TẠP CHÍ KHOA HỌC
TRƯỜNG ĐẠI HỌC SƯ PHẠM TP HỒ CHÍ MINH

HO CHI MINH CITY UNIVERSITY OF EDUCATION
JOURNAL OF SCIENCE

Tập 17, Số 5 (2020): 766-774

Vol. 17, No. 5 (2020): 766-774

ISSN: 1859-3100

Website: *http://journal.hcmue.edu.vn*

Research Article

KOLB'S EXPERIENTIAL LEARNING MODEL: TEACHING THE SIDE-SIDE-SIDE SIMILARITY CASE OF TWO TRIANGLES

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Received: October 25, 2019; Revised: November 22, 2019; Accepted: May 25, 2020

ABSTRACT

Many Vietnamese mathematical educators express their interests in experiential learning since experiential activities have been discussed in the new Vietnamese national Mathematics curriculum, which was promulgated in 2018. Nevertheless, it seems that experiential learning plays a minimal role in the current status of teaching and learning mathematical knowledge and skills. In this paper, we want to expand the role of experiential teaching in the direction of creating new knowledge. Basing on Kolb's experiential learning model, we propose a teaching situation of the side – side – side similarity case of two triangles. This teaching situation leads to a possibility of teaching similar triangles proactively, and at the same time, raises many hypothetical questions about the development of Kolb's experimental model in teaching Mathematics.

Keywords: experiential learning; similar triangles; teaching mathematical theorems

1. Introduction

On December 26th, 2018, the Ministry of Education and Training officially announced a new Vietnamese general education curriculum, which will be effective nationally starting with the first grade from the 2020-2021 school year. Within the new curriculum, math education in Vietnam will be changed drastically: a shift from a content-based approach to a competency-based approach. In the new general education curriculum, competence is defined as "a personal characteristic which is formed and developed by the nature and the process of practice and learning, allows humans to apply skills, knowledge, and other personal characteristics like enthusiasm, belief, will power… to successfully perform an activity and achieve a goal under specific circumstances" (Ministry of Education and Training, 2018a, p.37). Accordingly, we can see that learning activities help students combine knowledge, skills and other personal attributes to develop their

Cite this article as: Tang Minh Dung, & Pham Khanh Minh (2020). Kolb's experiential learning model: Teaching the side-side-side similarity case of two triangles. *Ho Chi Minh City University of Education Journal of Science*, *17*(5), 766-774.

competence. One of the mandatory activity types specified in the curriculum is experiential activity. These experiential activities are conducted separately with 105 hours/school year and in all school subjects. In the Mathematics education curriculum, experiential activity is compulsory for students from grade 1 to grade 12, accounting for 5% of total learning hours in primary and 7% in secondary. Some activities suggested by the Ministry of Education and Training (2018b, pp.16-17) for experiential learning are: "Conducting topics and learning projects in Math, especially subjects and projects on the practical application of mathematics; organizing math games or clubs, forums, seminars, and contests on Math; publishing a newspaper (or magazine) on Math; visiting math training and research facilities, interacting with students who are capable and interested in Math...". The aim of these activities is "helping students apply the knowledge, skills, and attitudes accumulated from mathematical education and their experiences in real life creatively; developing students' capacity to organize and manage activities, to promote students' self-awareness and positive thinking; helping students initially identify their strengths to orient and choose a career; creating some basic competencies for future workers and responsible citizens" (p.17).

From the perspective of the teaching process, it can be said that experiential activities are being considered as an "extension" of the curriculum, to help students apply what they have learnt from the "official" math lessons. In this paper, we would like to consider a different, broader approach in which experiential activities play a larger role, allowing teachers to "create" new knowledge that needs to be taught. Specifically, we will use the Kolb's Experiential Learning Model that is considered as "the most scholarly influential and cited model regarding experiential learning theory" (Morris, 2019, p.1). Basing on this theoretical framework, we propose an instruction to teach a theorem about the case "side – side – side" similarity of two triangles, part of Mathematics curriculum of grade 8.

2. Theoretical framework

There are many definitions of experiential learning, but they all refer to the learning process through concrete experiences. It is the process of creating new knowledge based on practical experiences, assessments, and analysis of existing experiences and knowledge. After that, the application of that knowledge will help develops learners' skills and values. Accordingly, teachers should encourage students to experience to solve any of their problems through a reflection process to acquire knowledge and skills. Experiential learning is often thought to be the opposite of academic learning – a process of acquiring information through research problems without direct experience. In this paper, we mainly consider the Kolb's Experiential Learning Theory that attracts a number of educators in the world. Specifically, Kolb's experiential learning model will be applied to design a mathematics lesson plan.

2.1. Kolb's experiential learning theory

The Experiential Learning Theory by Kolb is based on Dewey's philosophical pragmatism, Lewin's social psychology, and Piaget's cognitive developmental genetic epistemology. These altogether "form a unique perspective on learning and development" (Kolb, 1984, pp.25-26). This theory was developed following Lewin's plan for "the creation of scientific knowledge by conceptualizing phenomena through formal, explicit, testable theory" (Kolb & Kolb, 2005, p.195) to "provide an intellectual foundation for the practice of experiential learning responding to John Dewey's call for a theory of experience to guide educational innovation" (Kolb, & Kolb, 2017, p.10).

The theory was built on six propositions:

- Learning is best conceived as a process, not in terms of outcomes;
- All learning is re-learning;
- Learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world;
- Learning is a holistic process of adaptation;
- Learning results from synergetic transactions between the person and the environment;
- Learning is the process of creating knowledge.

(Kolb, & Kolb, 2009)

Therefore, the Experiential Learning Theory is a "dynamic, holistic theory of the process of learning from experience and a multi-dimensional model of adult development" (Kolb, & Kolb, 2017, p.11).

2.2. Kolb's experiential learning model

In 1984, Kolb introduced a fully experiential learning model that was later concerned, applied, and developed by many educators. The Experiential Learning Theory defines learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (Kolb, 1984, p.41). Grasping experience is the process of perceiving information; transforming experience is how individuals interpret and act on information.

According to Kolb's model, experiential learning is a four-step process: *Concrete Experience* (CE), *Reflective Observation* (RO), *Abstract Conceptualization* (AC) and *Active Experimentation* (AE) (Figure 1).

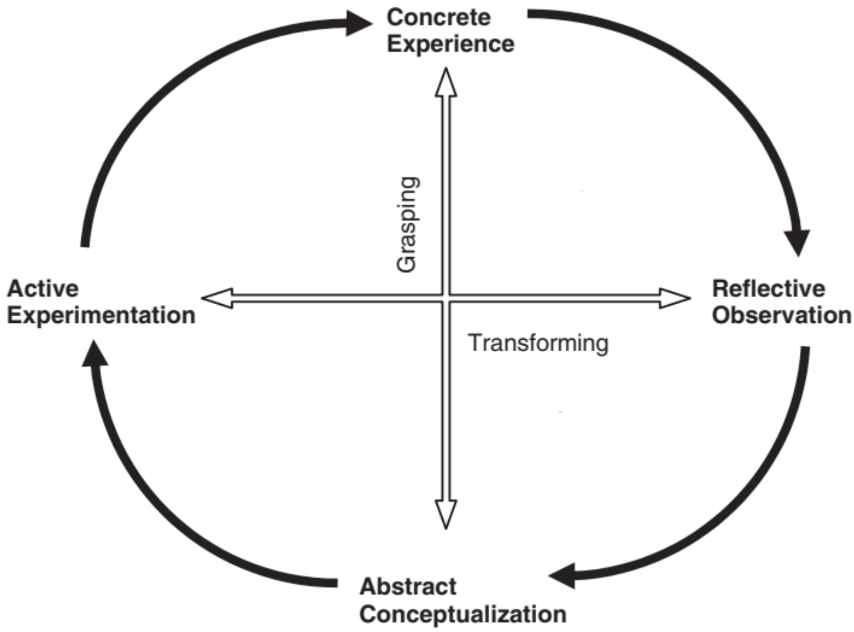

Figure 1. *Kolb's experiential learning model (1984)*

Concrete experience (CE): Students take part in some introductory tutorials on the topic they need to study, or testing in a lab with machines in groups or individually. Students encounter a new experience or participate in the process of reinterpreting an existing experience. Specific experiences created by exercises, games, role plays...

Reflective observation (RO): Students evaluate and reflect on the new experience. Individually, students review tasks, activities that both experience and think, analyze, and evaluate what has happened and what happened.

Abstract conceptualization (AC): Through the reflection process, students create a new idea/concept/theory or modify an existing abstract concept – analyze the concepts, form conclusions, and generalizations. To do this, students need to understand and know how to link events through comparison and thinking based on everything they have known and experienced with the knowledge they have learned.

Active experimentation (AE): Students try and apply new concepts and knowledge from previous stages to other situations – conclusions and generalizations are used to check hypotheses from which learners also participate in new experiences. This practice helps students to gain new insights and transform it into predictions of what to do next. Activities for this stage can be case studies, role-plays, and problem-solving.

3. Designing a mathematical lesson plan using Kolb's experiential learning model

3.1. Selecting a subject for teaching

In this paper, we are interested in the content of similar triangles of the current curriculum taught in grade 8. This content was studied by Hoang (2019), but she only mentioned the "angle-angle" condition to prove the similarity of two triangles in connection with Thales's theorem. Following up this research, we propose an instruction of the "side – side – side" case of two similar triangles based on Kolb's experiential learning model. This is the teaching situation of a theorem when students have learnt the concept of two similar triangles. This allows reducing the conditions of examining two similar triangles. Indeed, based on the definition of two similar triangles, students must check if the three angles of the two triangles are equal and if the three sides of the two triangles are proportional to each other. With this theorem, the conditions to consider were "halved": needing only three corresponding sides are proportional.

3.2. Main activities

Preparing activity: Identify two similar triangles

Students work in pairs to find similar triangles in a group of triangles provided by the teacher. Students can use two strategies: similarity in shape or measure the angles of triangles and the length of the sides.

At the end of the activity, the teacher interviews students about the concept of two similar triangles in the previous lesson: three equal pairs of angle and three proportional pairs of edge. The teacher also asks the students the ratio of similarity of the two triangles.

In this stage, each pair of similar triangles must have significant differences in the angle and the length of sides. The setting of these triangles helps students find similar triangles easily by comparing the shapes by vision.

Activity for CE: Experience the similarity of two triangles with only three corresponding proportional sides

Students still work in pairs and are provided rulers (straight ruler and protractor), pencils, and geometry compass. One student in the pair is asked to draw a triangle, then measure the length of the sides of the triangle and inform the second student about these measurements and a ratio. The second student will draw a new triangle whose length of sides is equal to the measurements provided multiplied by the ratio. The pairs will then check the similarity of the two triangles based on the definition of two similar triangles mentioned in the preparation. They can use two methods as follows:

- The similarities in shape;
- The equality of the pairs of angles and the proportionality of length of the pair of sides (definition of two similar triangles).

Activity for RO: Detect and evaluate the possibility of reducing the similarity conditions of two triangles

The entire class will discuss the possibility of lowering the requirements to have two similar triangles (activity for CE). Two questions can be raised in the discussion:

(1) “In the beginning, what did we have (about the two triangles)?”

(2) “In the end, what did we draw out (about the two triangles)?”

Questions (1) and (2) are respectively related to hypotheses and conclusions of the theorem of the side-side-side similarity case of two triangles we want to address. The expectation is that after studying many cases of similar triangles and different ratios, students conjecture (discover) that if the three corresponding sides of two triangles are proportional, the triangles are similar (Figure 2).

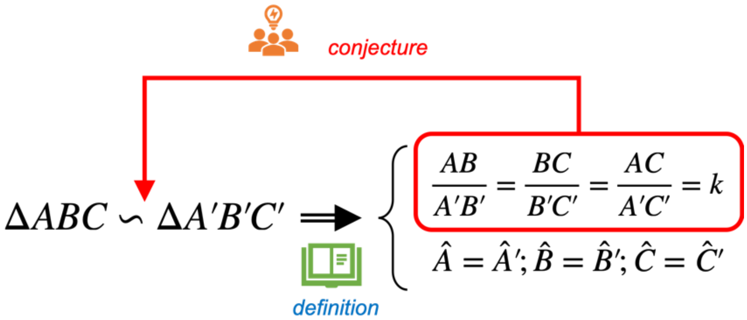

Figure 2. *Reflective Observation*

Besides the two above questions, the teacher can give a hint for students by reminding them of conditions for the two congruent triangles they learned in grade 7.

Activity for AC: Forming the theorem of “The side-side-side similarity case of two triangles."

The teacher presents a system of questions to guide students in confirming conjectures in Activity for RO through a proof (see the mathematics textbook of grade 8, pp.73-74). After the conjecture is proved, the teacher will institutionalize the theorem of “The side-side-side similarity case of two triangles”.

Activity for AE: Applying the theorem of “The side-side-side similarity case of two triangles."

Students work in groups (5-6 students in a group) to do the task: Create a new tetrahedron model with faces that are similar to the ratio k (different for each group) to the faces of a given tetrahedron model.

Students are provided with a pencil, a ruler (without dividing lines), scissors, glue, cardboard, a geometry compass, and a tetrahedron model (Figure 3).

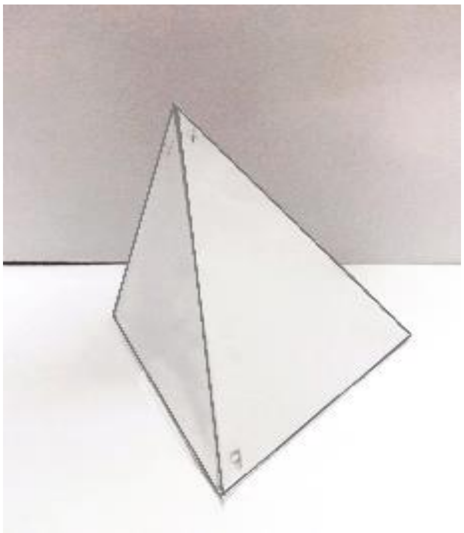

Figure 3. *Tetrahedron model that students receive in Activity for AE*

To create a new tetrahedron, students need to study and measure the sides of the provided tetrahedron model. At this time, due to the absence of a protractor, students cannot measure the angles of the triangular faces. Students are forced to use the theorem of "The side-side-side similarity case of two triangles" to calculate; then, to cut and join the triangular faces to form the new tetrahedron model.

4. Discussion

In this paper, we designed a situation to teach the theorem of “The side-side-side similarity case of two triangles.” The situation is based on the problem of reducing conditions of similarity of two triangles. Thus, this situation can be expanded to consider all three similarity cases of two triangles. On the other hand, the above problem has many similarities with the (three) cases of the two congruent triangles that the students have studied before. This allows us to think about developing a teaching situation with similar problematic ways: “At grade 7, to examine if two triangles are congruent, it is not necessary to examine if all corresponding sides and interior angles are congruent, we only consider a few conditions (three cases of the two congruent triangles: side – side – side, side – angle – side, angle – side – angle). Is it possible to do the same thing, reduce the conditions for the two similar triangles?” Moreover, teachers can suggest experiential activities to draw out a list of cases of two similarity triangles basing on Kolb’s model.

From a theoretical perspective, the application of Kolb's experiential learning model to teaching a mathematical theorem (as the teaching situation that we have proposed) is different from the application of this model to other science subjects. That is, validating a theorem cannot be based on empirical practices but must be through logical reasoning. And so, where does the proof of the theorem lie in Kolb's model? Besides, this question will not be raised in the case of teaching mathematical concepts. Thus, at least, in two teaching situations of a notion and a theorem, the application of Kolb's experiential learning model has specific characteristics to be considered.

Also during the process of developing the situation, we found many similarities between the steps in Kolb's experiential learning model and the Experimental/Theory process of teaching a mathematical theorem (see Le, 2016). The differences, as well as the interference between these two models, will need to be clarified. This will allow the additions required to develop Kolb's experiential learning model in teaching Mathematics.

❖ ***Conflict of Interest:*** *Authors have no conflict of interest to declare.*

REFERENCES

Hoang Thi, T. T. (2019). *Van dung li thuyet tinh huong didactic vao thiet ke hoat dong trai nghiem trong mon toan: Truong hop tam giac dong dang* [*Applying the Theory of Didactical Situations to designing experiential activities in Mathematics: Case of similar triangles*]. Master Thesis of Education, Sai Gon University.

Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of management learning & education*, *4*(2), 193-212.

Kolb, A. Y., & Kolb, D. A. (2009). Experiential learning theory: A dynamic, holistic approach to management learning, education and development. S. J. Armstrong, & C. Fukami, (Eds.). *The SAGE handbook of Management Learning, Education and Development*, 42-68. London: SAGE Publications Ltd.

Kolb, A. Y., & Kolb, D. A. (2017). Experiential learning theory as a guide for experiential educators in higher education. *ELTHE: A Journal for Engaged Educators*, *1*(1), 7-14.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* New Jersey: Prentice-Hall.

Le, V. T. (2016). *Phuong phap day hoc mon Toan* [*Methods of Teaching Mathematics*]. Ho Chi Minh City: Ho Chi Minh City University of Education Publishing House.

Ministry of Education and Training. (2018a). *Chuong trinh giao duc pho thong – Chuong trinh tong the* [*General Education Curriculum*]. Ha Noi: The Author.

Ministry of Education and Training. (2018b). *Chuong trinh giao duc pho thong – Chuong trinh mon Toan* [*Curriculum of Mathematics*]. Ha Noi: The Author.

Morris, T. H. (2019). Experiential learning–a systematic review and revision of Kolb’s model. *Interactive Learning Environments,* 1-14.

MÔ HÌNH HỌC TẬP TRẢI NGHIỆM KOLB: DẠY HỌC TRƯỜNG HỢP ĐỒNG DẠNG CẠNH-CẠNH-CẠNH CỦA HAI TAM GIÁC

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Ngày nhận bài: 25-10-2019; ngày nhận bài sửa: 22-11-2019; ngày duyệt đăng: 25-5-2020

TÓM TẮT

Dạy học trải nghiệm đang thu hút nhiều sự quan tâm của các nhà giáo dục toán học Việt Nam khi mà nó được đưa vào Chương trình giáo dục phổ thông môn Toán 2018. Tuy nhiên, dường như nó vẫn xuất hiện khá khiêm tốn với vai trò tạo cơ hội cho học sinh ứng dụng các kiến thức, kĩ năng toán học. Trong bài viết, chúng tôi muốn mở rộng vai trò của dạy học trải nghiệm theo hướng kiến tạo tri thức mới. Dựa trên Mô hình học tập trải nghiệm Kolb, chúng tôi đề xuất một tình huống dạy học trường hợp đồng dạng cạnh-cạnh-cạnh của hai tam giác. Tình huống này mở ra khả năng dạy học các trường hợp đồng dạng của hai tam giác theo hướng tích cực hoá người học, đồng thời nêu ra nhiều câu hỏi trên phương diện lí thuyết về sự phát triển của Mô hình học tập trải nghiệm Kolb trong dạy học Toán.

Từ khóa: học tập trải nghiệm; hai tam giác đồng dạng; dạy học định lí