



Capability Analysis of Pedagogical Content Knowledge (PCK) of Preservice Physics Teachers on Microteaching

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Article Info	Abstract
Article History Received: 13 Agustus 2019 Revised: 5 September 2019 Published: 30 September 2019	<i>Pedagogical Content Knowledge (PCK) is a knowledge combination of pedagogic and teaching content. This study aims to analyse the PCK ability of preservice teachers during microteaching subject. This research is a descriptive study to get an initial description of PCK ability of preservice teachers. CoRe and PaPeR were used as research instruments and the subjects are 25 students who took microteaching in semester 2 Academic Year 2018/2019. Based on the results of CoRe and PaPeR analysis, it is obtained that the number of big ideas for the development of teaching material is only 1 to 3. In average, physics materials selected by the preservice teachers were basic materials in X and XI grade of high school. Furthermore, 72% of preservice teachers had difficulty in mastering concept that result in misconception in explaining physics concept. Only 24% of preservice teachers were able to utilize effective learning media and learning strategies and 56% still had difficulty in class management. The difficulty of preservice teachers in preparing assessments was only 36%. While in the provision of apperception, 52% of preservice teachers had constraints. It can be concluded that the ability of preservice teachers' pedagogical content knowledge (PCK) was still inadequate and needs to be improved by applying right strategies in microteaching.</i>
Keywords Pedagogical Content Knowledge (PCK), Preservice Teachers, Physics	
Sitasi: Safriana, Marina. (2019). Capability Analysis of Pedagogical Content Knowledge (PCK) of Preservice Physics Teachers on Microteaching. Science Education and Application Journal (SEAJ). Vol. 1, No. 2:62-67	

PENDAHULUAN (INTRODUCTION)

The government is currently promoting the preparation of qualified human resources in the face of the 4.0 industrial revolutions. The quality of human resources that has competitiveness is defined by the education system. Teachers play an important role in the development of education. Teacher is the spearhead in determining the quality of education outcomes in Indonesia. This is in accordance with the statement by (Sunhaji, 2014) that teacher is the most influential component in the process and results of education. Other than that, (Ramdhani et al., 2012) also added that teacher competence plays an important role in attaining student academic achievement. Therefore, a qualified teacher would create a qualified education.

One attempt to improve teacher quality is by developing the quality of preservice teachers at the university. This is in accordance with Clarke and Hollingtown's statement that teacher professional development begins when they are still as preservice teachers during education period (Indrawati and Sutarto, 2016). University needs to prepare a top learning program for students to become qualified educator and to acquire professional knowledge before teaching in the classroom (König et al., 2017).

Physics Education Study Program under the Educational Institutions of Higher Education (LPTK) is a program that is expected to produce graduates of professional physics teacher. To achieve that, students are required to have good pedagogical abilities in addition to

mastering physics materials. (König et al., 2017) argues that pedagogical knowledge is knowledge about students, learning, assessment, purpose and context of education. While content knowledge is knowledge about certain subject related to the content that must be taught by teacher. When that knowledge is combined during teaching, it will produce new knowledge, namely pedagogical content knowledge (PCK).

PCK is one of the abilities that must be possessed by teacher. According to (Evens, Elen and Depaepe, 2015) the ability of PCK is very important for teachers because it represents teacher's professional. PCK is a concept of thinking, which explains that it is not enough to teach science by just knowing science content but also how to teach (Sukaesih, Ridlo and Saptono, 2017). In addition, PCK can also be interpreted as a description of how teacher teaches subject by accessing what is known about the subject, about the students, about the curriculum related to the subject and what is believed to be a right way of teaching in the context (Rollnick et al (2008) in (Rahmat and Purwianingsih, 2016)).

The ability of PCK is not an ability that is self-acquired but it must be trained and developed. Shulman (1987) explained that the ability of PCK could be developed during the process of becoming preservice teachers. One effort to develop PCK is through the development of courses based on learning and teaching practices such as microteaching. Microteaching is a technique that can be used to develop the professional of preservice teachers (Karçkay and Sanlı, 2009) dan (Bilen, 2015). In microteaching, the skill of preservice teachers in teaching is evaluated and the fellow students provide input for improvement (Altuk, Kaya and Bahceci, 2012). Thus, microteaching is a method that can be used to develop PCK ability of preservice teachers (Kartal, Ozturk and Ekici, 2012).

But so far, the microteaching subject has not yet involved in the development of PCK. Based on the results of the observation during the implementation of microteaching practice, the preservice teachers experienced several obstacles in understanding the curriculum, such as the discrepancy of indicators in achieving basic competency (KD) and the use of media that was still lacking and not optimal. In addition, they also tend to be weak in mastering the material. This is known from the number of preservice teachers who experienced misconceptions during teaching (Safriana and Fatmi, 2018). This is in accordance with the results of the study (Purwoko, 2017) that weak teacher mastery of content can result in impartial student understanding of the concepts. These constraints are related to pedagogical skill and content mastery or Pedagogical Content Knowledge (PCK) capability.

Based on this, PCK analysis is very important to be conducted to know the ability of Pedagogical Content Knowledge of preservice teachers in Physics Education Study Program FKIP University of Malikussaleh as an initial description of pedagogic competence and content mastery before entering the supervised teaching training at school. The data obtained can be used as an evaluation related to the learning process and curriculum evaluation in Physics Education Study Program in order to improve the quality of graduates. PCK analysis is also expected to provide information about whether the students already have good PCK ability or still need improvement.

METODE (RESEARCH METHOD)

This research is a descriptive research to analyse and describe the PCK ability of preservice teachers in Physic Education Study Program. The subjects of this study are 25 students who took microteaching courses in semester II Academic Year 2018/2019. The instrument for collecting data on PCK abilities is CoRe (Content Representation) and PaP-eR (Pedagogical and Professional-Experience Repertoire) (Loughran, Berry and Mulhall, 2008). Descriptive analysis was carried out on the data obtained from the results of CoRe and PaPeR. The indicators used to analyse PCK include apperception, selection of basic competency and teaching material, the number of big ideas for teaching material, time management, classroom

management, content mastery, selection of teaching strategies, and selection of learning media. The PCK data were analysed in descriptive percentages.

HASIL DAN PEMBAHASAN (RESULTS AND DISCUSSION)

Based on the results of data analysis on the PCK ability from 25 students using CoRe (Content Representation) and PaP-eR (Pedagogical and Experience Repertoire), the information is presented in the following tables 1 and 2.

Tabel 1. CoRe Analysis Results of PCK

Student	Material	Class	Number of Big Ideas
1	Static Fluid	XI	2
2	Free Fall Motion	X	2
3	Dynamic Electricity (Current)	IX	2
4	Newton's Law	X	3
5	Temperature and Heat	X	3
6	Straight Motion	X	2
7	Temperature	X	2
8	Gas Kinetics	X	2
9	Force and Energy	X	2
10	Force and Energy	XI	3
11	Static Fluid	XI	2
12	Free Fall Motion	X	2
13	Force and Energy	XI	1
14	Straight Motion	X	2
15	Dynamic Electricity	IX	1
16	Light	X	3
17	Temperature and Heat	X	2
18	Harmonic Motion	X	3
19	Static Electricity	IX	2
20	Force and Energy	XI	3
21	Force and Energy	XI	2
22	Geometrical Optics	X	2
23	Temperature	X	2
24	Static Fluid	XI	3
25	Harmonic Motion	X	3

Table 1 shows that in the preparation of lesson plan, the preservice teachers only chose materials for class X and XI at 60% and 40%, respectively. No one chose class XII materials. This is because they considered basic material in grades X and XI is easier and the difficulty level of the material is not too high. In addition, teaching material in class X and class XI is not too difficult compared to class XII. The table also shows the number of big ideas contained in CoRes answer about teaching material were only 1 to 3. This shows that the preservice teachers were not capable to master the material properly. During the teaching practice, the preservice teachers were still not confident, nervous and still had difficulty in explaining the material. The following is the summary of the reflections of the preservice teachers' constraints while teaching presented in Table 2.

Table 2. Student Reflection Summary

Aspect	Reflection
Teacher Readiness (Personal)	They were not ready, tensed, stiff and lack of confidence in teaching because they still have lack of mastery on physics material. It seemed that the preservice teachers were still too nervous in delivering the material, did not master the concept well so they had misconceptions, were nervous and talked too fast. They used materials from website not from book. The materials were not in accordance with the basic competence. They only provided materials on the Student Worksheet without explanation.
Teacher Readiness during Teaching Practice	The teaching practice was not really effective, lack of mastery of good teaching practice, often not in accordance with the lesson plan that has been made, not really able to manage the class well, there were still misconceptions, lack of interaction between teacher and students, lack of mastery of the lesson plan that has been made, did not emphasize on answers. They were also not really able to associate material with everyday life and difficult to interact with students during teaching.
Time Management	They had difficulty in controlling time during student discussion, were not able to use the time well, and were in rush pursuing time. Learning objectives were not achieved according to the target.
Media Usage	The use of media is not varied, not maximal and not effective to increase students' understanding. The media used were only boards, slides, videos and student worksheet. They were unable to utilize those media to explain concepts.
Learning strategies	Learning strategies had not been carried out optimally, not in accordance with the syntax of the lesson plan, more teacher-centred. Lack of mastery of learning strategies; they often used lectures, guess prizes, group discussions and answer percentage. Overall, they had not been able to implement learning strategies in accordance with the lesson plan that has been made.

The reflective summary results show the obstacles experienced by the preservice teachers during teaching; for example, the difficulty of giving apperception at the beginning of learning, explaining concepts and mastering learning strategies. This shows the need for an evaluation for lecturers to continue guiding and coaching the students through lectures and curriculum in order to improve their ability to teach, optimize their mastery of physics materials and pedagogy. The other cause that made students being not optimal in teaching during the microteaching is that they still took many courses during microteaching, so, they did not have good preparation.

Table 3. Observation Results of Obstacles during Microteaching Based on PaPeR

Component	Percentage
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Time Management	40%
Class management	52%
Mastery of the Concept	72%
Strategy Selection	76%
Media Usage	76%
Assessment	36%
Apperception	52%

Furthermore, the results of PCK analysis of the preservice teachers through Content Representation (CoRe) instrument developed by Loughran and his team (Loughran, Berry and Mulhall, 2008) represent the depth of knowledge of preservice teachers about the material to be taught at a certain level. Preservice teachers answer the questions on CoRes Instrument by formulating a number of big ideas relating to the material that will be taught to students. The formulation of these important concepts will determine the learning strategies that will be applied and the scope of concepts adapted to curriculum (Ramdhani et al., 2012). The results of the study show that the preservice teachers could only formulate big ideas related to material as much as 1 to 3 big ideas. This can be seen in the lesson plan draft made by them. The assessment based on the Cores aspect shows that they were still weak in the mastery of materials and the strategies applied during teaching were not really effective. This is because the preservice teachers did not understand the use of teaching instruments properly. Learning can be said to be effective if the teaching instruments used is adjusted to the needs and characteristics of the teaching material (Sulmi, 2019).

Aside from CoRe, PCK of the preservice teachers was also analysed using PaPeR. Table 3 shows that the preservice teachers experienced problems in time management by 40%, only 60% were able to manage the time to teach well. This is because they still have lack of experience in teaching so that they had obstacles in managing time well. In addition, the constraints in classroom management were also experienced by 52% of the preservice teachers. They did not understand how to manage the students well.

In mastering the concept, only 28% of preservice teachers mastered the concept well. 72% had low concept mastery, as seen from misconceptions they made during teaching practice. Furthermore, the constraints of preservice teachers in the selection of strategies and media use are quite high at 76%. They had difficulties in deciding and implementing teaching strategies that have been made and were still using board as teaching media. In addition, the preservice teachers also had not been able to utilize the media optimally such as the use of video and slides. This shows that the understanding of the preservice teachers on the principle of active learning had not been applied to the maximum (Sukaesih, Ridlo and Saptono, 2017). In the aspect of assessment, overall students were able to make a complete assessment instrument, which consists of cognitive, affective and psychomotor assessment. But in the aspect of apperception, 52% of the preservice teachers had difficulty in giving apperception. Only 48% of students could give a suitable apperception in accordance with the concepts taught. The assessment of apperception aspects was also seen when they answered questions in CoRes. In general, they did not understand how to explain to students the importance and usefulness of the concepts. In addition, they also had not been able to provide contextual questions that are in accordance with the material being taught so that they had difficulty in giving apperception

KESIMPULAN (CONCLUSION)

Based on the results of the study, it can be concluded that the pedagogical content knowledge (PCK) abilities of preservice teachers are still inadequate and need to be improved in several aspects such as concept mastery, effective teaching strategy, apperception and physics instructional media. As for suggestions for further research, it is necessary to think of a suitable

strategy in teaching microteaching so that it would be able to improve the teacher's pedagogical content knowledge (PCK) skill

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