Implementation of Multimodel Active Learning to Improve Basic Teaching Skills of Pre-Service Physics Teachers

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Implementation of Multimodel Active Learning to Improve Basic Teaching Skills of Pre-Service Physics Teachers

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Abstract. Pre-service teachers must have a good basic teaching skills that are opening lesson, use of learning model, use of learning media, mastery of teaching materials, submission of teaching materials, class management, and closes lesson ability. Basic teaching skills influenced by learning material design and communicating skill. Improving pre-service's basic teaching skill can't did only by an effective learning model, but a collaborative model that can called multimodel learning. From the study known that pre-service teacher have a good score of learning design and teaching skills.

1. Introduction

Improving the quality of education can be started by increasing the basic teaching skills of prospective teachers while implementing pre-service training in universities. Increased competence of the teacher candidate is not only on the science material but also on the pedagogy. This condition relates to the teachers'role as professional educators who are not only judged from the understanding of the science concepts but also the ability to teach those concepts. Basic teaching skills that should be owned by prospective teachers (pre-service teachers) are the ability to open lessons, use of learning models, use of instructional media, mastery of teaching materials, submission of teaching material, classroom management, and closing lessons.

Improving the ability to teach students as candidates for physics teachers can be done through the application of active learning. Active learning is a learning approach that provides opportunities for students to play a more active role in the learning process (searching for information, processing information, summarizing it, and applying) by providing a learning environment that makes students not depressed and happy to carry out learning activities ([1])

Referring to Fink [2], active learning consists of two main components, namely experience, including doing and observing and dialogue, including self-dialogue and dialogue with others. Doing is an activity that refers to the learning process in which students actually do something real and directly interact with related objects. Observing activities occur where students can see and listen when other people "do something", related to what they are learning. Observing actions can be done "directly" or "indirectly." Direct observation means that students are invited to observe real activities or situations directly. Indirect observation means that students are invited to observe the situation, case study or invited to watch a movie (video). Dialogue with Self is a student activity in reflective thinking about a topic. The student can ask himself, what is or should be considered, what is felt from the topic he is studying, and "think about his own thoughts (thinking about my own thinking)". This ability to think is called metacognitive ability. Dialogue with others can be seen in the interaction between

students in the class that aims to make the process of exchange of thoughts occur. This activity can be done by discussing in groups or class discussions with experts or other sources.

The improvement of teaching ability as a physics teacher candidate can be held through the application of multimodel active learning in a class that facilitates the practice of teaching (peer teaching and microteaching). The learning system was done using multimodel active which includes interactive learning models with the aim of improving the quality of student involvement during the learning process such as Problem Based Learning (PBL), Cooperative Learning type Jigsaw, and Think Pair Share (TPS), and Direct Instruction. Each model has its goal achievement that can facilitate the improvement of basic skills of teaching for pre-service teachers. PBL used to help master the basic concepts about types of learning models, Cooperative Learning (Jigsaw and TPS) used to support students in group discussions, and Direct Instruction provides examples of modeling the implementation of a learning model in class.

This research is dedicated to study the influence of the application of active learning multimodel on the ability of students as candidates for physics teacher in designing and learning implementation. Pre-service teachers are expected to have excellent and competent teaching basic skills so that later they can apply effective learning systems when teaching in schools.

2. Methods

This research uses mixed method model, that is combining both qualitative and quantitative research method using explanatory design with participant selection model (QUAL emphasized). The data obtained from the learning is analyzed qualitatively and quantitatively to describe the complete results of the research. Characteristics of this method are data retrieval, and data analysis done quantitatively as the support method and then continued with the data collection and qualitative analysis as the primary method. Qualitative methods in this study are expected to help to get a description of the variables measured such as the basic teaching skill. In general, the stages of this research as follows,

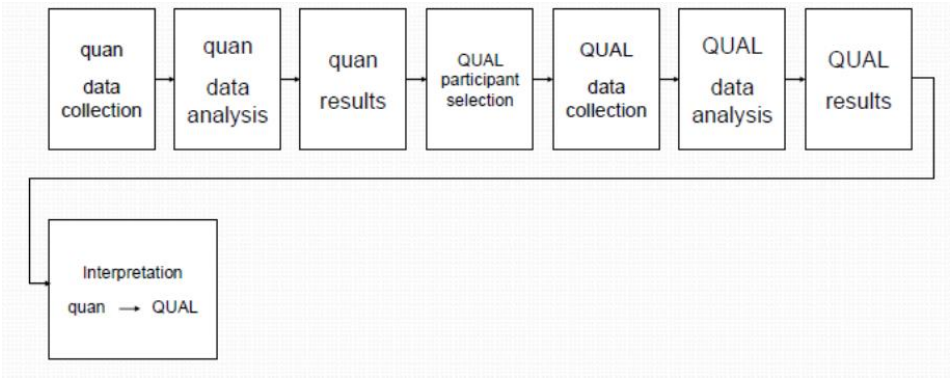


Figure 1. Design of mixed method experiment

Quantitative data retrieval research conducted after the implementation of multimodel active learning of pre-service teachers. Quantitative data in this study were obtained through tests at the end of learning which included the subject matter of the pedagogic and physics materials. Other quantitative data is in the form of the value of observations of the ability to teach physics teacher candidates which include the ability to design teaching materials and peer teaching and qualitative data is a description of learning observations using active multimodel and peer teaching observations. Besides that, the results of interviews with prospective teachers were also related to the peer teaching results that had been conducted.

In addition to getting a quantitative score, interviews and activity record to determine the success of the action also conducted. At the time of the interview session, the students were asked to state the advantages and disadvantages of the learning that had been done. Quantitative and qualitative data were then analyzed to determine their accuracy. The data analysis showed the students' teaching ability improvement after the action. These results can be used to express the effectiveness of applied learning.

3. Results and Discussion

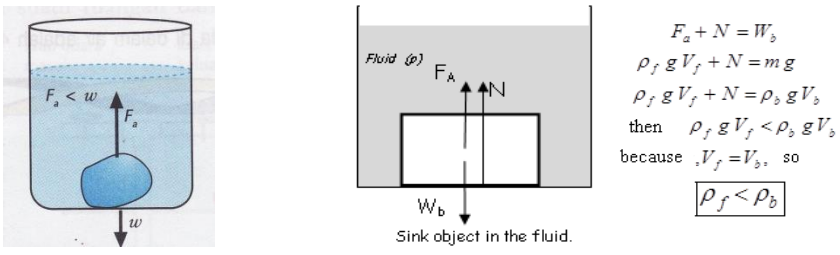
This activity begins with the implementation of learning using active learning multimodel. Some types of learning models are implemented during the lecture process by referring to the expected goals, which can train the teaching skills of physics teacher candidates. Learning models selected include PBL (problem-based learning), Jigsaw cooperative learning and think pair share, as well as Direct Instruction.

As the final product of the learning process, students are asked to do peer teaching using learning models that have been taught in the classroom. Peer teaching is done to find out students' abilities in teaching. Before peer teaching, students were also asked to prepare lesson plans according to the model applied. Assessment of the lesson plan is carried out by looking at the completeness of the components and the suitability of the content with the objectives to be achieved. Score of lesson plan include as quantitative data. The following are quantitative data of learning design ability which obtained during the study.

Table 1. Learning Design Data

Aspect	Average score	Official Statement
Arranging learning indicators	81,25	Difficulties in determining cognitive level
Arranging learning objectives	85,00	Adjust the ABCD format (audience, behaviour, condition, degree)
Analysis of learning materials	70,00	There are still found inappropriate concepts and misconceptions
Analysis of learning models	77,50	The learning model used should not be random chosen
Arranging syntax of learning models	78,75	The stages are in sequence but the contents are incomplete
Ability to choose learning sources	81,25	Learning resources are relevant to students' needs

Based on data, known that students as candidates for physics teachers have quite good abilities in designing learning. A good lesson plan can make an effective learning because effective implementation of educational and instructional activities requires planned work ([3]). The preparation of a good lesson plan is influenced by the completeness of its components, including indicators of learning, learning objectives, teaching materials, selection of learning models and methods, syntax (step of learning model), and selection of learning resources. The lowest value obtained by students is related to the preparation of teaching materials. In the teaching material, there is still a discrepancy in the concept. An example is the static fluid material in the Archimedes's law which discusses objects that float and sink in the fluid. Figure 1 is the example of incomplete material. Students show an image of a sink object, but they do not explain the concept. Sink object has three force which included to the system, such as buoyancy force (Fa), Weight (Wb), and Normal Force (N) because the object was touched bottom surface of the glass.



(a) **(b)**

Figure 2. Example of sink object from student material on the lesson plan (a) Example of complete concept (b)

The second quantitative data are score of pre service's teaching skills. The basic teaching skills contain of opening lesson, use of learning model, use of learning media, mastery of teaching materials, submission of teaching materials, class management, and closes lesson. The data shown on Table 2.

Table 2. Description of Teaching Skill Component

Aspect	Average score	Official Statement
Opening Lesson	70,00	Less of using interesting and unusual phenomenon
Use of Learning Model	86,25	Good, because effect of modelling
Use of Learning Media	91,25	They have good creativity
Mastery of Teaching Materials	71,25	There are some misconception
Submission of Teaching Materials	88,75	The communicating skill is good
Class management	80,00	They have good interaction with students
Closes Lesson	73,75	Lack of time

Based on data of Table 2, known that students as pre-service physics teacher have highest score in using learning media (91,25). This is influenced by the high creativity of students in making and using innovative learning media. In addition, it is also supported by technological sophistication that can be utilized by the community to the fullest. In accordance with [4], that learning media can be a useful component for organizing learning activities. Students also have realized the importance of media in learning physics, so that the value obtained is optimal. Other high values are found in the ability to explain physics material. They earned an average score of 88.75 which means that the ability of students to inform teaching material is well supported by a language that can be understood by students. According to [5], students will be better able to understand and explicate how language is used as it is being acquired through interaction resourcefully, contingently, and contextually.

The ability to teach with the lowest score is to open and close the lesson. The score obtained is less than 75. Based on the results of interviews with students, the low score influenced by the timing of inappropriate activities. Students do peer-teaching with a time allocation of 1x45 minutes with certain teaching materials that done in class with a time allocation of 2x45 minutes. As a result, many students cannot complete the learning on time. Whereas for the ability to open the lesson is influenced by the lack of creativity of students in providing physical phenomena that can be a link between teaching materials and their applications. Examples delivered by students are phenomena that have often appeared during teaching activities. Students should be able to find other cases that are better and more recently the teaching material presented.

At the end of the peer-teaching stage, students are asked to conduct tests to determine their ability to master basic physics and pedagogy. Physical material tests include the fields of kinematics, dynamics, thermodynamics, optics, and magnetic electricity. While pedagogy material comprises knowledge about school curriculum, characteristics of students, learning theory, innovative learning, and assessment systems. Based on the test results, students tend to have a better pedagogy score, which is 67% and a physics score of 33%. Ideally, they should have equal value (50:50) because as candidates for physics teachers, students are required to have the ability to both teach and deliver teaching materials in physics. Figure 3 shows the results of the student test scores.

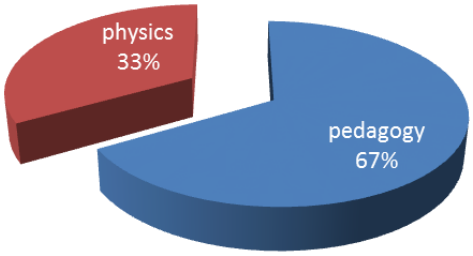


Figure 3. Score of Physics dan Pedagogy Test

Active learning that is applied is not only capable of improving students 'understanding of teaching material but also can improve students' ability to carry out learning. The ability to carry out learning is an ability that can improve through skill training. This statement supported by the research's results in [6] which can improve the ability of students who are skilled with active learning.

Furthermore, the application of multimodel through the collaboration of several types of learning models that applied in the classroom is known to improve students' teaching ability. This ability improvement is known from the results of observations when students conduct peer-teaching activities compared to the previous year's class. Students who receive learning using multimodel active learning have better abilities than last year students. This improvement is evidenced by the appearance of students when peer-teaching is neater, structured, and appropriate with the lesson plan. This is a positive impact of each model that is applied, namely (1) Problem Based Learning (PBL), helping students in analyzing the basic concepts of learning to be carried out, (2) Cooperative Learning type Jigsaw, and Think Pair Share (TPS), help students collaborate and interact socially with colleagues; and (3) Direct Instruction provides modeling learning so students know first-hand the stages in the classroom implementation.

Through active learning, students are more accessible to remember and understand teaching material. The teaching material focused on content that is the basis for students when conducting teaching practices such as learning theories and learning models. Students are not only invited to learn the material, but also develop it and form the characteristics of their learning. This condition is following by active learning goals based on Student-Centered Learning. Students get the opportunity to be actively involved during the learning process, not only emphasizing the mastery of the material but also in the development of student character (life-long learning) ([7]).

4. Conclusions

Based on the result of the analysis and discussion, it is found that the basic ability to teach physics teacher candidates is of good enough value and meets the criteria expected during the lecture process using active learning multimodel. Students can practice complete teaching methods according to the design stages of learning.

One of the interesting findings in this study is that the students as candidates for physics teacher have a dominant value in mastering the subject matter in the field of pedagogy compared to the physics materials. For suggestions, physics majors related to this problem i.e the holding of training or seminars for pre-service physics teachers need to link to how to learn effectively and efficiently. It is expected students can improve the understanding of physics and pedagogy materials. Also, further research is needed for students to obtain a comprehensive result related to the effects of innovative models in the understanding basic teaching skills.

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