

CONCLUSION

Research results from teaching and learning practice show that teachers and students have formed a relatively complete understanding of the role and significance of experiential learning in mathematics at the junior high school level. Both teachers and students express interest in teaching and learning using this approach. Students feel enthusiastic about learning while doing, and teachers clearly see the increased interaction and proactiveness of learners. However, when placed in the context of actual teaching, the gap between awareness and action remains large : Many teachers have not fully grasped the characteristics of experiential learning, do not know how to select and design appropriate situations, and have not fully utilized the strengths of this method. As a result, the application of experiential learning in mathematics lessons is still reactive, lacks continuity, and has not achieved the high effectiveness expected. Students also face many difficulties in experiential learning in mathematics. The main reason is that students lack the skills or practice of experiential learning and group activity skills, making experiential learning not truly effective.

From the results of this study, it can be seen that building a system of principles and procedures for experiential learning in mathematics for junior high school students is a necessary and urgent task. These principles and procedures not only help teachers effectively organize and coordinate learning activities but also create conditions for students to participate actively, gradually overcome difficulties, and enhance their self-confidence in learning. Through this, the quality of mathematics learning is improved, meeting the current direction of educational reform, aiming for the comprehensive development of students' abilities and qualities instead of just focusing on knowledge transmission.

These are also essential topics that need to be covered in professional development programs for mathematics teachers

REFERENCES

1. Nguyen Thi Tan An, Tran Dung (2009), Using mathematical modeling in teaching Mathematics, Journal of Education, No. 219, Hanoi.
2. Nguyen Thi Tan An (2013), Building teaching situations to support the mathematization process, Journal of Science of Ho Chi Minh City University of Education, ISSN 1859-3100, 48 (82), Ho Chi Minh City.
3. Resolution No. 29 – NQ/TW, dated November 4, 2013, on fundamental and comprehensive reform of education and training to meet the requirements of industrialization and modernization in the context of a socialist-oriented market economy and international integration.
4. Bernd Meier, Nguyen Van Cuong (2021), Modern Teaching Theory , Hanoi Pedagogical University Publishing House, Hanoi
5. Ministry of Education and Training (2014), Proceedings of the Workshop on Creative Experiential Activities of High School Students , Vietnam Education Publishing House , Hanoi.

6. Ministry of Education and Training (2018), General general education program , Circular No. 32/2018/TT-BGĐT dated December 26, 2018 of the Minister of Education and Training, Hanoi.
7. Ministry of Education and Training (2018), General education program for Mathematics , Circular No. 32/2018/TT-BGĐT dated December 26, 2018 of the Minister of Education and Training, Hanoi
8. Ministry of Education and Training (2018), 2018 General Education Program for Experiential Activities and Career Guidance , No. 32/2018/TT-BGDĐT, Hanoi.
9. Ministry of Education and Training (2020), Implementation of STEM education in secondary education , Official Letter 3089/BGDĐT-GDTrH, Hanoi
10. Dinh Quang Bao (2017), Integrated teaching - differentiated teaching in the overall curriculum , Proceedings of the Ministry of Education and Training Workshop, Education Publishing House , Hanoi.
11. Trinh Van Bieu, Phan Dong Chau Thuy, Trinh Le Hong Phuong (2010), Project-based learning - From theory to practice , Journal of Educational Science, No. 10, Ho Chi Minh City University of Education.
12. Nguyen Van Cuong (1997), Project-based learning or project-based teaching , Scientific Bulletin of Hanoi University of Education, Vietnam National University, Hanoi.
13. Cao Cu Giac, Phan Thi Thanh Hoi and Tran Thi Gai (2017) , Organizing the experiential learning activities in teaching science for general education in Vietnam , World Journal of Chemical Education, 5(5), 180–184.
14. Tuong Duy Hai and colleagues (2017), Creative experiential activities in subjects , Vietnam Education Publishing House, Hanoi.
15. Jean Piaget (1997), Psychology of Intelligence, Education Publishing House, Hanoi.
16. John Dewey (Pham Anh Tuan, 2012), Democracy and Education , Tri Thuc Publishing House, Hanoi.
17. John Dewey (Pham Anh Tuan, 2012), Experience and Education , Youth Publishing House, Ho Chi Minh City.
18. Nguyen Ba Kim (2004). Methods of teaching Mathematics . Hanoi University of Education Publishing House.
19. Kruteski V. A (1980), The Foundations of SP Psychology, Education Publishing House, (Pham Van Hoan, Le Hai Chau, Hoang Chung translated)
20. Nguyen Thi Lien and colleagues (2016), Organizing creative extracurricular activities in general schools , Vietnam Education Publishing House, Hanoi.
21. Lev S. Vygotsky (1978), The Social Origin of Intelligence: The Development of Higher Psychological Processes , Writers' Association Publishing House, Hanoi.
22. Lev S. Vygotsky (1997), Collection of Psychology , National University Publishing House , Hanoi.
23. Dao Thi Ngoc Minh, Nguyen Thi Hang (2018), Experiential learning - theory and application in designing and organizing experiential activities in subjects at secondary schools , Journal of Education, No. 43, pp. 36-40.
24. Phan Trong Ngo (2005), Teaching and teaching methods in schools , Pedagogical University Publishing House.
25. Lai Bich Ngoc, Pham Khac Chuong (1991), J.A. Comenius - an outstanding educator Education Publishing House, Hanoi.
26. Nguyen Quang Nhu (2018), Training primary school teachers on organizing students to learn Mathematics through experiential activities , Doctoral dissertation, Hanoi Pedagogical University 2.
27. Hoang Phe (2002), Vietnamese Dictionary, Institute of Linguistics, Da Nang Publishing House.
28. Dinh Thi Kim Thoa (2015), Summary report of research task: Objectives, outcome standards, content, methods, forms of educational organization, assessment of student learning outcomes through creative experiential activities in the new general education program, Hanoi.
29. Nguyen Huu Tuyen (2020), Organizing experiential activities in teaching Mathematics in junior high school , Doctoral dissertation in Educational Science, Thai Nguyen University of Education - Thai Nguyen University.
30. Vietnamese Encyclopedia (2005), Vietnamese Encyclopedia Volume 4, Encyclopedia Publishing House, Hanoi.
31. Alan H. Schoenfeld (1992). Learning to think mathematically: Problem solving, metacognition, and sense-making in mathematics . In DA Grouws (Ed.), Handbook of research on mathematics teaching and learning (pp. 334–370). Macmillan. method (2nd ed.). Princeton University Press.

32. Angela Passarelli and Garima Sharma (2014), On Becoming an Experiential Educator: The Educator Role Profile, Case Western Reserve University.
33. Beard, C., & Wilson, J. P. (2006). Experiential learning: A best practice handbook for trainers and educators (2nd ed.). Kogan Page. London.
34. Bruner. Jerome S (1966), Toward a Theory of Instruction, WW Norton, New York.
35. Douglas H. Clements & Michael T. Battista (1992). Geometry and spatial reasoning. In DA Grouws (Ed.), Handbook of research on mathematics teaching and learning (pp. 420 – 464). Macmillan.
36. Gardner, Howard (1999), "Intelligence Reframed "Multiple intelligences for the 21st century", Basic books, 187.
37. Garrison, C., & Ehringhaus, M. (2013). Formative and summative assessments in the classroom. Association for Middle Level Education. https://www.amle.org/wp-content/uploads/2020/05/Formative_Assessment_Article_Aug2013.pdf
38. David A Kolb (1984), Experiential Learning: Experience as the Source of Learning and Development. Prentice – Hall, Inc., Englewood Cliffs, New Jersey.
39. Kolb, AY and Kolb, DA (2013), The Kolb Learning Style Inventory 4.0: A Comprehensive Guide to the Theory, Psychometrics, Research on Validity and Educational Applications, Hay Resources Direct, Boston MA.
40. David A. Kolb, (2011), Experiential Learning: Experience as the Source of Learning and Development, Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
41. Lewin Kurt (1946), Group experiential learning and action research, George Williams College, YMCA.