THE ABILITY OF PEDAGOGICAL CONTENT KNOWLEDGE (PCK) PROSPECTIVE ELEMENTARY SCHOOL TEACHERS

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Abstract
This research is motivated that to support the professionalism of prospective elementary school teachers, it is necessary to be equipped with the right pedagogy and also the ability in mastering teaching materials, the collaboration between them is called Pedagogical Content Knowledge (PCK). This research aims to analyze the ability of PCK prospective of elementary school teachers when planning, implementing and reflecting learning. This research method uses a qualitative approach with descriptive design method. The three students sixth semester the involved as research subjects. Three participants were assigned to teach in class V about with water cycle material. Before implementing the lesson, each participant was asked to prepare the lesson plan, fill out the CoRe format and after carrying out the lessons asked to narrate the reflection on the implementation of the lesson in the PaP-eRs format. During the observations of execution of learning are conducted as complementary data. The research instrument used CoRe format, PaP-eRs format, RPP format and to plan instrument support that is observation sheet. The results showed that the ability of prospective teachers to plan the learning using CoRe is good enough because it is able to integrate pedagogical knowledge and content knowledge. But, it is still not been optimally implemented in making RPP. Prospective teachers have not yet fully formulated the objectives of learning, the selection of learning resources has not varied because it is only fixated on the student handbook, and in final activities do not tell about the present knowledge.

Keywords: PCK, Prospective Elementary School Teachers, CoRe, PaP-eRs.

1. Introduction

Teachers are an important aspect of education. The main task of the teacher is to educate, guide, teach, train students. The task of educating is closely related to how students are educated through a variety of scientific approaches to fit the goals of education and the values prevailing in society. Therefore, teachers are expected to have pedagogic competence, personality, professional and capable personality.

Teacher is also a profession. The profession is said because the process is pursued through the special education level of teacher training which in the process is equipped with educational sciences. This knowledge distinguishes it from other professions. Therefore, as a profession, teachers have to get insight knowledge of the task of educating, teaching and other professional duties.

To support its professionalism, the teacher needs to be equipped with the right teaching knowledge and the knowledge of mastery of profound teaching material. There are aspects that need to be considered in the science of education that is related to the ability to master the material, convey the subject matter, and the ability to use models, approaches, strategies, learning methods. Even teachers are also required to be able to master and optimize the media and learning resources.

Mastery of knowledge about how to teach the concept of teaching material aims so that the learning material can be delivered optimally. On the other hand, the teacher or prospective teacher also should master the teaching material that will be taught in the learning process. Collaboration between pedagogical knowledge and knowledge of the concept of teaching material is called PCK (Pedagogical Content Knowledge). According to Shulman (1986) pedagogical content knowledge is knowledge that must be understood by a teacher and prospective teacher. PCK provides an overview of teacher competencies in learning process.

Teacher candidates are important profession who will in the future be responsible for practicary optimal learning in accordance with the expected goals. By having PCK knowledge, prospective teachers are expected to be able to prevent misconceptions (misconceptions) of students regarding the material being taught which will result in less optimal learning outcomes.

Based on consideration of the importance of professional competence of teachers and prospective teachers, this study takes the title "The ability of Pedagogical Content Knowledge (PCK) for Prospective Elementary School Teachers." (Descriptive study of students of PGSD STKIP Bina Mutiara Sukabumi on Water Recycling Materials).

The problem formulation in this research is how is the ability of PCK candidates for elementary school teachers in planning, implementing and reflecting on learning? ”The formulation of the problem is explained in the following questions:

1) What is the profile of PCK ability for elementary school teacher candidates in planning learning?
2) What is the profile of the ability of PCK candidates for elementary school teachers to implement and reflect on learning?

The purpose of this research is as follows

1) To find out the ability of PCK prospective elementary school teachers in planning learning.
2) To find out the ability of PCK candidates for elementary school teachers in implementing and reflecting on learning.

The results of this study are useful especially in providing information about the ability of Pedagogical Content Knowledge (PCK) of prospective elementary school teachers in water recycling material at STKIP Bina Mutiara Sukabumi. In addition, this research is useful as a study material for further researchers related to the ability of PCK prospective elementary school teachers. Besides this research is also useful to equip prospective teachers about PCK knowledge that are expected to be implemented when they will become teachers.

2. Related Works/Literature Review

Concept of Pedagogical Content Knowledge (PCK)

The teacher is a profession that has the task to teach. Teaching assignments should continue to be improved to support their professional performance. In practice, teaching itself complex and varied. Teaching means not just transferring knowledge. But, just as constructivism views, the process teaching of organizing student activities through a series of activities that give birth to a learning experience. In this case, the role of the teacher as a facilitator facilitates students to learn, where the teacher is expected to actively create an environment that supports student learning. The students are positioned as active subjects who construct their knowledge, skills, and attitudes so that this activity pattern is known as student centered.

In the context of the teacher's role as a facilitator, the teacher's task is to facilitate the student can learn well. Of course, this task is not easy. Teachers need knowledge about how to teach certain content or teaching materials, so that the teacher is able to make plans, make choices of strategies, methods, media, appropriate teaching materials. On the other hand, teachers are also required to master a number of content knowledge or teaching materials so that information in the form of knowledge can be conveyed in full, in addition to avoid misconceptions about the material being taught. Collaboration between pedagogical knowledge and content knowledge is commonly called Pedagogical Content Knowledge (PCK).

According to (Loughran, Mulhall, & Berry, 2008) Pedagogical Content Knowledge (PCK) is a theoretical construction introduced by Shulman (1986) as a way of describing certain forms of content knowledge that embodies aspects of content that are most closely related to efforts to formulate the certain material subject to be easily understood by students. Furthermore, according to Borko & Putnam in (Loughran et al., 2008) PCK is useful for exploring aspects of teacher professional knowledge and, for some development, Pedagogical Content Knowledge (PCK) is considered a teacher education goal. As according to (Rollnick, Bennett, Rhemtula, Dharsey, & Ndlovu, 2008) Pedagogical Content Knowledge (PCK) can be described as teacher's teach, in the way teachers can access what they know about the subject, the students, and the curriculum which they work and what they believe is important in the context of their teaching.

According to Shulman in (Childs & McNicholl, 2007), knowledge of pedagogical content includes:

"The most useful form of representation of topics, analogies, illusions, examples, explanations, and demonstrations is the strongest, a way to represent and formulate a subject that makes it understandable to others. Pedagogical knowledge content also includes an understanding of what makes certain learning topics easy or difficult: conception and prejudice that students of different ages and backgrounds bring along learning topics and lessons that are most often taught. "

In Geddis and Wood (Rollnick et al., 2008) considers that Pedagogical Content Knowledge (PCK) as a category of more knowledge which involves transformation of subject matter pedagogy, besides Pedagogical Content Knowledge (PCK) is a representation of subject matter, instructional strategies, curriculum material, and curricular. The last term refers to the teacher's understanding of the place of the topic in the curriculum and the purpose of teaching it.

Shulman in (Putra, Widodo, and Sopandi, 2017) stated that PCK includes forms of representation, analogies, illustrations, the most useful examples, explanations, demonstrations, pedagogical techniques, and knowledge of concepts. Meanwhile, according to Shulman in (Henze, Driel, & Verloop, 2008) as teacher's knowledge of (a) instructional strategies on certain topics; (b) students' understanding of this topic; (c) ways to evaluate the student understanding of this topic; and (d) goals for teaching specific topics in the curriculum. Based on this explanation, it can be understood that Pedagogical Content Knowledge (PCK) is a knowledge of pedagogical abilities in delivering content or teaching material, as well as content knowledge or teaching materials.

Pedagogical Content Knowledge (PCK) for prospective teachers

Teacher candidates are one of the potentials in education. They become "iron stock" which will be useful in the process of improving the quality of education, because they tend to have the ideal

theoretical understanding obtained in the lecture process. This understanding is useful as a provision when undergoing a profession as a teacher. According to (Nilsson, 2008) prospective teachers need togain a deeper understanding of subject content and pedagogical abilities in the context of learning and how they interact in teaching classes in order to be able to build students' scientific conceptions.

To become an ideal teacher, the prospective teacher students are required to always learn in everything, especially in terms of teaching. They need to learn about how to deliver teaching material, in addition they also have to master the teaching material. More specifically, they need to be provided with some knowledge about designing learning, managing classes, sorting learning strategies, mastering teaching materials, delivering teaching materials, evaluating and giving reinforcement.

In practice, prospective teachers tend to face constraints that allow them to have difficulties when asked to design learning related to certain material that starts from mastering the material and designing the effective learning strategies to be taught. Therefore, the knowledge of prospective teachers needs to be explored to be given briefing about mastering the content or teaching material and how to teach it based on a pedagogical approach. This knowledge is called Pedagogical Content Knowledge (PCK).

Assessment of Pedagogical Content Knowledge (PCK) through CoRes and PaP-eRs

The assessment of Pedagogical Content Knowledge (PCK) in general based on several studies, was carried out using CoRes and PaP-eRs instruments. Both of these instruments are able to describe descriptively the knowledge and ability of teacher and prospective teacher's Pedagogical Content Knowledge (PCK). According to (Bertram, 2014) content representations (CoRes) and a description of pedagogic representation and professional experience or professional experience Repertoires Representations (PaP-eRs) have been widely carried out and reported in the science education literature as a significant instrument claimed to be effective in articulating development to the teacher while undergoing a career.

Loughran, et all in (Bertram, 2014) believes that through a combination of CoRes and PaP-eRs related to PCK the teacher becomes known by making the nature of reasoning and pedagogical decisions explicitly in making the context of teaching certain science content. Assessment through CoRes is done by giving an overview of how the teacher conceptualizes the subject matter content (Loughran et al., 2012). While PaP-eRs are carried out by assessing narratively related to the implementation of teacher's PCK or teacher candidates in the mastery of material content taught (Loughran et al., 2012).

Water Cycle Material

The concept of water cycle taught in grade 5 elementary school is related to the benefits or uses of water, the scheme or process of water cycle, the influence of human activities on the water cycle, and how to save water.

Relevant Research Results

Nilsson (2008) examined the nature of PCK complexes in pre-service education. He researched the PCK abilities of the student of prospective physics teacher, by assigning several prospective teachers in pairs to plan and learn a topic in physics that was freely chosen by prospective teachers. The results of the study show that there is a strengthening of the ability to plan learning, the ability to implement teaching, and an increasing in the ability to conduct evaluations.

Research on PCK exploration in science teacher education by Loughran, Mulhall, and Berry (2008). This study explores how the training of science teacher PCK uses Co-Res (Content Representation) and PaP-eRs (Pedagogical and Professional-experience Repertoires Representations) methods. The results showed that with PCK debriefing through Co-Res and PaP-eRs prospective teachers became able to prepare a clearer framework when preparing a lesson.

Rollnick, Bennett, Rhemtula, Dharsey & Ndlovu (2008) examined the position / role of subject matter knowledge in PCK, using Co-Res and PaP-eRs developed by Loughran, Berry & Mulhall (2008). Conclusion This study shows that Co-Res is proven to be a methodology that is very useful for constructing teacher PCK.

Henze, Driel and Verloop (2008) conducted research on experienced science teachers through Models of the Solar System and Universe. This study aims to investigate the development of PCK from nine high school science teachers experienced in Germany, through PCK's content and structure on specific topics about the solar system and the universe. The results showed that there were two variations / types that were qualitatively different in the prospective teacher's PCK.

3. Material & Methodology

Types of research

The research approach used is a qualitative approach with descriptive method design (Creswell, 2010). In this study, conducted an analysis of the ability of PCK prospective primary school teachers on water cycle material through the use of CoRes (Content Representation) and PaP-eRs (Pedagogical and Professional-experience Repertoires). The data collected in the form of analysis results from the assessment of PaP-eRs, CoRes, RPP, and observation guidelines as supporting data.

Research subject

The subjects in this study were three PGSD students in the sixth semester. Subject taking in this study was carried out based on the consideration of the ability / intelligence of each student that was relatively varied and did not have teaching experience in elementary school. Furthermore, the research subject was named participant.

Research Settings

The study was conducted in class V SDN 1 and 2 Pasirhalang, Kecamatan Sukaraja which carried out the learning of Water Recycling material in class V Semester 2.

Data collection technique

Data collection techniques in this study use the following instruments:

a. CoRes Assessment

CoRes assessment is a format that provides an overview of how teachers conceptualize certain subject matter content (Loughran et al., 2012). CoRes is an assessment guide offering a perspective on certain content taught when they are teaching a topic.

b. Assessment of PaP-eRs

Assessment of PaP-eRs is a guide to assessing narratively related to the implementation of teacher's PCK or teacher candidates in the aspect of mastering the material content being taught (Loughran et al., 2012). PaP-eRs are short but specific in meaning and are intended to show the implementation of CoRes aspects.

c. RPP Assessment

RPP assessment is a guide to assessing the components that must exist in learning activities carried out by prospective teachers.

Data analysis technique

a. PaP-eRs Analysis Format

PaP-eRs analysis was analyzed using the score based on PaP-eRs components adjusted to the observation sheet. The analysis is carried out by scoring on each component narrated by the prospective teacher. The following is a table of criteria for scoring PaP-eRs components.

Table 3.1. PaP-eRs Component Scoring Criteria

Score	Criteria
0	Does not fill at all
1	Fill in but incorrect
2	Fill in and almost correct
3	Fill in and all correct

The ability of prospective teacher PCKs to reflect learning in narrative form is indicated by percentages. The calculations are as follows:

$$\text{Percentage (\%)} = \frac{\text{Acquisition score}}{\text{Maximum score}} \text{x } 100$$

b. CoRes Analysis Format

CoRes analysis was analyzed using the score based on the components adopted and adaptation of Loughran. Analysis is done by scoring on each component described by the prospective teacher. Following are the criteria for scoring the CoRes component.

Table 3.2. CoRe Component Scoring Criteria

Score	Criteria
0	Does not fill at all
1	Fill in but incorrect
2	Fill in and almost correct
3	Fill in and all correct

The ability of prospective teachers to compile CoRes is expressed in percentage form. The calculations are as follows:

$$\text{Percentage (\%)} = \frac{\text{Acquisition score}}{\text{Maximum score}} \text{x } 100$$

c. RPP Analysis Format

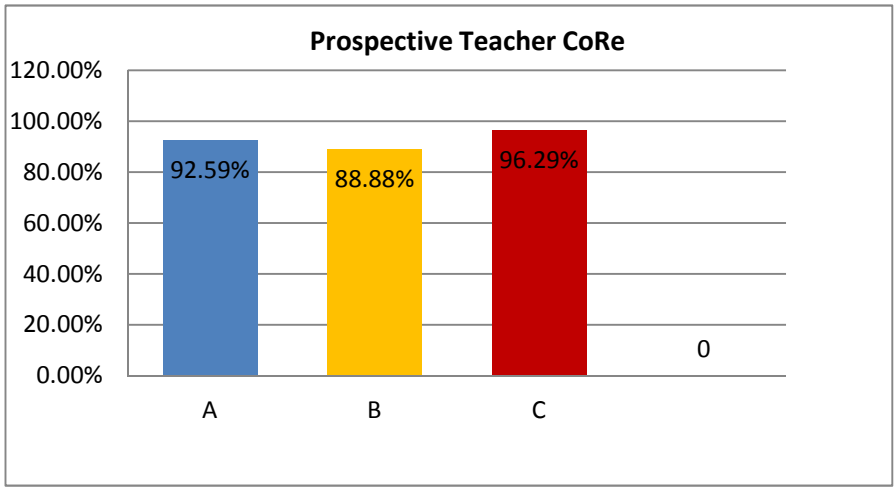
Analysis of RPP documents is carried out using the RPP analysis format. The analysis was carried out by scoring against the RPP components of the prospective teacher. Furthermore, the ability of prospective teachers in preparing RPP is shown in percentage form. The calculations are as follows:

$$\text{Percentage (\%)} = \frac{\text{Acquisition score}}{\text{Maximum score}} \text{x } 100$$

4. Results and Discussion

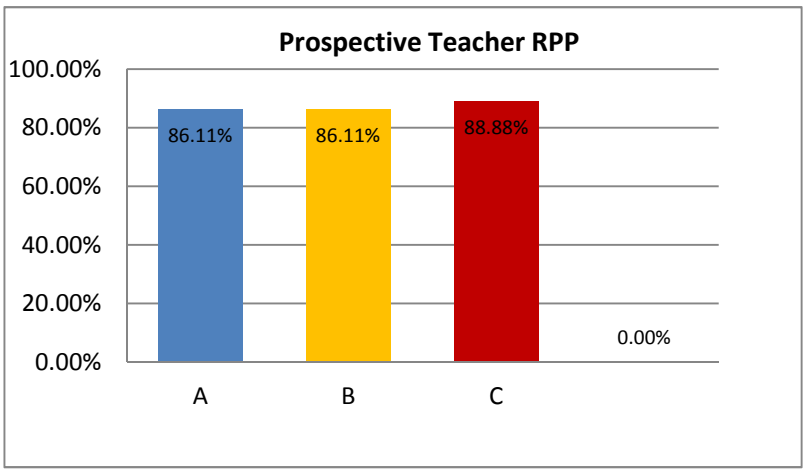
Profile of PCK Capabilities of Prospective Teachers in Planning Learning through CoRe and RPP

The profile of the prospective teacher's PCK ability in planning learning is obtained based on the CoRe format filled by participant teacher candidates. In line with the opinion of Hamidah (in Nurmatin, 2015) which states that the ability of a teacher's experience is represented through CoRe and PaP-eRs that are related, then combined to produce PCK folio resources on the given content or topic. CoRe filled by prospective teacher participants is a format that provides an overview of how teachers conceptualize certain subject matter content (Loughran et al., 2012). The ability of PCK from three teacher candidates in planning learning through CoRe is shown when the prospective teacher determines the main idea of a material and outlines the main idea in accordance with the eight components in CoRe. Eight components of CoRe are in the form of questions that represent the knowledge of prospective teachers that includes concepts that must be mastered by students, the ability of students to accept concepts, the process to be carried out in learning to how to assess students' abilities related to the main ideas raised. The percentage of prospective teacher PCK abilities based on their ability to develop CoRe is shown in Figure 4.1



According to Loughran et al (2012) the number of main ideas is not specifically determined for certain material so that the participant teacher candidates are free to determine the number of main ideas. The number of main ideas raised by the three students is four to five main ideas for water cycle material. The main idea is a picture that is shown by prospective teachers as an important concept to develop students' understanding in certain concepts (Loughran et al., 2012). The main ideas raised by the three teacher candidates as a whole are the uses / benefits of water, the water cycle scheme / process, the saving of water, the influence of human activities on the water cycle, natural disasters, and water sources. These basic ideas are important concepts to develop understanding of elementary school students in the concept of water cycle. The three teacher candidates have been able to bring up the main idea which is an important concept of water cycle material. In other words, all three prospective teachers can translate a concept to be accepted by students. In addition, the three participant teacher candidates were able to explain the urgency / importance of the main idea to be understood by students. In other CoRe components namely difficulties or limitations in teaching the main idea, the three participant teacher candidates can describe the prediction of the difficulty of teaching the main idea well enough. It's just that in the assessment component of students to ensure an understanding of the main idea, the three teacher participants did not specifically give an example of the problem. Overall, in describing the eight components of CoRe, the three participant teacher candidates can describe the learning plan for the main ideas raised. Thus, the ability of prospective teacher PCK in planning learning through CoRe has demonstrated the ability of prospective teachers to integrate pedagogical knowledge and content knowledge.

Furthermore, the profile of the prospective teacher's PCK ability in planning learning, is also obtained from the preparation of the Learning Implementation Plan / RPP. The RPP components were analyzed, namely, lesson identity, formulation of learning indicators, formulation of learning objectives, selection and organization of teaching materials, learning methods, selection of learning media, selection of learning resources, learning steps, and assessment of learning outcomes. The percentage of ability of the three teacher candidates in preparing the RPP is explained in Figure 4.2.



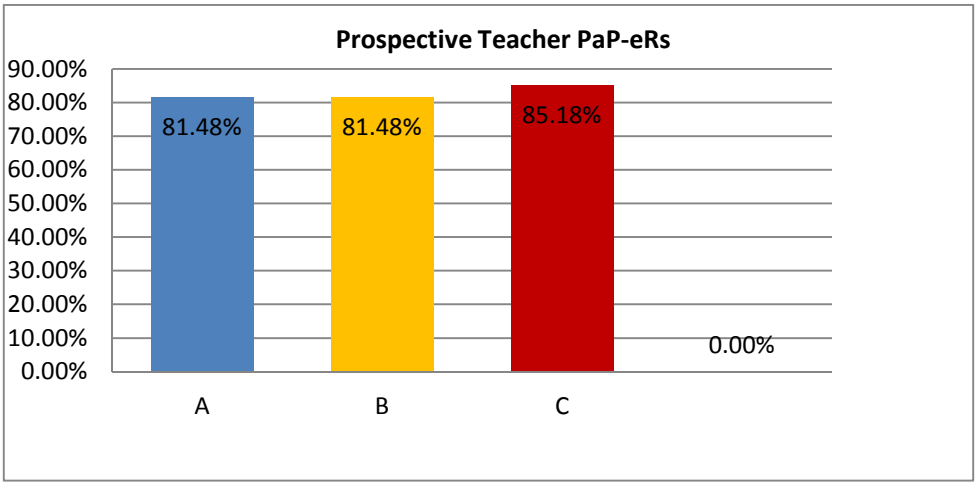
From the nine components of the RPP compiled by prospective teachers, six of them show results that have not been maximized. The six components are the identity of the lesson, the formulation of learning objectives, selection and organization of teaching materials, selection of learning resources, learning steps, and assessment of learning outcomes.

The identity component of the lesson should contain school identity, subject identity, class / semester, subject matter and time allocation. Two prospective teachers, teacher A and teacher C, only listed four of the five identities. The identities that are not included are the subject matter and subject matter. In the components of the formulation of learning objectives, there are four things that must be included, namely, the subject (audience), the suitability of the competency achieved by the behavior, the learning experience and the degree to be achieved. The three participant teachers have not formulated the complete learning objectives related to this. Furthermore, in the components of the selection and organization of teaching materials must contain facts, concepts, principles and procedures that are in accordance with the formulation of learning indicators. One teacher candidate, candidate B teacher, only filled three of the four material that were relevant to the formulation of the learning indicator. The next component regarding the selection of learning resources. The three teacher candidates are still not maximal in using learning resources. Things that can be used as learning resources are books in the sense that they are not only fixated on the student handbook, print media or the natural surroundings that are in accordance with the competencies to be achieved, the learning objectives, and the characteristics of students.

The next component of the learning steps consists of three stages namely introduction, core, and closing. In the preliminary activities the three teacher candidates have not provided cognitive conflict to students. In the core activities, the three teacher candidates involve student centered in learning. In the closing activity the three teacher candidates reflect, provide an evaluation of the core concepts that are appropriate to the learning objectives, assignments and inform learning activities for the next meeting, but do not provide information about current knowledge.

Profile of Prospective Teachers' PCK ability in Reflecting Learning through PaP-eRs

The profile of the prospective teacher's PCK ability in reflecting learning is shown through the making of PaP-eRs after the prospective teacher participant implements learning. PaP-eRs are CoRe's supporting documents which usually take the form of a narrative teaching experience of a teacher by highlighting certain parts of the implementation of learning, or aspects of the material being taught (Hamidah, in Nurmatin 2015). In addition to PaP-eRs, the profile of the prospective teacher's PCK ability in reflecting is complemented by the observations of prospective teachers during the learning process. Observations made during learning show that the three prospective teachers carry out learning based on what was planned in advance in the RPP. PaP-eRs created by prospective teachers narrate the learning that has been done by prospective teachers during the learning process. The ability of PCK prospective teacher participants was determined based on the percentage obtained by the prospective teacher participants in each PaP-eRs that were made. PaP-eRs made by the three participant teacher candidates represent PCK knowledge based on five components of Magnuson. The PaP-eRs components narrated by prospective teachers are shown in Figure 4.3.



PaP-eRs made by each participant teacher participant narrate the implementation of learning which includes preliminary activities, core activities, and closing activities. In the core activities, the three prospective teacher participants did not thoroughly narrate the learning activities. The purpose of making PaP-eRs is to elaborate and provide insight into the interaction betweenstudents and teachers so that they can be used as a reflection of learning (Loughran, 2012). Therefore it can be concluded that the ability of the three teacher candidates in reflecting learning through the making of PaP-eRs is still not optimal. This is most likely due to the lack of teaching experience of the three teacher candidates in the water cycle material. The results of the overall PaP-eRs are described in the followig table.

PCK component	Components that must appear in PaP-eRs	The ability of prospective teacher PCK in reflecting learning
Orientation to science teaching	Narrating apperception, motivation, and cognitive conflict	The three teacher candidates narrate the apperception, motivation, and learning goals to students but do not provide cognitive confidency.
Knowledge of science curriculum	Narrate the core activities in learning that include exploration and elaboration activities:	The activities narrated by the three teacher candidates at the core activities are observation activities, asking questions, and communicating activities.
Knowledge in understanding students' ability to learn science	1. observation activities 2. activity of asking questions 3. reasoning activities 4. trying activities 5. communicating activities	The closing activity narrated by the three teacher candidates is related to mastering the concept. The three teacher candidates do not tell current knowledge but at a glance link the concepts to everyday life. Only prospective teacher B will inform the best group and give prizes as a form of reward.
Knowledge of learning strategies for teaching science	Narrating confirmation and closing activities in learning which include: 1. reflection activities related to concepts that must be mastered by students 2. activities to provide current knowledge or application of concepts to daily life 3. information related to the best individual learning groups	
Knowledge of science assessment	Narrate assessment activities	Only prospective teacher C narrates in detail the assessment activities conducted in the classroom

5. Conclusion

a. In the CoRe assessment, of the eight components of CoRe that are assessed, the three participant teacher candidates can describe the learning plan for the main ideas raised. Thus, the ability of prospective teacher PCK in planning learning through CoRe has demonstrated the ability of prospective teachers to integrate pedagogical knowledge and content knowledge.

b. In the RPP assessment, out of the nine components of the RPP compiled by prospective teachers, six of them show results that have not been maximized. The six components are the identity of the lesson, the formulation of learning objectives, selection and organization of teaching materials, selection of learning resources, learning steps, and assessment of learning outcomes

c. In the PaP-eRs assessment made by each participant teacher candidate, all three are able to narrate the implementation of learning which includes preliminary activities, core activities, and closing activities, although not yet maximal. This is most likely due to the minimal teaching experience of the three teacher candidates in the water cycle material. Based on these conclusions, this research can be known about the description of the ability of PCK prospective primary school teachers STKIP BIna Mutiara Sukabumi. This research can be an input for lecturers to provide educational services that lead to efforts to improve the ability of prospective teachers, so that prospective teachers who will become teachers are better prepared and competent in mastering the content of teaching materials as well as ways to teach them in their entirety and comprehensively based on pedagogical approaches.

Based on the findings of the research that has been done, there are several recommendations that need to be followed up for further researchers including:

a. In the learning process, this research was conducted in a relatively small frequency, so that the ability of prospective teacher PCK has not been described comprehensively. Therefore, for the next researcher, it is necessary to make more frequency of meetings in learning so that they can see the constancy of the prospective teacher's PCK abilities.
b. In the teaching material, the ability of teacher candidates is only seen from the mastery of one subject. For further researchers, to be more convincing about the ability of prospective teacher PCK, it is better to conduct PCK assessments of prospective teachers based on the mastery of various subjects so that prospective teacher PCK can be assessed from their ability to master various subjects.
c. This research was conducted in high class (grade 5) which still applied separate learning. Researchers can then assess the ability of prospective teachers in the low class in integrated thematic learning, so that they can see the ability of prospective teacher PCK in designing, implementing and reflecting learning that is carried out in an integrated thematic manner.

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