



## Research Article

# APPLYING EXPERIENTIAL LEARNING CYCLE TO ENHANCE PRE-SERVICE TEACHERS' TEACHING SKILLS THROUGH THE COURSE OF PRACTICE TEACHING MATHEMATICS

*Bui Thi Thanh Mai*

*Ho Chi Minh City University of Education, Vietnam*

*Corresponding author: Bui Thi Thanh Mai – Email: maibtt@hcmue.edu.vn*

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## ABSTRACT

*Developing student teachers' teaching competence is a key task of the teacher training programs at Ho Chi Minh City University of Education (HCMUE), one of the largest teacher education institutions in Vietnam. However, there remains a huge gap between theoretical knowledge and teaching practice in these programs. This article introduces solutions implemented at the Department of Mathematics, HCMUE since 2015 to bridge the gap. In particular, we focus on the development of a learning sequence in the Teaching Mathematics Practice course based on David Kolb's experiential learning cycle. This learning sequence was applied at two classes of 20 senior students at the Department during the first semester of the school year 2019-2020 in order to help them improve teaching skills before taking part in the Teaching Practicum. Although we received positive feedback from students, further research needs to be conducted to measure the effectiveness of the new learning sequence.*

**Keywords:** experiential learning cycle; teaching skills; teacher training

## 1. A problem arose: the knowing-doing gap

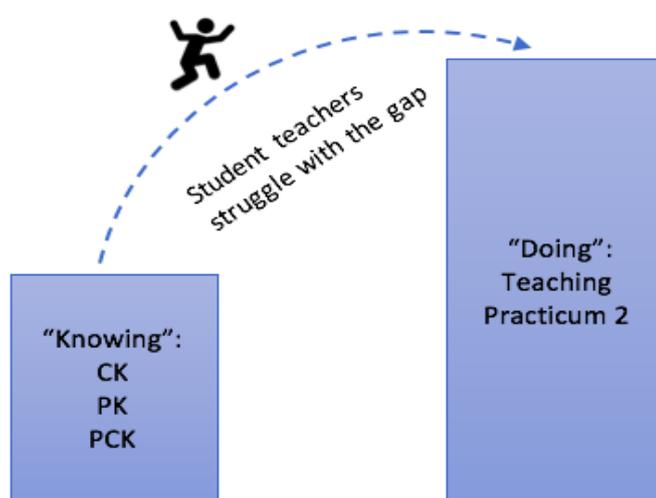
According to the four-year Mathematics Teacher Training Curriculum at Ho Chi Minh City University of Education, student teachers are equipped with Content Knowledge (mathematics) (CK), Pedagogical Knowledge (PK) and Pedagogical Content Knowledge (PCK) throughout seven semesters. In addition, it is mandatory for them to take part in two practicum before being fully licensed as a teacher: Teaching Practicum 1 and Teaching Practicum 2. The former lasts 5 weeks in the fifth semester of the training program, and the later lasts 10 weeks in the eighth semester. During the Teaching Practicum 1, pre-service teachers mainly observe in-service teachers' classes, while the Teaching Practicum 2

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provides them with opportunities to apply theories into teaching practice under the mentorship of experienced teachers.

And problems emerged in this transitional step: while their university courses commonly involve lectures, textbooks reading, and homework assignments. This means that they learn the “knowing what.” When student teachers going to high schools, they are expected to design lesson plans, conduct classroom lessons, and perform other duties of a schoolteacher, which means “knowing how”. As a result, many pre-service teachers struggled to fill this knowing-doing gap. They are unable to put the knowledge accumulated at university into practice and usually performance poor during the practicum.



*Figure 1. The “knowing-doing” gap in Mathematics Teacher Training Curriculum*

## 2. Strategies to bridge the gap

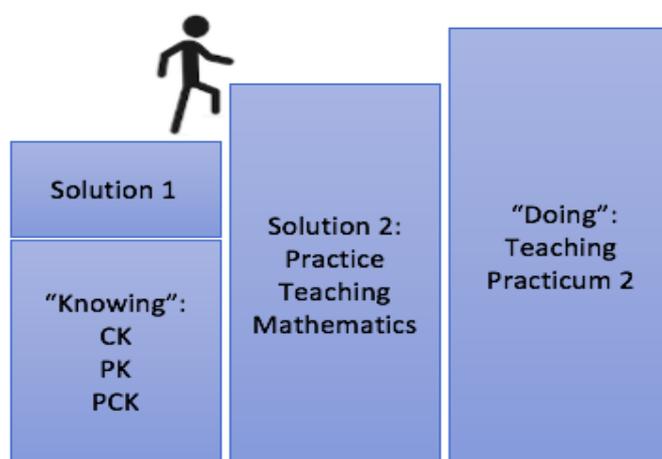
Being fully aware of this “knowing-doing” gap in the curriculum, as the teacher educators at the Department of Mathematics, Ho Chi Minh City University of Education, since 2015, we have suggested and implemented two solutions in order to tackle the problem:

- The first solution was to innovate the curriculum as well as methods of teaching and assessment. In the new curriculum, there are more credits for PCK: 15 credits compared to 10 credits in the old curriculum, adding two courses including Assessment in Mathematics Education (2 credits) and Mathematics Curriculum Development (2 credits). We have also sized down the number of students in each class from about 60 students in the past to only 15-25 students. This change has allowed us to use modern approaches to lesson delivery. Instead of lecturing, project-based learning and more hands-on activities have been employed so that student teachers have more occasions to apply the knowledge. In almost all courses involving PCK, they have to work in group of 2-4 students, designing a lesson

plan on a chosen topic and practicing teaching (about 15-20 minutes). In terms of assessment methods, the current trends such as authentic assessment, performance-based assessment, and portfolio assessment have been used instead of written tests.

- The second solution was to add a course, a complete new course titled “Practice Teaching Mathematics” to the curriculum. Pre-service teachers have to complete this course in the seventh semester as a prerequisite before they are allowed to take part in the Teaching Practicum 2. In this course, student teachers will conduct a lesson in a simulation of real classes under the guidance of a university lecturer in order to improve their teaching skills. This aims at preparing students for the Teaching Practicum 2.

These two solutions are considered as scaffolds to bridge the knowing-doing gap.

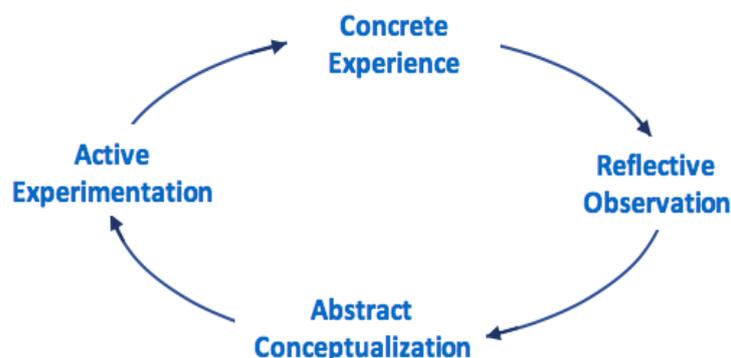


*Figure 2. Strategies to bridge the knowing-doing gap*

In this study, we put focus on the second solution and how we applied David Kolb’s Experiential Learning Cycle to enhance pre-service teachers’ teaching skills through the course of Practice Teaching Mathematics.

### **3. David Kolb’s Experiential Learning Cycle**

“I hear and I forget. I see and I remember. I do and I understand” – the Confucius quote reflects the spirit of “learning by doing” theory which was developed by an American philosopher John Dewey. Experiential learning is an approach of “learning by doing”, in which students learn through experience, taking part in hands-on activities. However, mere experience is insufficient because an important characteristic of experiential learning is the reflection on experience (Felicia, 2011). The most common model of experiential learning was developed by David Kolb (1984), based on the work of John Dewey, Kurt Lewin, and Jean Piaget, compassing four stages shown in Diagram 1.



*Diagram 1. David Kolb's Experiential Learning Cycle (ELC) (Kolb, 1984)*

The cycle begins with the learners actively participating in an experience (Stage 1), they then consciously reflect on that experience (Stage 2). It is from the observation and reflection that learners are able to generalize a model of what is experienced (Stage 3), and finally apply that model to a new experiment (Stage 4). According to Kolb, each stage is mutually supportive of and feeds into the next, and it is possible to enter the cycle at any stage and follow it through its logical sequence. However, effective learning only occurs when a learner can pass all four stages of the ELC (McLeod, 2017).

#### **4. Applying the ELC in the Practice Teaching Mathematics course**

##### **4.1. Introduction to the course**

The course of Practice Teaching Mathematics is a 10-week-course for senior students at the Department of Mathematics, HCMUE, who have already taken the courses including Introduction to Mathematics Teaching Methodology, Methodology of Algebra and Analysis Teaching, and Methodology of Geometry Teaching. There are about 15 to 20 students in each class.

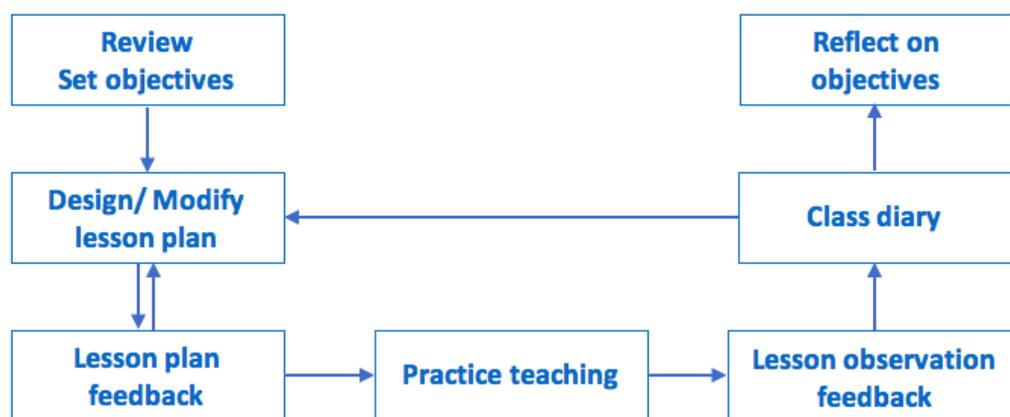
This course provides pre-service teachers with an occasion to apply the knowledge attained from previous courses to teaching practice. Thanks to the process of preparing lesson plans and putting them into practice, the trainees are expected to foster their professional development.

##### **4.2. The learning sequences in the course of Practice Teaching Mathematics**

Based on David Kolb's Experiential Learning Cycle, we have designed the learning sequences in the Practice Teaching Mathematics course with the aim of enhancing pre-service teachers' teaching skills. In order to ensure the instructional effectiveness, we tried to make sure that the learning sequences comply with two following fundamental principles:

- The learning sequences facilitate the reflection on experience rather than the mere experience;
- The learning sequences lead student teachers through the full cycle of Kolb's model.

We summarize the step-by-step process of applying the ELC to the course of Practice Teaching Mathematics in Diagram 2.



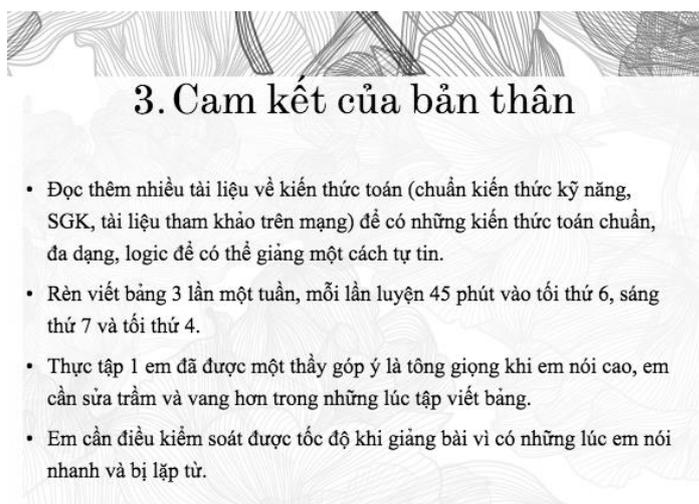
*Diagram 2. Learning sequences in the Practice Teaching Mathematics course*

- **Step 1**

On the first lesson of the course, the lecturer briefly reviews some knowledge on methods of teaching mathematics, especially how to design a lesson plan and different approaches to lesson delivery. Student teachers are then guided to use free writing technique to identify their teaching beliefs and set learning goals through answering the questions:

- What is the purpose of learning in general and learning mathematics in particular? How should students learn mathematics?
- What is the image of the teacher that you I would like to build?
- What level is your professional competence at present? And what do you need to improve in order to become a teacher like that?

The learning sequences of the course, the assessment criteria of a lesson plan and an instruction are also introduced. Finally, the lecturer instructs student teachers to use Sway to keep their “class diary” after each lesson, and the very first task is to specify their learning objectives in the diary.



**Translation**

My commitment:

- Read more mathematics documents (textbooks, online materials, common core national standard) to get deeper insight into the subject and be more confident in teaching.
- Practice writing on board three times a week (45 minutes each time, on Wednesday evening, Friday evening, and Saturday morning).
- Practice lowering my high-pitched voice so that it will be warmer and deeper.
- Practice controlling my speaking speed as I sometimes speak too fast with words being repeated quite often

Figure 3. Learning objectives in a student’s diary

• Step 2 – 3 – 4

Each pair of student teachers are given a mathematics lesson in high school curriculum to prepare for. They need to collaborate to design a lesson plan and upload it to Google Classroom (Step 2) so that other student teachers can view and give feedback through a Google form (Step 3). The lesson plan is then modified by that pair of students (Step 4) before teaching. The assessment criteria of a lesson plan that lecturer gives pre-service teachers on the first lesson are used in these steps.

**GÓP Ý VỀ GIÁO ÁN BẤT ĐẲNG THỨC CÔ-SI (NHÓM 4)**

**Góp ý về nội dung giáo án**

Gợi ý: Tiến trình dạy học sử dụng trong giáo án có phù hợp với bài dạy không? Các hoạt động đã phù hợp chưa, việc sử dụng hoạt động nhóm có phát huy hiệu quả không? Bài tập có phù hợp hay chưa? Nội dung hoạt động đã đúng với ý đồ sư phạm đặt ra chưa? Việc đặt các câu hỏi có gây khó hiểu cho học sinh không?...

Hoạt động tạo động cơ của nhóm khá hay. Nhưng một số chưa cụ thể như các dụng cụ để học sinh làm chiếc hộp gồm những gì, và những dụng cụ này học sinh chuẩn bị trước hay gv phát.

Hoạt động 1 diễn ra trong 7 phút. Trong đó học sinh thảo luận nhóm trong 4 phút, chỉ còn 3 phút cho giáo viên đưa ra đề bài, thời gian học sinh trình bày sản phẩm, gv nhận xét bài làm của học sinh liệu có hợp lí hay không?

Hoạt động 1: Sau khi học sinh trình bày sản phẩm thì gv nhận xét sản phẩm có đạt yêu cầu không?. Vậy hoạt động này có hợp lí không khi chưa biết thể tích lớn nhất là bao nhiêu ?

Hoạt động 2: Liệu có nên thêm những cặp số hữu tỉ, vô tỉ vào bảng các số liệu không?

Phần bài tập khá hợp lí nếu học sinh trong lớp khá giỏi.

**Translation**

- The first activity engages students; however, it is essential to specify the materials (how many boxes need to be prepared, and who prepares them, teacher or students?)
- Time estimation is not reasonable (7 minutes for students to discuss, find solutions, presentation, and for teacher to give feedback?)
- How does teacher comment on students’ work as the solution can be only figure out at the end of the lesson?

Figure 4. A part of a student’s feedback on the lesson plan “Cauchy-Schwarz inequality”

- **Step 5**

After modifying the lesson plan, the pair of student teachers practice teaching themselves, they then play the role of teachers while other student teachers attend the class as high school students as well as observing and taking notes on their peers' teaching. The lecturer also observes and takes notes.

- **Step 6**

The pre-service teacher trainees self-evaluate their lesson delivery, then others give lesson feedback based on their observation, notes and the criteria in the instructional assessment rubric. It is important for them to keep in mind that the objective of lesson feedback is not to judge or assess their peers' classroom performance, but to support them and help them to improve teaching skills. Hence, the student teachers are encouraged to provide constructive feedback: the positive points are dealt with before the negative points, and the negative points are followed by some planning about what might be done instead next time. At the end of this step, the lecturer adds supplementary comments if needed and summarizes the main points. He/she might sometimes raise a question involving the lesson for the student teachers to examine. For instance, after a lesson in which the pre-service teachers integrated technology, the students were asked to figure out what is an effective technology integrated lesson and how to build it.

- **Step 7**

After each lesson, the pre-service teachers are required to fill in the class diary to record their experiences, feelings, then analyze these experiences and draw conclusions from them. It is obligatory for student teachers to have a strict routine of keeping up regular entries as much of the details and feeling of recollection data fades within 24 hours.

Qua buổi dạy của hai nhóm và qua những lời góp ý và nhận xét của cô và các bạn, em rút thêm cho mình thêm những kinh nghiệm:

- Về Kỹ năng sư phạm

Giáo viên là người truyền lửa cho HS vậy cho nên việc chọn cách dạy và đặt những câu hỏi cho HS là điều rất quan trọng, cả hai nhóm lần này đều thực hiện tốt về kỹ năng đó.

Việc cho HS trình bày sản phẩm của mình cũng rất quan trọng, giúp GV hiểu được mức độ vận dụng bài học của HS như thế nào, đồng thời tạo cho các em có năng lực tự tin, thuyết trình trước đám đông.

- Thiết kế giáo án

Em thấy giáo án tuần qua của 2 nhóm rất tốt, chỉ có chút cần rút kinh nghiệm đó là bố trí thời gian vào các nội dung cần phải hợp lý hơn, không nên quá tham qua nhiều hoạt động để rồi cố gắng đẩy nhanh nội dung dẫn đến HS không theo kịp tiến trình dạy.

**Translation:**

Observing the teaching practice of two groups this morning helps me to gain some experiences:

- It is important to choose the appropriate approach to deliver the lesson.

- Question technique also plays crucial role in teaching.

- Teacher should let students present their group work in order to know their level of understanding, it is also a good occasion to develop students' presentation skill...

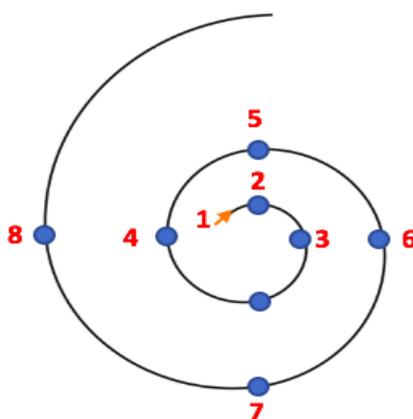
*Figure 5. A part of a student's class diary*

- **Step 8**

The pair of pre-service teachers modify the lesson plan after receiving feedback from the lecturer and other students. Then the cycle repeats with other pairs of student teachers. At the end of the course, pre-service teacher trainees look back on their class diary, especially the learning objectives they set at the beginning of the course and self-evaluate their improvement in teaching skills.

#### 4.3. *Analyzing the learning sequences according to ELC*

The designed learning sequences of the Practice Teaching Mathematics course involves two types of experiences: designing a lesson plan and practice teaching of a lesson. Both of them go through four stages of Kolb's experiential learning cycle (Diagram 3).



**Diagram 3.** *Analyzing the learning sequences in the course of Practice Teaching Mathematics according to ELC*

Student teachers enter the cycle at Step 1 (arrow position in Diagram 3), which is the planning for experience. Free writing technique and setting objectives in class diary are used as the methods for preparing them prior to teaching so that they make the most of those experiences. This also provides a valuable aid to the students' reflection and self-assessment after the experience.

At step 2, pre-service teachers pass concrete experience (Stage 1 of ELC) of preparing a lesson plan. They then need to give lesson feedback at step 3, which is the reflection stage (Stage 2 of ELC). The act of modifying the lesson plan after receiving feedback (step 4) is the active experimentation (Stage 4 of ELC). While there is no specific step corresponding to the "abstract conceptualization" (Stage 3 of ELC), student teachers absolutely learn from the feedback so that they could perfect their lesson plan.

At step 5 and 6, a pair of pre-service teacher trainees practice teaching (Stage 1 of ELC) while others observe and take notes to give feedback on the lesson (Stage 2 of ELC). Both experiences of delivering and observing a lesson are valuable to improve teaching skills. Student teachers can realize how their peers use the teaching methods, how they interact with students, how they deal with problems arising from their lesson on a daily basis and, to certain extent, can discover effective teaching strategies that the observer has never used in class before (Phat, 2019). The reflection is then be generalized to their own knowledge shown in their class diaries Step 7 (see Figure 5). This is the abstract conceptualization stage (Stage 3 of ELC). Finally, they apply new knowledge gained to modify the lesson plan the second time (Step 8), which is the active experimentation stage (Stage 4 of ELC).

## 5. Conclusion

This article presents the learning sequences in the course of Practice Teaching Mathematics which are based on Kolb' ELC model. We have analyzed the learning sequences according to four stages of the ELC. This model has been applied in the Practice Teaching Mathematics course in the first semester of the schoolyear 2019-2020 and has received positive feedback from student teachers. However, more qualitative and quantitative researches need to be conducted in order to validate the effectiveness of this model in terms of fostering pre-service teachers teaching competence. This could be the focus of our future research in which we are planning to use video-recording technique and a rubric to evaluate the instructional quality of preservice teachers before and after the course.

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

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**VẬN DỤNG MÔ HÌNH HỌC TRẢI NGHIỆM ĐỂ NÂNG CAO KỸ NĂNG SỰ PHẠM CHO SINH VIÊN THÔNG QUA HỌC PHẦN THỰC HÀNH DẠY HỌC TOÁN****Bùi Thị Thanh Mai***Trường Đại học Sư phạm Thành phố Hồ Chí Minh, Việt Nam**Tác giả liên hệ: Bùi Thị Thanh Mai – Email: maibtt@hcmue.edu.vn**Ngày nhận bài: 23-10-2019; ngày nhận bài sửa: 15-11-2019; ngày duyệt đăng: 26-5-2020***TÓM TẮT**

*Phát triển năng lực giảng dạy cho sinh viên là trọng tâm của các chương trình đào tạo giáo viên tại Trường Đại học Sư phạm Thành phố Hồ Chí Minh. Tuy nhiên, tồn tại một khoảng cách lớn giữa lý thuyết và thực hành trong các chương trình đào tạo. Phần đầu của bài báo trình bày những chiến lược được triển khai tại Khoa Toán – Tin học từ năm 2015 nhằm thu hẹp khoảng cách này. Sau đó, chúng tôi tập trung trình bày chuỗi hoạt động học trong học phần Thực hành dạy học Toán được xây dựng dựa trên mô hình học trải nghiệm của David Kolb. Chuỗi hoạt động học này đã được triển khai cho hai lớp học phần Thực hành dạy học Toán với sĩ số 20 sinh viên/ lớp trong học kì 1 năm học 2019-2020 nhằm giúp các sinh viên nắm tư nâng cao kỹ năng sư phạm trước khi đi thực tập tại trường phổ thông. Chúng tôi nhận được các phản hồi tích cực từ phía sinh viên, tuy nhiên, để khẳng định và đo lường tính hiệu quả của chuỗi hoạt động học này cần tiến hành thêm các nghiên cứu tiếp theo.*

**Từ khóa:** mô hình học trải nghiệm; kỹ năng sư phạm; đào tạo giáo viên