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Prospective Teachers' Commognitive: The Pedagogical Knowledge in Designing Mathematics Class for Proving Trigonometric Identity

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Abstract: This research aims to describe the pedagogical commognitive framework of prospective teachers in designing and teaching mathematics class for trigonometric identity sub materials. This type of research is qualitative research with a descriptive approach. Determination of the subject in this study using a purposive sampling technique. The subjects of this study were prospective teacher students who were undergoing microteaching learning. The pedagogical skills would be observed from their design and teaching practices activities which consist of the introduction activities, main activities, and closing activities. Researchers tried to combine commognitive and pedagogical knowledge to analyze the data. There are four components of commognitive were used in pedagogical knowledge. Those are word use, visual mediator, routine, and narratives. The main instrument in this study is the researcher himself because the researcher himself is planning, implementing, collecting data during the research through recording video and audio learning, observing, or interviewing the subject and reporting the results of the study. Word use is used as a keyword and the initial information given to students in accordance with the material to be taught. The use of the word use component is done by means of spoken orally. Visual mediators used in learning activities are prospective teacher students using laptop and blackboard media in explaining learning material, giving examples of questions, and several other learning activities. The method that prospective teacher students use in presenting material using sample questions, reminding the previous material, in providing understanding to new students then forming a conclusion (inductive approach). In addition, prospective teacher students provide understanding and focus on the concepts of the material being taught then provide questions, questions, and exercises in supporting student understanding (deductive approach).

Keywords: pedagogical commognitive, designing mathematics, prospective teachers, trigonometric identity.

▪ INTRODUCTION

In Pisa latest report, Indonesia ranked 70th among xx countries (OECD, 2023). It shows that there is an increase compare to previous achievement which was in 74th position. Interestingly, even though the rank has been increased, the PISA score has been lower than PISA achievement in 2018. The 2022 results is the lowest ever recorded by PISA for Indonesia; they are comparable to those started from 2003 in mathematics. Even though the findings of a few of the earlier evaluations were better than those of the first few years, the decreases that were seen starting in 2015 offset these advances (OECD, 2022). One of the components of ability in PISA is the ability to think and communicate. These two abilities are the abilities that are discussed in commognitive. For more detail, Indonesian achievement in mathematics can be seen in Figure 1.

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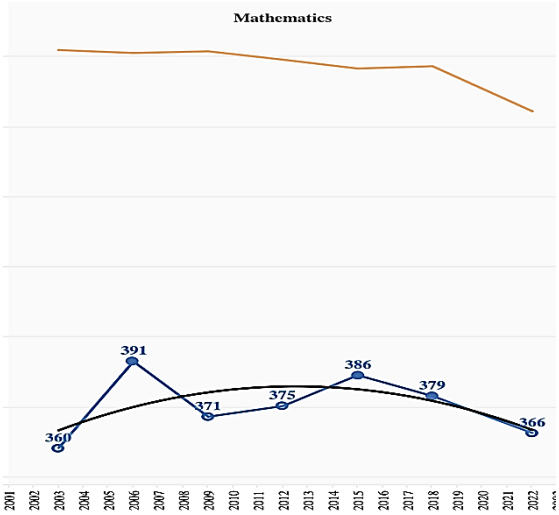

Figure 1. Indonesian achievement in PISA 2022

It can be seen in Figure 1 that Indonesian achievement for mathematics is decreasing since 2015. Moreover, its achievement was still under the average of all nations. Compared to their 2018 counterparts, school principals in 2022 were more likely to report a teacher shortage. 18% of Indonesian pupils attended schools in 2022 where the principal stated that a shortage of teachers or underqualified teachers were impeding the school's ability to deliver education. In contrast, this factor was only around 13% in 2018. As a result, mathematics test scores were lower for students attending schools where the principal reported a lack of teaching personnel than for children attending schools where the principal reported few or no shortages (OECD, 2022). Therefore, Indonesian education expert still suggest all Indonesia teachers to evaluate and improve their mathematics class to facilitate mathematical literacy and mathematical problem-solving skills.

Recently, mathematical problem-solving skill, such as represented by PISA test, is still becoming important for students. Students need this skill to support them when they face some problems in their daily life. Of course, teachers have important role to sharpen their students problem-solving skills through well-designed mathematics learning activities. (Hiebert & Grouws, 2007) show two important aspects of teaching mathematics, namely the connection between mathematical facts, procedures, ideas and students' efforts to understand mathematics. Furthermore, (Schoenfeld, 2014) argued that teachers had authority to explore students' mathematical ideas to achieve all learning goals.

Teachers' knowledge about teaching is very important, starting from the basic definition until how to conduct a proper mathematics class. Interestingly, designing mathematics class is not only related to the tasks involved in teaching but also the mathematical demands which contained in the learning objectives (Ball et al., 2008). Teaching mathematics is a professional practice. Therefore, professional community, such as teachers, educators, and researchers, can formulate reasonable conceptions of professional practice (Mosvold & Fauskanger, 2014). Teaching involves careful planning intending to help students learning certain content (Ball & Forzani, 2009). Teaching

mathematical problem solving is the key to make mathematics become meaningful for students. Therefore, teachers have to be able to design proper mathematics class such that students are facilitated with problem solving skills(Ball & Forzani, 2009). These responsibilities, somehow, caused some problems for teachers referred to as a teaching assignment.

Designing teaching process, sometimes, become very tricky. Teachers have to think and feel what should be done by their students in learning mathematics. In other words, teachers must be creative in imagining how a mathematical concept can be learned by students. Therefore, Guskey stated that teaching tasks can be a long and difficult process (Guskey, 2002). Teachers must be truly professional and responsible for student development. (Ball et al., 2008), moreover, reported that although many studies have shown teacher mathematics knowledge can help improve student achievement, the actual nature, and level of knowledge are largely unknown. (Talbert-Johnson, 2006)has also made another strong statement that teachers' content knowledge is not the only indicator to justify that the teacher is highly qualified. Furthermore, emphasize that teachers learn through learning, by action and reflection, by collaborating with other teachers, by looking at students and their work, and by sharing what they see in this case pedagogy plays a role.

Unfortunately, teachers' skills in mathematics and designing mathematics class is not related to each other. (Rodgers & Raider-Roth, 2006) explains that many teachers have a good content knowledge, but they do not have a way to make the content understandable by students. While some others have the opposite side. Therefore, these two skills must be owned by teachers in the same times. Pedagogical knowledge is theory or belief about the teaching and the learning process in which a teacher has influence in teaching. This learning process includes the ability to plan and prepare materials, class management time and skills, implementation, problem-solving, and problem teaching strategies, questioning techniques, and assessment (Hudson, 2007). Therefore, pedagogical knowledge has a holistic feature when teachers need to design from the beginning until the end of learning process.

Teachers' pedagogical skills and mathematics content knowledge cannot be ignored especially in facilitating in studying mathematics. Those are two sides of coin which cannot be separated to each other. (Auerbach & Andrews, 2018) state that pedagogical knowledge has the potential to be generalized across topics and even disciplines. This relates to teachers' understanding about teaching and learning such as knowledge of learning theory, and classroom management. Moreover, in the deeper understanding, pedagogical knowledge contains general principles, learning approaches and assessment, lesson structure, class organization and management, other students' knowledge, and even students' motivation (Grossman & Richert, 1988; König et al., 2014) . One study that can offer insights to teachers about teaching mathematics is commognitive framework. (Tuset, 2018) investigates the feasibility of employing a commognitive framework to teach mathematics to pre-service teachers and supply them with relevant information.

Commognitive is a new word consisting of two words, communication, and cognition (Sfard, 2008). It shows that there is a strong relationship among those words. This relates to (Sfard, 2008),which uses a cognitive component using keywords, narratives, and meta-rules in relation. (Shabtay & Heyd-Metzuyanim, 2017; Zayyadi et al., 2022) said that commognitive propose to see this because of teaching practices that

are part of the pedagogical discourse or discourse about teaching and learning. This determines what students need to discuss, how they teach, and what is often not talked about, but which is still very important, namely who can learn (or not learn). The basic principle of cognitive thinking is a version of intrapersonal communication. Thinking is a form of communication and thinking encourages as a version of individual communication (Sfard & Kieran, 2001). To clarify, ask questions, and broaden the subject matter, students can interact in group discussions as well as through interactions between teachers and students or between students themselves (NCTM, 2000). Teachers typically have the most influence over classroom communication (Viseu & Oliveira, 2012; ZAYYADİ, 2020). As a result, while teaching in a classroom, a teacher needs to be knowledgeable and able to communicate effectively.

Comognitive research on prospective teachers in learning and teaching has been conducted previously, one of which is in the discourse of studying the concept of derivatives (Watford, 2024), regarding the concept of functions (Viirman, 2014) and mathematical modeling (Park, 2017). Of the several studies, none have conducted comcognitive research on trigonometry. In addition, other studies investigate through case studies the pedagogical discourse of high school teachers when introducing the concept of derivatives (Gallego-Sánchez, et al., 2022). Meanwhile, no research has investigated how prospective teachers apply the comcognitive framework during their duties as teaching and learning designers. Therefore, this study aims to fill the missing phenomenon of pedagogical comcognition in designing mathematics classes, especially in solving trigonometric identities.

The commognitive framework can provide an overview of the learning carried out by prospective teacher students. Therefore, research is needed that bridges the description of the pedagogical knowledge of prospective teacher in designing and implementing the mathematics class. Consider about this, researchers want to analyze: 1). The pedagogical knowledge in designing and teaching mathematics class for trigonometric identity sub materials, dan 2). The pedagogical commognitive framework of prospective teachers in designing and teaching mathematics class for trigonometric identity sub materials.

▪ METHOD

Research Types and Participants

This is qualitative research with a descriptive approach that aims to describe the pedagogical commognitive of prospective teacher students in designing mathematics teaching. Meanwhile, the subjects in this study were determined using purposive sampling techniques. This technique aims to find subjects that are suitable for the research objectives, namely prospective teacher students with pedagogical cognitive abilities in designing mathematics learning. The subjects in this study were prospective Mathematics teachers from the Madura University. The subjects of this study were prospective teacher students who were undergoing microteaching learning. The pedagogical skills would be observed from their design and teaching practices activities which consist of the introduction activities, main activities, and closing activities. Researchers tried to combine commognitive and pedagogical knowledge to analyze the data. Therefore, there are four components of commognitive were used in pedagogical knowledge. Those are word use, visual mediator, routine, and narratives. For detail, the pedagogical commognitive of prospective teacher in designing and implementing their design during

real-teaching practices is presented in Table 1.

Table 1. Commognitive components in learning activities

Learning Aspects	Word use	Visual Mediator	Routine	Narrative
Introductory activities				
- Preparing students. - Asking for apperception and giving motivation - stating the purpose of learning. - Stating material coverage	Greeting/Opening	Explaining by using white board	Checking attendance	
	Giving simple jokes	Providing a visual picture (PPT-LCD)	Clarifying students - asking questions	
	Asking how students are doing	Using manipulatives	Expressing attention	
	Providing examples	Stating the concept of opening gesture verbal	Conditioning class (group-seating)	
	Asking previous concept			
	Consider the matter of recall			
	About impressions about the concepts that will be discussed			
	Mention the concepts to be discussed			
Main activities				
- Giving the material - Delivering the concept of learning materials - Implementing learning models/ approaches/ strategies - Using the learning media/ learning resources - Class management	Giving examples and practice questions	Writing on the board	Clarifying students - asking questions	Explaining the problems
	Asking the previous concept	Giving a visual picture (PPT-LCD)	Giving attention	Relating with the previous material
	Asking for a recall-question	Using manipulatives	Conditioning class (group-seating)	Giving a conclusion
	Impressing the concepts will be taught	Explaining the concept of opening gesture/verbal	Clarifying students - asking questions	Providing methods from general to specific or vice versa
	Mentioning the concepts to be discussed	Writing on the board	Giving attention	Giving *scaffolding*

- Involving students in learning - Implementing of learning assessment	Giving examples and practice questions	Giving a visual picture (PPT-LCD)	Involving students in learning interactions
	Asking the previous concept	Using manipulatives	
		Using students' and teacher's handbooks	
Closing Activity			
- Summarizing the material. - Reflecting the process and subject matter	Closing/greeting		Motivating students to study at home (homework)
	Delivering the upcoming meeting material		Reflecting the material that has been learned
			Finish the learning

Instrument and Data Collection Technique

The main instrument in this study was the researcher himself because the researcher himself planned, implemented, collected data during the study through video and audio recording of learning, conducted observations, or interviews with subjects and reported the results of the study (Creswell, 2012). Supporting instruments in this study were interview guides, recording devices, software to assist in transcribing videos and data, and observation sheets. Data collection through interviews was carried out using semi-structured interview guidelines. Interviews were conducted to clarify and explore problems or clarify learning activities carried out by subjects during the learning process, especially those concerning cognitive components. The interview guidelines that were developed were then validated by two experts as validators. The validation results from the validators were generally suitable for use. An audio-visual camera (handycam) was used to record the mathematics learning process in class and several in-depth interviews with the activities of the subjects in the learning carried out. An audio recorder was used to record the results of interviews with subjects before and after learning mathematics. The recorder was used by researchers to record stimulated recall-based interviews to explore the data needed in the study. This observation sheet was used to determine the activities of prospective teacher students in carrying out the teaching and learning process during microteaching. In addition, observation also has a function to determine the suitability of the implementation of actions with the learning implementation plan that has been prepared previously. The observation sheet was developed and then validated by two experts.

Data Analysis Techniques

The results of the data in this study consisted of 3 (three) stages. The first stage is a video recording of learning activities by subjects, and the second is video data fragments of learning activities by the subject, and the third stage is data from the results of video transcripts from learning activities by subject and interviews. In interviews with the

stimulated recall technique, prospective teacher students are asked to stop the video when they can recall what they think and feel during the learning process. Student teachers are asked to provide recordings of their thinking as accurately as possible. From the statements given by prospective teacher students, researchers explored them by asking questions to explore answers to predetermined problems. Researchers recorded conversations with subjects using a voice recorder. Video fragments of the subject's activities and recorded interviews become data.

The results of transcripts and other documentation are shown by the research subjects and analyzed by reducing data, which refers to the process of selecting, simplifying, abstracting, and transforming raw field data. If there is invalid data, the data is modified and may be used as verification and other results. Furthermore, the data presented is carried out so that the data resulting from the reduction is organized, arranged in a relationship pattern so that it is easy to understand, easy to conclude, and has a certain meaning. So that a conclusion can be drawn in describing pedagogical commognitive students of the prospective teacher in learning.

In this part, research sample need to be clearly explained in this section. It is also necessary to write down techniques for obtaining subjects (qualitative research) and/or sampling techniques (quantitative research). Procedure should be described according to the type of research. How research is carried out and data obtained, needs to be described in this section. For experimental research, the type of design (experimental design) used should be written in this section. Types of data, how data is collected, with instruments where data is collected, and how technical the collection is, should be explained clearly in this section. Then, how to interpret the data obtained, in relation to problems and research objectives, needs to be explained clearly.

▪ RESULT AND DISSCUSSION

Prospective Teachers' Pedagogical Knowledge in Designing and Teaching Trigonometric Identity

Pedagogic knowledge must be possessed by prospective teacher in designing mathematics class. This can be seen from the knowledge of learning theories, general principles, and approaches to teaching and assessment, lesson structure, class organization and management, student motivation, and another student knowledge. However, that knowledge must be able to be implemented in their teaching actions. Therefore, in this research, there are three steps of learning designs namely introduction, main, and closing activities. The following data was gathered from observation and documentation when the subject taught trigonometric identity.

Introductory Activities

In the opening section, prospective teachers tried to warm up the situation. They started from the simplest question which is by greeting "assalamualaikum wr. wb". As well as the subject conveys the learning objectives that must be done and asks the readiness of students in the lesson and says "Today we will study a new material about trigonometric identity. All you guys ready to take a lesson?". It shows that teachers start the learning by checking students' readiness. Furthermore, They, by statistical data, could show that the apperception activities positively influenced the flow of learning in certain mathematical topic. Teacher asked the initial knowledge to see whether students are ready to follow today's meeting by asking the definition of sinus α. For further basic knowledge

and emphasize students' response, teacher informed that the trigonometric identity material is relate with the material comparison of right triangles "for the studying the trigonometric identity is relate with the comparison of right triangle trigonometry."

In general, prospective teacher students carry out the preliminary stage of learning with the stages of preparing students, stating the purpose of learning, asking for apperception and giving motivation, and stating material coverage. The use of commognitive in the introductory stage with the components of word use, visual mediator and routine and no narrative component. The commognitive components in the preliminary stage are shown in Table 2.

Table 2. The commognitive components in the introductory stage

Learning Aspects	Word use	Visual Mediator	Routine	Narrative
Introductory activities				
- Preparing students. - Asking for apperception and giving motivation - stating the purpose of learning. - Stating material coverage	Greeting/Opening	Explaining by using white board	Checking attendance	
	Giving simple jokes	Providing a visual picture (PPT-LCD)	Clarifying students - asking questions	
	Asking how students are doing	Stating the concept of opening gesture verbal	Expressing attention	
	Providing examples	Stating the concept of opening gesture verbal		
	Asking previous concept			
	Consider the matter of recall			
	Mention the concepts to be discussed			

Main Activities

At this stage, the subject performs several stages such as explaining the learning material while encouraging students to be involved in the explanation. In addition, the subject also gives questions to students. Furthermore, the subject also gives examples to students and provides practice questions for students to work on. In addition, the subject checks students' understanding. The pedagogical knowledge when learning core activities include the subject explaining the learning material while providing stimulation to students to get involved in the explanation like this "studying trigonometric identities, there are three things we must learn, the first is a reverse identity, the second is a comparative identity, and the third is the Pythagorean identity. .". Besides, the subject also gives questions to students like "For example miss will write become $sin\ sin\ \alpha = \frac{1}{\frac{r}{y}}$ all you guys think that is change the value or not?". Furthermore, the subject also gives examples of trigonometric identities to students and provides practice questions to be done by students (i will give you all some exercise to solve.). also, the subject gives

scaffolding to students when students have difficulty in answering exercises such as "I will tell you the process, this yours, □tan tan α replaced with $\frac{sinsin\ \alpha}{coscos\ \alpha}$ while □sin sin α is replaced $\frac{1}{cosec\ \alpha}$

At this stage, the four components (word use, visual mediator, routine, and narrative) are commonly used in trigonometry learning. The commognitive components in the main activities stage are shown in Table 3.

Table 3. The commognitive components in the main activities stage

Learning aspects	Word use	Visual Mediator	Routine	Narrative
Main activities				
- Giving the material - Delivering the concept of learning materials - Implementing learning models/ approaches/ strategies - Using the learning media/ learning resources - Class management - Involving students in learning	Giving examples and practice questions	Writing on the board	Clarifying students - asking questions	Explaining the problems
	Asking the previous concept	Giving a visual picture (PPT-LCD)	Giving attention	Relating with the previous material
	Asking for a recall-question		Conditioning class (group-seating)	Giving a conclusion
	Impressing the concepts will be taught	Explaining the concept of opening gesture/verbal		Providing methods from general to specific or vice versa
	Mentioning the concepts to be discussed	Writing on the board	Giving attention	Giving *scaffolding*
	Giving examples and practice questions	Giving a visual picture (PPT-LCD)	Involving students in learning interactions	
	Asking the previous concept	Using students' and teacher's handbooks		

Closing Activities

Pedagogical knowledge of prospective teachers namely the word use component in this activity provides information about the material to be studied at the next Meeting " Tomorrow we will continue the trigonometric identity again, so finish the exercise that i give you all guys earlier" and say the closing sentence "*assalamualaikum warahmatullahi wabarakatuh*". The routine component in this activity is to provide information about the material to be learned at the next Meeting, motivate students to complete the exercises provided, and learn at home about the material to be studied next Meeting and end the learning.

At this stage, only two commognitive components are used, namely word use and routine, while visual mediators and narratives do not appear or are used. In general, the commognitive components at the closing stage of learning are as in Table 4.

Table 4. The commognitive components at the closing stage

Learning aspects	Word use	Visual Mediator	Routine	Narrative
Closing Activity				
- Summarizing the material. - Reflecting the process and subject matter	Closing/greeting		Motivating students to study at home (homework)	
	Delivering the upcoming meeting material		Finish the learning	

The Pedagogical Commognitive Skills of Prospective Teachers in Designing and Teaching Trigonometric Identity

The Pedagogical Commognitive in Introductory Stage

In the introductory learning activities, word use used as keyword and first information that gives to students appropriately with the material that will be a lesson. This is following the statement by (Mosvold, 2016) in which the word use used in mathematical discourse includes specific words (certain words). The use of the word use component is done verbally. The words conveyed by the subject both verbally and written are a form of linguistics. This is following the statement by (Moschkovich, 2024)that a word, both verbally and written, is a linguistic sign. furthermore, the routine aspect for pedagogical framework, also, appeared in this part. Teachers tried to engage two-way communication by checking students' attendance "is anybody absent today?". (Brendefur & Frykholm, 2000) explained that the initial communication between teacher and students will lead a good mathematical communication during the learning activities. They, further, emphasized that the real mathematical communication appeared, mostly, in the main activities when question-and-answer activities goes together in a two-way path.

The visual mediator component used in the introductory learning activities is a laptop and whiteboard media in explaining learning material, giving examples of questions, and several other learning activities. Following the opinion of (Yulistiani, 2016) which states that learning media (computers) as the main component in the learning process and tools that have the function to convey information (material). Subjects use student handbooks to provide practice questions both in person and questions for groups.. also, consistent with the opinion of (Sfard, 2008) reveals that this concrete mediator can watch in plain view. Routine and narrative components in pedagogical knowledge in this introductory activity are greeting as an opening for learning, checking students' attendance, and providing information related to the previous material with the material to be taught. The teacher must do so that the teacher can consider the prior experiences of the students. The teacher must pay close attention to the knowledge students in the learning process that will be done. This is following constructivist understanding which views that teachers need to provide opportunities for students to actively develop their knowledge by paying attention to students' prior knowledge. Besides, the subject conveys

the learning objectives to be taught and provides motivation. This is consistent with the opinion of (Sharpe et al., 2006) who said that the teacher sets clearer expectations for students by explaining the goals, peculiarities, and excellence of each learning context.

The Pedagogical Commognitive in Main Activities Stage

The word use component of pedagogical knowledge during core learning activities includes speaking orally in explaining learning material while giving an inducement to students to get involved in the explanation. Besides, the subject also gave questions to students. Furthermore, the subject also gives examples to students and provides practice questions to be done by students. Also, the subject gives a check on student understanding. The use of words is done by oral and written. In the process of these learning activities, the use of the word use component is done by speaking orally and also written down. This is consistent with the opinion of (Wanjiru & O-Connor, 2015) that mathematics must be expressed and explained through written and oral words even though mathematics is a visual language of symbols and numbers. The realization of word use can be written and expressed/spoken (Ngin, 2018).

The word use component of pedagogical knowledge during core learning activities includes speaking words in activities explaining learning material while giving an inducement to students to get involved in the explanation. Besides, another visual component of the mediator is using student notebooks (asking students to work on the problems given in the book). In this case, the subject uses a concrete mediator (blackboards (when form groups), notebooks (when working on questions), and books to solve the problem that must do). The subject uses concrete mediators when explaining the material on the board. Besides, another visual component of the mediator is to use the teacher's handbook and in explaining subject matter using gestures as well as using fingers to count when learning takes place. This is consistent with the opinion of (Robutti et al., 2022)which states that the explanation combined with gesture is a communication tool that allows more meaningful conversation.

The visual component of the mediator in pedagogical knowledge in the core learning activities is the subject using a concrete mediator for example explaining the opposite identity (while taking notes on the board). Besides, another visual component of the mediator is using student notebooks (asking students to work on the problems given in the book). In this case, the subject uses a concrete mediator (blackboards on dividing groups, notebooks when working on questions and books to solve some questions must be worked on). The routine component in pedagogical knowledge in core learning activities is to explain learning material while providing an inducement for students to get involved. Following (Leinhardt, 1990) opinion that instructional explanation aims to explain concepts, procedures, events, ideas, and class problems to help students understand, learn, and use information in flexible ways. Besides, the subject also gave several questions when explaining the material. Consistent with the opinion (Zayyadi et al., 2019) which states that the problem can determine the extent of understanding that students have. Questions are the most used instructional tool (Zayyadi & Lanya, 2023). Furthermore, the subject gives some exercise for the student. The subject also came to students who had difficulty in solving the problem at hand. Subjects in learning in this study have not yet conducted an assessment.

The routine component in pedagogical knowledge in the core learning activities is the subject of explaining the subject of learning while providing stimulation to students to get involved. Also, the subject provides several questions on the sidelines of explaining the material and always involves students in every detail of the explanation given. Furthermore, the subject also givses practice questions to students and helps students to complete one of the given practice questions, such as "For the second problem you try to simplify" and as in Figure 4.21. The subject also came to students who had difficulty in solving the problem at hand. Such as “i will tell you the process, this yours, □tan tan α replaced with $\frac{sinsin\ \alpha}{coscos\ \alpha}$ while □sin sin α is replaced $\frac{1}{cosec\ \alpha}$

The narrative component in pedagogical knowledge in core learning activities is explaining the identity of students and students understanding it more, among others, is providing scaffolding in explaining the concept and the process of solving problems. The narrative component in pedagogical knowledge in core learning activities is the method used in conveying material by using example problems, reminding the previous material, in providing understanding to new students then forming a conclusion (inductive approach). Besides, the subject provides understanding and focuses on the concept of the material being taught then provides questions, questions, and exercises in supporting student understanding (deductive approach). It is according to (Rahmah, 2017) that inductive teaching methods lead us from special to general or examples for general rules so that students can generalize while deductive teaching methods go from general to special, abstract to concrete and from formula to example. Here the rules or definitions that have been set are given to students and asked to solve problems related to using the formula/definition. Besides, come and give questions to students in explaining the concept and the process of understanding. This is under Vygotsky's theory, which states that students will be able to solve problems with one of them by providing scaffolding is an intervention needed for students to expand the zone of proximal development.

The Pedagogical Commognitive in Closing Activities

The component of word use in pedagogical knowledge in the closing activity is to say the words about the material to be learned at the next Meeting. Furthermore, the routine component of this activity is the provision of information about the material to be learned at the next Meeting, motivating students to complete the exercises given and learning at home about the material to be studied next Meeting and ending learning.

▪ CONCLUSION

Provide a clear scientific justification for your work and indicate possible applications and extensions. Pedagogical commognitive from prospective teacher in learning mathematics used are word use, visual mediator, routine, and narrative. In the word use component, namely by saying words in several learning activities. Word use is used as a keyword and the initial information given to students in accordance with the material to be taught. The use of the word use component is done by means of spoken orally. Visual mediators used in learning activities are prospective teacher students using laptop and blackboard media in explaining learning material, giving examples of questions, and several other learning activities. Prospective teacher students make learning material slides (powerpoints) and use student handbooks to provide practice

questions either individually or in groups. In addition, the use of visual mediators is also through gestures.

Routine in pedagogical knowledge in learning activities is prospective teacher explaining the learning material while giving a inducement to students to get involved, giving a few questions in between doing the material explanation, always involving students in every detail of the explanation given. Furthermore, prospective teacher students also provide practice questions to students and come to students who have difficulty in solving problems faced. Narrative in pedagogical knowledge in the core activities of learning is to come and give questions to students in explaining the concept and the process of understanding. The method that prospective teacher students use in presenting material using sample questions, reminding the previous material, in providing understanding to new students then forming a conclusion (inductive approach). In addition, prospective teacher students provide understanding and focus on the concepts of the material being taught then provide questions, questions, and exercises in supporting student understanding (deductive approach).

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