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Organizing the Experiential Learning Activities in Teaching Science for General Education in Vietnam

Cao Cu Giac[1,*], Tran Thi Gai[1], Phan Thi Thanh Hoi[2]

[1]Pedagogical Institute of Natural Science, Vinh University, Vietnam
[2]Department of Biology, Ha Noi National University of Education, Vietnam
*Corresponding author: giaccc@vinhuni.edu.vn

Abstract Experiential learning is the ultimate way to match learning with the practical application, consisting of gaining knowledge and development of skills at the same time. The article analyzes the nature and role of experiential learning activities in teaching. The experiential learning model of David Kolb is the theoretical foundation for the design and organization for the experiential learning activities that contributes to the proactivity in learning activities for students through 4 stages: (i) concrete experience, (ii) reflective observation, (iii) abstract conceptualization, and (iv) active experimentation. In this article, we introduce the experiential learning activities model that supports learners to apply theoretical knowledge into practice, as well as demonstrating these activities in the case study of teaching the topic "Mineral Nutrition" in teaching "Science" in the general education curriculum of Vietnam.

Keywords: *experiential learning, experiential learning activities, experiential activities, teaching science, mineral elements, mineral nutrients*

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1. Introduction

Experiential learning is the practical application inspired by the ideals of pragmatism in philosophy applied in education. It is a prominent modern educational theory in the 20th centrury, associated with names of leading educators such as William James, John Dewey, Jean Piaget, Vygotsky, Lewin, George Santayana and David Kolb. Experiential learning has been playing a central role in progressive education, considered as the trend and cornerstone of education in the 21st century (Itin, 1999). [1]

Experiential learning is oriented towards a strong personal learning experience and capacity development. Experiential learning only brings about positive results when there are changes in the judgment, emotions, knowledge and ability of the learner through the life events, meaning that there is a change in the learner's knowledge, behavior and attitude [Chickering, A, 1977] [2]. Learner engagement includes intellectual, emotional, sensory and proactive engagement in the learning activities (Boud, D., & Cohen, R., 2000) [3]. Experiential learning attaches great importance to encourage the connection between abstract lessons and specific educational activities to optimize learning outcomes (Sakofs, 1995) [4]; as well as learning from the reflection, and analysis progress from experiences by the learner (Chapman, McPhee and Proudman, 1995) [5].

In studies conducted by Andresen, L., Boud, D., & Cohen, R. (2000), Catherine A. Broom, Ph.D. & Heesoon Bai, Ph.D. J., & White, G. (2010), Coffield, F., Moseley, D., Hall, E., & Ecclestone, K. (2004), Gentry Kolb (1984), Linda H. Lewis & Carol J. Williams (1994), Miettinen, R. (2000), Moon, JA (2004), Stavenga de Jong, JA, Wierstra, RFA, and Hermanussen, J. (2006), Wessels, M. (2006), experiential learning is a theory of learning and human development which provides models of learning from experience. Educators consider experiential learning as a remedy of transforming the traditional way of learning focusing only on assimilating knowledge from the teacher to students; to the model in which learners learn proactively by emotion, trust, cooperation, sharing experience and value, as well as the real living and working conditions.

Teaching is not just about forming knowledge for students, but more importantly, it is about how to apply knowledge into practice, is through learning activities that shape students' abilities to transform the process of learning into the process of developing creative thinking. One of the modern educational solutions that maximizes the capacity of learners is the organization of experiential activities in cognitive and practical situations. Experiential activities organization is the implementation of the principle of "learning coupled with practice, education combined with labor production, theory connected with practice". By encouraging students to participate in real-life experiences, learners will have the opportunity to view the subject from different perspectives and approaches,

avoiding imposition; and have the opportunity to bring innovative solutions bearing the individual signature.

Organizing experiential activity in teaching science is to provide opportunities for students to observe and experiment; discover and explore science; apply knowledge to solve theoretical and practical problems; from which they can continue to enhance the development of qualities and abilities (Bybee, R.W., 2010) [6]. The purpose of teaching science through experiential learning is to connect students to the practical situation to learn in, by and for the real life (Hmelo-Silver, C. (2004) [7]. As a result, students identify practical problems and have decision-making skills to solve the problem (Visconti, C. F., 2010) [8]. Experiential learning is considered to be highly effective with activities which involve the active participation of students in activities that link the theory to reality (Hoachlander, 2008; Silverstein *et al*., 2009) [9,10].

2. David Kolb's theory of experiential learning

Kolb's views on learning are called "experiences" associated with the point of intellectual origin in the works of Dewey, Lewin and Piaget. Based on Lewin's Model of Action Research, Dewey's Model of Experiential Learning, Piaget's Model of Learning and Cognitive Development, Kolb has inherited a subtle way of developing a model of experiential learning that comprehensively describes how everyone learns from experiences. Kolb emphasizes that experience plays a central role in the learning process: "Learning is the process in which knowledge is created through the transformation of experience" (Kolb, 1984) [11]. Kolb's model describes two dialects: (1) Two empirical ways of experiencing concrete experience and abstract conceptualization and (2) Two ways of transferring experience between Reflective Observation and Active Experimentation (Kolb, DA, Boyatzis, R., & Mainemelis, C. (2000)[12]. Learning through participatory experiences is viewed as opposed to teacher-led interactive learning (Clark, RW, Threeton, MD, & Ewing, JC, 2010) [13]. The learning cycle is described in Figure 1.

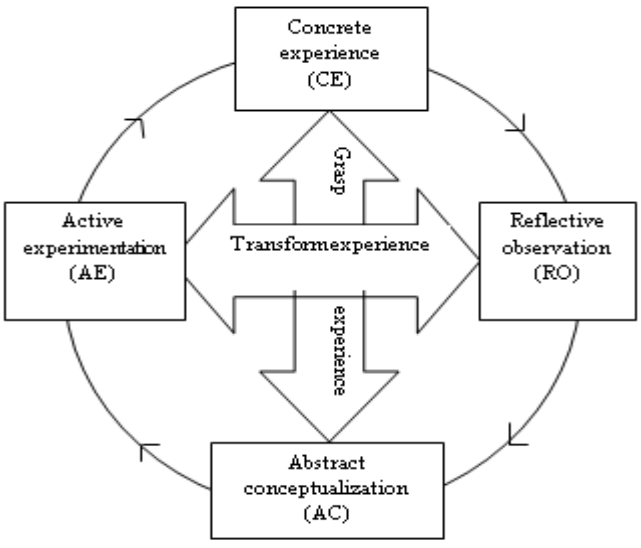

Figure 1. Kolb's Experiential Learning Cycle Kolb, A. Y., & Kolb, D. A. (2009) [14]

(1) Concrete experience: It is a skill acquired through experimentation and activity in specific circumstances. This is where the learning cycle comes in. It is usually linked with the role of playing game. Any method that requires self-assessment, personal interaction can be used as the "work" part of the learning experience to develop student-centered data. This means that what happens in operation (whether completed or not) generates background information for the next stage.

(2) Reflective observation: is a stage of the cognitive process towards the world. What is reflected in the observation will be analyzed by the subject to be processed in order to have a basis for action in line with reality to achieve results (knowledge formation). Reflective activity is to re-think activities and systematically examine the experiences that have gone through, to discover its characteristics. Together, they share, analyze and discuss in order to unify the views and view the problem in a systematic way. Students need to analyze and evaluate events and experiences through their own thinking about the experience. When thinking, the learner will go deep into the nature of the process, this is a good condition for learning.

(3) Abstract conceptualization: The concept of abstraction is the result obtained from the acquisition of the concrete inherent in reality, through the process of the subject, to obtain true perception on the object. In order to have the concept of an object, a certain phenomenon, the subject needs to have enough knowledge about the object itself, its movement and development in relation to other objects. After having detailed observation and deep thinking, the learner generalizes the experience into reasoning. This is an important step for the experience to be transformed into "knowledge" and begin to store in the cerebral cortex.

(4) Active experimentation: In the previous stage, the learner had a "conclusion" drawn from reality with closely linked arguments and thoughts. That conclusion can be treated as a hypothesis, and we must put it into practice for testing. This means that learners will have to change their old ways of doing things, try new ones and practice them daily.

Kolb's experiential learning model is a spiral that describes the learning process. Learning can begin at any stage depending on the individual's learning style (i.e., diverger, assimulator, converger, accomendator) but learning will be the most effectively when completing all four stages. Continuing education in spiral shape promotes the continuous development of learners' experiences (Kolb, D.A., 1981; Kolb, A. Y., & Kolb, D.A., 2013) [15,16]. Learning comes from a contradiction between concrete experience and abstract conceptualization, which is simply the contradiction between the known and the unknown. In resolving this conflict, each learner may prefer to use abstract conceptualization or experience (Mick Healey & Alan Jenkins, 2000), [17]. The learner who likes to comprehend, perceives the problem will prefer "Thinking," while anyone who is interested in clarity, understands the problem will prefer "Feeling" when expressing, Demonstrate a learning experience. Learners may keen on using one of two methods of transition: positive or reflective. Learners who prefer openness, understanding the problem will choose "Doing", while anyone who likes the content, will

be into "Watching" the content when trying to comprehend the meaning of experience. Kolb's theory is based on assumptions of learning: knowledge originates from experience, knowledge must be learned by the learner, not by memorizing what it is. Learners need feedback based on experience to derive reasoning. Then this theory is applied and tested to see the correctness, usefulness, and uselessness that result in new experiences, and they become the inputs to the next learning cycle. The process continues to repeat until goal is reached. Kolb's experiential learning model is supported by many educators and serves as the basis for research in specific areas.

3. Applying David Kolb's Theory of Experiential Learning into Designing Experiential Learning Activities

3.1. Definition of Experiential Learning Activities

In our experience, experiential learning is a task in which students are independently engaged or involved in all aspects of conceptual design, planning, organization and evaluation. The result is that students acquire knowledge, develop skills and qualities. As the student experiences, the teacher acts as a motivator for the learner. Experiential activities are usually organized in a cycle where, at the beginning, students use their own experiences to solve problems and, at the end of the day, students can use them. Knowledge and experience have been learned in order to solve the real issues of life and society in a flexible, active and creative manner.

Svinicki and Dixon (1987) [18] proposed a number of experiential learning activities that can be used in David Kolb's four-stage experience cycle to guide teachers during instruction. Concrete experience: readings, examples, or laboratories. Reflective observation: journals, discussions, and brainstorming activities. Abstract conceptualization: model-building activities, assignments, or deliver specialized lectures. Active experimentation: simulations, case studies, fieldwork, or final projects. This is one of the suggestions for teachers to select and arrange learning activities to help students learn from experience when dealing with contextual learning situations.

3.2. Illustration of Using Experiential Learning Model for Teaching Science in General Education with The Topic "Mineral Nutrition"

• *Objectives of the activity*

- Explain the roles of minerals in plant life;
- Present the absorption and transportation of mineral elements depends on the characteristics of the root system, soil structure and environmental conditions;
- Describe the roles of nitrogen, nitrogen and nitrogen assimilation in the atmosphere;
- Explain the reasonable use of fertilizers to produce high yield of crops;
- Do experiment on fertilizers.

This experiential activity is intended to form self-learning and problem solving competence (association with reality).

• *Operation progress*

(1) Assignment (1 period at school)

* Subgroup: each group of 3 or 5 members.
* Assigned:

- Understanding theoretical contents:

+ The role of essential mineral elements in plants.
+ Supply of mineral nutrients to plants.
+ Nitrogen conversion and nitrogen assimilation.
+ Fertilizer and crop yields and the environment
+ Fertilizers are often used today, how to apply and how long fertilizer.
+ The groups of crops are commonly cultivated in the field of the localities where they live in Quy Hop district, Nghe An province, Vietnam.
+ Type of fertilizer, how to apply fertilizer and period of application for each species.
+ The lack of nutrition in plants of agricultural crops is cultivated on the field of the local where they live in Quy Hop district, Nghe An province, Vietnam.

- Assignment to groups of students about crop nutrition surveys.

The Assignment process in the class is described in Figure 2.

Figure 2. Assignment process in the class

(2) Concrete experience (at home and in the field - 1 week)

+ Questionnaire survey with household heads in agricultural production households cultivating to find information on fertilizer rates and time for fertilizer application (Figure 3).

Figure 3. Students are taking surveys on the cultivating households

+ Field surveys in survey gardens to detect signs of deficiency or over-nutrition in plants on leaf, stem and branch organisms compared with normal leaves in the same plant species in the household area (Figure 4).

* Investigation skills

To conduct the investigation, students need to do the basic operations such as:

- Design questionnaires;

- Select the surveyed households: It is the best to select about 3 households to conduct the survey. One household with high productivity, one with low productivity, and one with average productivity.

- Select plant varieties for investigation: Plant varieties must be basically identical between households for easy monitoring and comparison of survey results.

- Question the respondent (household owner).

- Ask some questions based on questionnaires and extended questions if needed.

- Exploit more information to clarify the content mentioned.

- Summarize and evaluate the information in the questionnaire and the actual survey.

(3) Reflective observation (1 period at school)

- The groups of students in turn report the results of the survey: number of surveyed households, number of species surveyed, number of species showing lack of nutrition, evaluation of fertilizer use and application period manure for each type of plant.

- Explain the causes of nutrient deficiencies in plants in root, stem, leaf.

(4) Abstract conceptualization

- Students show the roles of mineral elements in plants. From that analysis, they can find out the roles of fertilizers in plant growth and development.

- Students watch videos about fertilization methods for crops, explain which fertilizers are suitable for using, and analyze the consequences if the fertilizer is applied incorrectly.

- Each group discuss the technical measures to improve crop yields.

(5) Active experimentation (4th period at school)

- Students design experiments to study the roles of fertilizers and provide solutions for the appropriate fertilization in a particular crop group with under-nutrition.

Figure 4. Students are conducting the field surveys

4. Conclusions

Experience learning is a strategy in teaching science in secondary schools to improve the effectiveness of teaching activities. Vietnam is an agricultural country so students not only learn in school but also help parents work in the field. Bringing scientific knowledge into practical application is a highly practical solution. Organizing experiential activities in the field also helps urban students have interesting experiences and become interested in science.

We have analyzed David Kolb's experiential learning model, and have came to define definitions of experiential learning activity. The experiential activity model is the basis for selecting and organizing the types of experiential activities into an experiential learning cycle. When organizing experiential activities, it is important to ensure that students go through four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. Well-organized learning activities will teach students the skills to apply knowledge into practice, create positive learning motivation, increase student interest in learning. The example of experiential learning in teaching science will bring high effectiveness to the development of student' s abilities.

References

[1] Itin, C.M., "Reasserting the philosophy of experiential education as a vehicle for change in the 21st century", *Journal of Experiential Education*, 22(2), pp. 91-98, 1999.

[2] Chickering, A., *Experience and Learning: An Introduction to Experiential Learning*, New Rochelle, NY: Change Magazine Press. p. 63, 1977.

[3] Andresen, L., Boud, D., and Cohen, R., *Experience-Based Learning,* in Foley, G., Understanding Adult Education and Training, Allen & Unwin, Sydney, second edition, pp 225-239, 2000.

[4] Sakofs, M., *Opinion: Opportunity and adversit,* In K. Warren, M. Sakofs & J. Hunt. (Eds.), The theory of experiential education, Dubuque, IO: Kendall/Hunt Publishing Company, pp. 441-443, 1995.

[5] Chapman, S., McPhee, P., & Proudman, B., *What is Experiential Education?,* In Warren, K. (Ed.), The Theory of Experiential Education, Dubuque: Kendall/Hunt Publishing Company, pp. 235-248, 1995.

[6] Bybee, R.W., *The teaching of science: 21st century perspectives*, United States: NSTA press, 2010.

[7] Hmelo-Silver, C., Problem-based learning: What and how do students learn? *Educational Psychology Review*, 16(3), pp. 235-266, 2004.

[8] Visconti, C. F., Problem-based learning: Teaching skills for evidence-based practice, *Perspectives on Issues in Higher Education*, 13, pp.27-31, 2010.

[9] Hoachlander, G., Bringing industry to the classroom, *Educational Leadership,* 65(8), 22-27, 2008.

[10] Silverstein, S. S., Dubner, J., Miller, J., Glied, S., & Loike, J. D., Teachers' participation in research programs improves their students' achievement in science, *Science,* 326, pp. 440-442, 2009.

[11] Kolb, D., *Experiential Learning: experience as the source of learning and development,* Englewood Cliffs, NJ: Prentice Hall, 1984.

[12] Kolb, D. A., Boyatzis, R., & Mainemelis, C., *Experiential learning theory:* Previous research and new directions*,* In R. Sternberg & L. Zhang (Eds.), Perspectives on cognitive learning, and thinking styles, Mahwah, NJ: Erlbaum, pp. 228-247, 2000.

[13] Clark, R. W., Threeton, M. D., & Ewing, J. C., The potential of experiential learning models and practices in career and technical education & career and technical teacher education, *Journal of Career and Technical Education,* 25(2), pp. 46-62, 2010.

[14] Kolb, A. Y., & Kolb, D. A., The learning way: Meta–cognitive aspects of experiential learning, *Simulation & Gaming,* 40, 297-327, 2009.

[15] Kolb, D. A., Learning styles and disciplinary differences, *The modern American college,* 232-255, 1981.

[16] Kolb, A. Y., & Kolb, D. A, *Kolb Learning Style Inventory workbook version 3.2,* Philadelphia, PA: HayGroup, 2013.

[17] Mick Healey & Alan Jenkins, Kolb's Experiential Learning Theory and Its Application in Geography in Higher Education, *Journal of Geography,* 99:5, 185-195, 2000.

[18] Svinicki, D., Dixon, M., The Kolb model modified for Classroom Activities, *College Teaching*, vol 35, No.4, pp 141, 1987.