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DESIGNING EXPERIENTIAL ACTIVITIES IN TEACHING THE MATHEMATICS EDUCATION MODULE FOR PRIMARY EDUCATION STUDENTS

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Abstract. The objective of this article is to propose a way to design the learning activities for primary education students in teaching the module Mathematics Education. The article focuses on theoretical research on experiential education; research on competency-based teacher training; research on the organization of experiential activities in teaching and learning Mathematical Education modules for students and applying it to the designing of experiential activities in teaching the module "Building Mathematics lesson plan to develop the qualities and competences of learner for primary students while studying this module.

Keywords: experiential activities, teacher training, Mathematics lesson plan.

1. Introduction

The bachelor's Curriculum of Primary Education of Hanoi National University of Education is currently built and implemented in the direction of developing learners' competencies. To meet this goal, contents and teaching methods of subjects must be selected and designed based on the outcome standards of the quality and competency of the training program as well as of each module. In the Mathematical Education module in primary schools, contents and teaching methods have been changed and adjusted to appropriate with objectives of the Training Program as well as the implementation of the 2018 Mathematics Curriculum [1, p.9], [2, p.6].

The bachelor's Curriculum of Primary Education is characterized by emphasizing on practical application and professional practicing. Students are allowed to practice and experience their careers right after they study the modules of the Academic majoring in Primary Education. For example, when studying the Mathematics Education module, students have access to Mathematics teaching plans, observing classes and teaching some lessons. Organizing experiential learning helps students to access and achieve the requirements of the curriculum related to the professional competencies of primary school teachers.

The purpose of this article is to clarify the theoretical basis of the form of designing experiential activities in Primary mathematics teacher training, and apply it to the designing of experiential activities for students in subjects of the Mathematics education module.

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2. Content

2.1. Experiential Education Theory

2.1.1. John Dewey's experiential education model

In "Experience and Education" (1938), John Dewey pointed out the fundamental weaknesses of both traditional and progressive education. Traditional education is based on the content of the subjects, requires rigor and rigid principles, the progressive school emphasizes the student's interest in the changes taking place in society, emphasizes the spontaneity and libertarianism. He believes that each point of view has errors because it is not based on the application of the philosophy of experience in education, which is built and developed in a coherent and systematic way. On that basis, he gives the views on experiential education: the necessity of experience in education, the criteria of the experiences, the adjustment of the social context to the experiences, the nature of educational freedom, the purpose of experiences, and the role of the educator in creating experiences in learners.

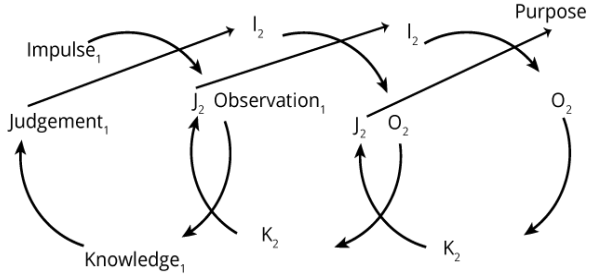


Figure 1. Dewey's experiential education model [3, p52]

According to Dewey, the intellectual development of learners is the result of experience. Intellectual development must first have the process of forming symbols; The experience will give the learner a mental representation of that object or phenomenon. According to him, the curriculum and teaching must be the process of strung together elements in the learners' old and new experiences; The learning process must be the process of forming new views, new interests and experiences. Therefore, schools and teachers must create a learning environment in which John Dewey's model of the learning process describes the process by which learners construct their knowledge through observable experiences. Dewey's learning model is a complex intellectual process, including: 1) Observation of surrounding conditions (Observation); 2) Forming knowledge of what has happened in similar situations in the past, a knowledge gained partly from memory and partly from the information, advice, and warnings of those who have broader experience (Knowledge); 3) Evaluate, judge what is observed and the knowledge gained (Judgment). 4) The result of this process will motivate people to perform the next sequence of activities to achieve the goal (Impulse) (figure 1) [3, p.53]

2.1.2. Kurt Lewin's experiential education model

Kurt Lewin (1890-1947), German-American psychologist is known as one of the pioneers of modern social psychology. In 1936 in Principles of Topological Psychology, Lewin put forward the equation for the development of human behavior: B = f (P, E), where B (behavior) is human behavior, P (person) is attributes of each individual, E (environment) is the surroundings of each individual. The above equation shows that the development of human behavior depends on the innate factors of each individual and the influences of the surrounding environment. Of the two factors above, P is a factor that is difficult to influence and change, so to change B, it is mainly based on changing E. In other words, in order to develop an individual's behavior, it is necessary to work together. affect the environment that contains each individual. Lewin first coined the term "behavior research" around 1944, and it appeared in his 1946 paper "Study of Minority Problems

and Behavior." Accordingly, behavioral development uses a spiral, each step consisting of a cycle of planning, acting, and drawing lessons from the results of the action.

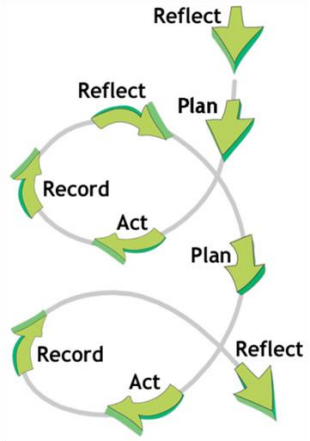


Figure 2. Lewin's experiential education model [4, p.47]

On that basis, he came up with a 4-stage experiential education model. According to him, learning is an integrative process, which begins with concrete/discrete experience; learners will then collect data, observe and reflect on that experience; these data are then analyzed and generalized to form abstractions and generalizations; finally testing the meaning of the concept in the new situation (Figure 2) [4, p.46]

2.1.3. J. Piaget's learning model

On the basis of research on the nature of human cognitive development, J. Piaget has proposed a model of cognitive development consisting of 4 stages as follows: Sensory motor, representational, concrete operations and formal operation (see Figure 3). This model clearly reflects the role of experience in cognitive development: intellectual achievements at this stage are the inheritance of previous experiences; the unified combination of existing structures from the previous period and the result of experience [5, p.20].

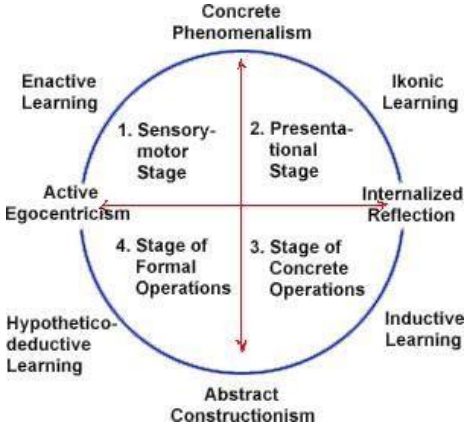


Figure 3. J. Piaget's learning model [5, p.20]

2.1.4. Kolb's experiential learning model

Based on the classic experiential education theories mentioned above, in 1984, David Kolb first proposed the theory of experiential learning and was perfected and added in the following years. Kolb's experiential learning theory is a dynamic view of learning based on a learning cycle driven by the resolution of the dual dialectics of action/ reflection and experience/abstraction. Learning is defined as "the process whereby knowledge is created

through the transformation of experience and knowledge results from the combination of grasping and transforming experience" [6, p.41]. Grasping experience refers to the process of taking in information, and transforming experience is how individuals interpret and act on that information. The \model portrays two dialectically related modes of grasping experience—Concrete Experience (CE) and Abstract Conceptualization (AC)—and two dialectically related modes of transforming experience—Reflective Observation (RO) and Active Experimentation (AE).

Learning arises from the resolution of creative tension among these four learning modes. This process is portrayed as an idealized learning cycle or spiral where the learner "touches all the bases"—experiencing (corresponding with CE), reflecting (corresponding with RO), thinking (corresponding with AC), and acting (corresponding with AE)—in a recursive process that is sensitive to the learning situation and what is being learned. Immediate or concrete experiences are the basis for observations and reflections. These reflections are assimilated and distilled into abstract concepts from which new implications for action can be drawn. These implications can be actively tested and serve as guides in creating new experiences [6, p.44] (Figure 4).

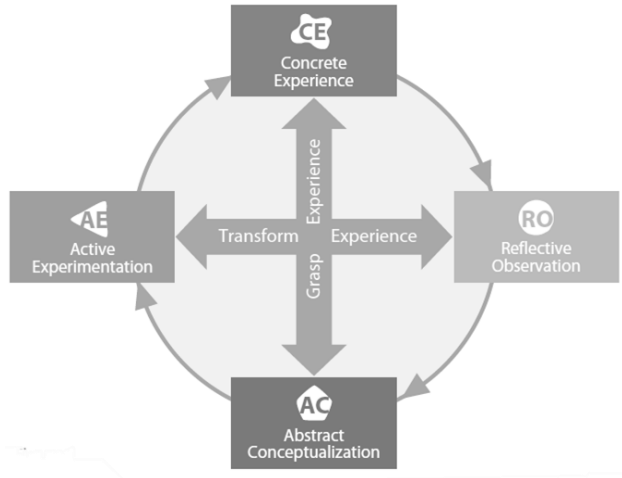


Figure 4. Kolb's Experiential Learning Cycle [5, p.40]

2.2. Competency-based teacher training

The teacher training program is following the trend of competency-based training (Competency Base Training). The main idea of this model can be described as follows:

- Take competency standards and professional logic as the starting point and basis for the development of training programs including training objectives, content, and methods.

- Get standards and structure of professional capacity instead of just paying attention to training according to subject logic.

- Integration between content components in a subject, between subjects in a major, between knowledge areas and training activities towards the same impact on learners according to vocational competency criteria.

- Integrating theoretical training with professional practice through the method of linking responsibility between teacher training institutions and schools. Such an association must be established so that teachers can be trained in a working position by "Clinical Experience" – a terminology in education, to make the educational profession a Clinical Practice Profession, then teach theory by practical situations [8, p.47]

- Evidence-based training is the principle of effectively taking the impact of professional

behavior to transform learners to design and evaluate training programs, to evaluate teacher's competency, to acquire and use feedback to organize the training process in pedagogical schools.

Based on such a teacher training model, Hanoi National University of Education has built a bachelor's degree program in general education in the direction of developing learners' capacity with the output standards includes 4 standards (23 criteria), including one quality standard and three competency standards [2, p.6-7] (Figure 5).

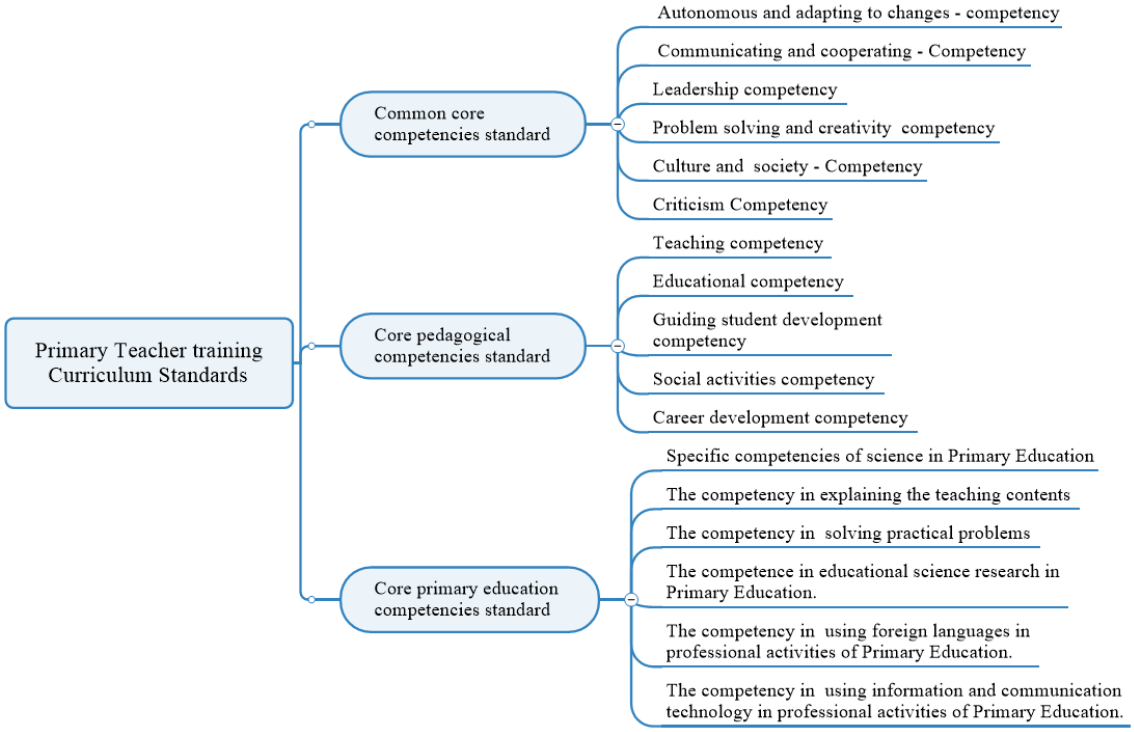


Figure 5. The Primary teacher training curriculum Standard [2, p6]

2.3. Characteristics of experiential activities for students in Mathematics education module

Based on the characteristics of experiential learning that Kolb introduced in 1984 and based on the characteristics of Mathematics education module, the author would like to suggest some characteristics of the experiential learning activities in the Mathematics education module:

• *Associated with the formation of "professional development competency" of primary mathematics teachers.* In the organization of experiential activities for students in the Mathematics teaching and learning modules, students are guided to perform tasks such as: doing research the program and Mathematics textbooks in primary schools (under the direction of lecturer); watching videos; doing observation; researching subject plans, lesson plans to understand contents, teaching methods and assessment methods in teaching Mathematics at primary schools; practicing micro-teaching in class and in primary schools to get experiences as well as to create new implementation for themselves; working directly with primary students to see how they learn Mathematics, and also figuring out how to organize activities that work for them, etc.

• *Towards developing competency to mobilize and connect knowledge.* Students can independently and actively conduct learning activities in a positive environment designed by

teachers, thereby transforming their own experiences and forming new knowledge. Creative experiential activities require learners to have available experiences or known knowledge as the basis for the experience process. This feature helps to distinguish learning through experience from learning by doing. Learning to go along with practice is to practice what you have learned (which can be understood as applying what you have learned into practice). Learning by doing is through performing a specific activity to form the necessary knowledge and skills (not required to be based on available experience). Based on Kolb's model, it can be seen that learning by doing are steps in the learning-by-experience cycle.

• *Associated with professional practical competency*. For the training of primary school teachers in the Pedagogical Universities, the Mathematics teaching and learning modules hold a particularly important position, being a specific professional subject. These modules help to equip students with the basic knowledge and skills of teaching Mathematics in primary schools, thereby helping to form the capacity of teaching Mathematics for students. One of the manifestations of the ability to teach Mathematics is the ability to help develop number of component mathematical competencies in students such as the ability to think and reason mathematically, the ability to model mathematics, ability to solve math problems, ability to communicate math, ability to use tools and means of learning mathematics [9, p.4]. These competencies are most effectively formed and developed through discovery and experiential activities in Mathematics. Thus, it is required that primary teachers know how to organize these activities for students in primary schools. Therefore, each student also needs to be involved in activities with professional experience, from which to be able to organize Mathematics instruction for primary students.

2.4. Designing experiential activities in Mathematics education module

2.4.1. The steps of designing experiential activities for students in Mathematics Education module

Base on the specific characteristics of experiential activities for students in the module Mathematics Education, we propose the following steps for the designing:

- Step 1: Analyzing the subject content in the Mathematics Education module
- Step 2: Determining the goal of the topic
- Step 3: Designing experiential activities (4 activities)

- Activity 1: Mobilizing relevant knowledge and experience
- Activity 2: Observing and reflecting on the activities that have been done
- Activity 3: Abstract Conceptualization
- Activity 4: Active experimentation.

2.4.2. Designing experiential activities in the subject "Building a lesson plan for Mathematics to develop the qualities and competencies of learners"

Step 1: Analyzing the subject content in the Mathematics education module

Students has learned the following content:

- The 2018 Mathematics Curriculum

- Using teaching methods and conventional methods commonly used in teaching Mathematics to develop the quality of learners' competencies.

- An outline on how to design a lesson plan (in the module "Theory of general education")

Step 2: Determining the goal of the subject

Students can:

- Determine the objectives of Math lessons in primary school; select the content, teaching methods, means - teaching materials suitable to the goal

- Build a series of learning tasks in accordance with the objectives, content, teaching

methods, means - teaching aids.

- Design each teaching activity in the direction of developing the quality and capacity of learners.

- Design a lesson plan for Mathematics in elementary school.

-Through activities to help students develop their teaching capacity (designing appropriate and effective business plan), communication and cooperation capacity (teamwork, exchange with primary school teachers).

Step 3: Design experiential activities

*** Activity 1: Mobilizing relevant knowledge and experience**

Objectives: Students can design a lesson plan by their own experience; collect information related to the design of a customer service plan**.**

Missions:

- Task 1: Studying the 2018 Math Curriculum, analyze the lesson, refer to the Grade 2 textbook "Division" to design a mathematics lesson plan.

- Task 2: Refer to the lesson plan "Division" is done in primary school and attend this lesson at elementary school, prepare questions for primary school teachers.

- Task 3: Record the activities in the class and the experiences shared by primary school teachers when designing the lesson plan as well as when teaching in class.

When observing class, use these hint questions below:

Table 1. The teaching and learning activities of teacher and students in class

The teacher's activities	**The primary student's activities**
Activity 1 (In each activity, describe the specific activities of teacher and student as follows:)	
- How did the teacher transfer the task to the students? - How did the teacher observe/help students/groups of students in the process of performing assigned learning tasks? - How did the teacher organize/control students/groups of students to share/ exchange/ discuss and evaluate learning products?	- How did the student receive the learning task? - What did each individual student do (listen, speak, read, write) to perform the assigned learning task? For example, what have students heard/read, shown by what students have recorded in their personal notebooks? - What did the students discuss with their group, expressed through words and gestures? - What are the learning products of students/groups of students? - How did students share/discuss the learning products? Which students/groups of students report? How reported? How did other students/groups of students in the class listen/ discuss/ recognize other's report?
Activity 2	
…	…

Some feedback information of activity 1:

The lesson plan "Division" includes the following basic contents:

- Present the objectives of the lesson: present and explain the meaning and symbols of division; write division and division results in symbols; Speaking/writing is allowed to divide according to the given situation and find the result of that division; develop some component competencies of the mathematics competency through a number of activities: for example, the ability to think and reason mathematically when dividing 6 oranges equally between 2 friends in

the activity of forming new knowledge.

- Identify suitable maps and means: visual maps for students to perform division, electronic lesson plans.

- Design 4 main activities:

+ Warm-up activity: Creating excitement for students and mobilize related knowledge (multiplication)

+ Knowledge and math skill construction activity: Organizing for students to form symbols, meanings, and symbols of division through experience/exploration activities, such as dividing 6 oranges equally among 2 people.

+ Practical activity: Organizing activities to help students consolidate symbols, meanings, symbols of division and practice skills to find results of division by having students say/write the corresponding division with some evenly divided situations shown in the illustrations.

+ Applying activity: Organizing activities to help students apply division in some practical situations.

+ In addition, reinforcement and assessment activities can be added after school.

Activity 2: Observing and reflecting on the activities that have been done

Objectives: To analyze the structure of the Mathematical Science Plan performed; characteristics of activities in lesson plan; the appropriateness of factors: objectives - content - teaching methods in all activities of the teaching plan and the appropriateness of the elements in each learning activity.

Missions:

- Task 1: Compare the plan of the group with the plan of the primary teacher about:

+ Goals, sequence of learning tasks of students

+ The relationship: objectives - content - teaching methods - assessment methods in the business plan and the relationship between these elements in each learning activity. Which way is more reasonable, and why?

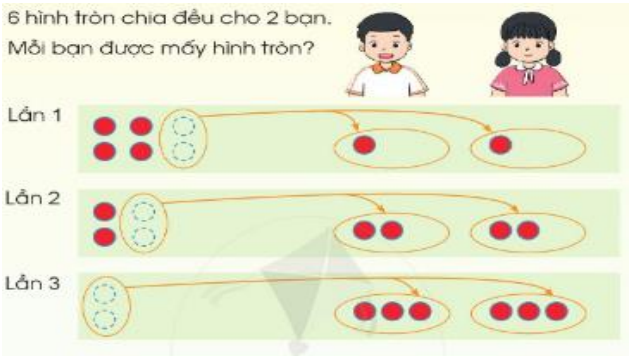
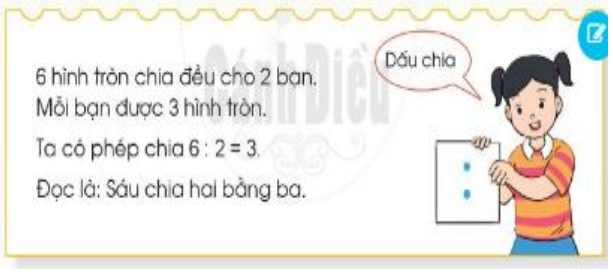
- Task 2: Is there any difference between the teaching plan of primary teachers and the actual activities in the classroom? Why is there such a difference?

(Instructions: Based on the lesson plan of the group and of the primary teacher, based on the classroom observations, based on the exchange and sharing of the primary teachers to perform the above tasks)

Some feedback information

Table 2. The comparison and analysis of the students' lesson plan with the primary teacher's plan

The students' lesson plan	**The primary teacher's plan**
Activity: Construct new knowledge and math skill	
Objective: Help students understand how to divide evenly, familiarize themselves with and perform division corresponding to the given situation. Teachers perform intuitive operations via PowerPoint: + 6 oranges divided equally into 2	Activity 1: Experiencing the situation of "equally dividing", helping students to perform the "dividing equally" - Students perform the operation "dividing evenly" under the guidance of the teacher (students can observe) - Teacher asks students to work in pairs: take out 6

baskets. + Each basket has 3 oranges + We have division 6: 2 = 3 + Read as: six divided by two equals three. - The teacher introduces the division mark, asks the students to take the division mark in the set of utensils. - Teacher asks students to read the division sign.	circles and divide them equally between 2 friends  - Students perform the operation in turn: give each friend a circle. And so on until all the circles run out (Indicate evidence and arguments) - Answer the question: "How many circles does each student get?" Student: Each of us gets 3 circles. (Describe the results of the observation) Activity 2: Standardization the knowledge, help students speak and write students the division by using mathematical language (speech-language and sign language) 
Comments: - The activities in the student's lesson plan: + The teacher chooses the situation "divide the oranges equally into two baskets", this situation is not available and the teacher solves the problem by using IT applications. The content of teaching, the method of implementation and the means of the teaching content are consistent and appropriate. + Advantages: The operation of dividing oranges, the results of dividing oranges on the slides are clear and vivid, students are easy to observe and understand the lesson. + Disadvantages: Students does not directly and actively participate in activities, so there is no opportunity for competency development. Therefore, the three factors mentioned above (content, implementation, and means) are appropriate and consistent but not consistent with the goal of developing quality and competency for students. - The activities in the primary teacher's lesson plan: + Teacher chooses the content of the situation "divide the dots equally for two friends". This visualization is available in the student's math learning kit and the method selected by the teacher is that the students manually divide these dots equally among their friends.	

+ Advantages: All students are directly and actively involved in the activity. Therefore, all objectives, teaching content, implementation, and teaching materials are consistent. Through this activity, students have an opportunity to develop their ability to solve problems and to use teaching aids and tools.

+ Difficulties: The organization of such activities for students requires the teacher to prepare the lesson plan more carefully, to anticipate possible situations when students use division (in case students divided into two unequal parts or they do not know how to divide and do not use division,...). During class time, the teacher also needs to have good classroom management skills to be able to manage the activities of students' groups and evaluate the performance of groups.

Activity 3: Abstract Conceptualization: Criteria of a mathematics lesson plan to develop students' competency in Mathematics

Objectives: To develop criteria for a mathematical plan to develop the quality of students' competence from reflections and analysis in previous activities; Develop criteria for the organization of classroom teaching with the designed plan.

Mission:

- Task 1: Based on the comparison and analysis between the designed plan of the designed group and the mathematical plan of primary teachers, proposing criteria for a mathematical plan and give levels for those criteria;

- Task 2: Based on the observations, comparisons and analysis between the primary teacher's plan and the actual activities taking place in the classroom, proposing criteria for the organization of teaching Mathematics in the classroom;

- Task 3: Discussing in general and unifying on specific expressions for each criterion.

Hint questions:

According to the criteria of a Mathematics lesson plan [10, p.38-41], we can use these hint questions to help students solve the problems.

Question 1: Each activity in the series of math learning activities (warm-up, new lesson formation, practice, application) is consistent with the objectives, content, and methods of teaching used to what extent can be described?

Question 2: In each student's learning task, how clearly are the objectives, content, implementation methods, and products described?

Question 3: In each student's learning task, how the appropriateness of the means and learning materials with the goals, content, methods and products be described?

Question 4: What criteria can evaluate the teacher's organization of each activity for students?

Question 5: What criteria can evaluate the performance of students' activities in class?

Activity 4: Active experimentation

Objectives: To design a Mathematics lesson plan according to the criteria that outlined in activity 3; Implement classroom teaching activities with that lesson plan; Adjustment of lesson plan.

Missions:

- Design the lesson plan "Numbers round hundred, numbers round ten (grade 2)" in the National Mathematics Curriculum.

- Represent each group to conduct classroom teaching at the practical school. Other members observe and record the activities of teachers and students during class time. Using the class observer.

- Based on the teaching and observations during the lesson, use the criteria table

established in the previous activity to evaluate each activity during the lesson.

- Adjust the lesson plan after the assessment.

Feedback information

After preparing a new lesson plan using the new knowledge acquired from activity 3 and conducting experimental teaching in class, students use the criteria given in the activity to self-assess the design of their lesson plan, combined with the teacher's assessment.

Table 3. Self-assessment of student after performing classroom teaching activities with the self-designed lesson plan

Criteria	Level			Score	Comment
	1	2	3		
Criterion 1: The relevance of the series of learning activities to the objectives, content and teaching methods used:					
Warm-up Activity			x	3	Creative warm-up activity, creating excitement for students, and at the same time connecting the knowledge of round numbers in grade 1 (two-digit numbers) with the lesson "round hundred and round numbers" in grade 2 (3-digit number)
Constructing new knowledge and math skill Activity			x	3	The content is appropriate, students are done with hundred/tenth square cards to write the corresponding number
Practical Activity			x	3	There are enough content for students to express verbally and sign content
Applied Activity		x		2	The content is similar to the practice-practice section. If only recounting, students have not really participated in the experience.
Criterion 2: The clarity of objectives, content, organization and deliverables for each learning task					
Warm-up Activity			x	3	Objectives, content, organization, and products to be achieved are clearly described
Constructing new knowledge and math skill Activity		x		2	The activity of analyzing the number 100 into hundreds and tens, the students can do it themselves, the teacher should not explain and model first.
Practical Activity		x		2	It is necessary to add more individual writing activities (lesson 3) because, in exercises 1 and 2, students only answer and write numbers in groups.
Applied Activity		x		2	Teachers need to redesign so that students can experience how to arrange bowls/plates into boxes by hundreds or tens
Criterion 3: The appropriateness of teaching equipment and learning materials used to organize students' learning activities					
Warm-up Activity			x	3	Prepare appropriate worksheets
Constructing new knowledge and math skill Activity		x		2	Reasonable use of the 100 square boxes in the map, the table is not clear for students and teachers to fill in the numbers.

Practical Activity			x	3	Properly prepare means for students to fill in the blanks with appropriate numbers
Applied Activity		x		2	Students who only look on the side have not had the opportunity to apply and experience in practice.
Total scores (30/ 36) *- Use appropriate learning materials* *- Use creative content* *- Teaching methods have been active in students' learning activities, there are opportunities for students to develop their general competence qualities and component competencies of mathematical competence. However, the way activities are organized should be created for students to have more opportunities to explore and experience.*					

3. Conclusions

After designing experiential activities for students with the topic of lesson planning, we organized these activities for students and obtained very positive results. Students are active, responsible, interested in performing tasks. Evaluation of the capacity to design lesson plans before and after the activity showed that the students had formed the capacity to design lesson plans in a short period of time, and initially implemented them. classroom teaching capacity with the designed lesson plan. This study also opens the way to redesign all modules of the subject into experiential activities for students in order to help students achieve the competencies required by the training program, access to achieve the competency to teach mathematics in primary school.

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