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THE EFFECT OF CONTENT KNOWLEDGE (CK) AND PEDAGOGICAL CONTENT KNOWLEDGE (PCK) TOWARDS THE PERFORMANCE OF MATH TEACHERS

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ABSTRACT

The purpose of this study was to determine: (1) the effect of mastering Content Knowledge (CK) on the performance of mathematics teachers at SMP Negeri Kecamatan Kuta Selatan. (2) the influence of mastery of Pedagogical Content Knowledge (PCK) on the performance of mathematics teachers at SMP Negeri Kecamatan Kuta Selatan. (3) the effect of mastering Content Knowledge (CK) and Pedagogical Content Knowledge (PCK) on the performance of mathematics teachers in SMP Negeri Kecamatan Kuta Selatan. This type of research is a Mixed Method research, with the research design is explanatory sequential. For sampling done by purposive sampling technique with 4 schools for research sampling. The research instrument used for content knowledge was obtained through tests and for pedagogical content knowledge and teacher performance was obtained through questionnaires, observation sheets and interviews. Quantitative data were analyzed using path analysis while for qualitative data using descriptive analysis. The results show that: (1) there is no significant effect between CK of teachers on teacher performance of -92.2% (2) there is a significant influence between teacher PCK on teacher performance of 166.6% (3) there is a significant influence between CK and PCK teacher to teacher performance obtained Y = -0,922X1 + 1,666X2 + 0,149 the magnitude of the effect of CK and PCK on teacher performance by 85.1%. The results of this study are supported by descriptive analysis, the interview guide shows that teachers who have CK and PCK with a high category because the teacher can apply teaching materials with other teaching materials besides the teacher can convey the material well and make students more comfortable and easier to understand besides that, the teacher can overcome the difficulties of students by presenting learning materials in their entirety and providing contextual examples so that teachers can improve their performance.

KEYWORDS: content knowledge, pedagogical content knowledge, teacher performance.

1. INTRODUCTION

In the world of education, teachers are one of the determining factors for the success of the learning process. Improving the quality of teachers can have a positive impact on the quality of education. The teacher is a professional educator with the main task of educating, teaching, guiding, directing, training, assessing, and evaluating students in early childhood education through formal education, basic education, and secondary education (PP No 74 Year 2008 About Teachers). One of the tasks and roles of a teacher is as a facilitator who is able to become a bridge between students and the material being taught. As educators, teachers are not only required to be able to master the subject matter, but are also expected to be able to make the learning atmosphere interesting and enjoyable. The teacher is a very complex profession because the teacher not only has an obligation to educate, but must also be able to motivate and inspire students and the people around them. Many problems can be analyzed, one of which is that the teacher does not master the teaching material, so that if a teacher does not master the material well, then how the teacher is able to build knowledge in their students. The main task of a professional teacher that is realized in teaching and learning activities is a form of teacher performance. Improved teacher performance will affect the quality of the output of human resources produced in the education and learning process. To be able to achieve optimal learning outcomes teachers must of course have and display maximum performance during the teaching and learning process by adjusting the development of science and technology. If the teacher's performance increases, it will affect the quality of the output,

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CODEN: IJESS7

therefore it needs support from various schools to improve teacher performance. According to Asf & Mustofa (2013: 155-156) teacher performance is the work that can be achieved by a teacher in an educational institution or madras a in accordance with the duties and responsibilities in achieving educational goals. The success of a teacher must meet established criteria and have good quality.

Professional teachers are a determining factor in the quality of the education process. Commenting on the current low quality of education, is an indication of the need to meet teacher professionals. A professional teacher needs to have a strong mastery of basic concepts (Content) as well as the ability to understand these concepts (Pedagogy) properly and correctly. Content is a knowledge that is mastered by the teacher which includes facts, concepts, principles, theories and develops them through reflective and consistent action. While pedagogic is a way that teachers can do to help students in helping a learning. As an agent of change, a professional teacher must have good PCK skills to demand quality and learning processes. Shulman (1986) suggests a perspective on educator's knowledge is formulated into 4, namely: (1) Knowledge Content, (2) Pedagogical Content Knowledge, (3) Curricular Knowledge, and (4) Content Examination. Purwianingsih (2011: 10) states that Pedagogical Content Knowledge (PCK) is an understanding of the relationship between Content Knowledge (CK) and Pedagogical Knowledge (PK). Shulman (1986) published Pedagogical Knowledge (PK) as a teaching method and process that contained class management, assignments, planning, learning implementation. Can help understand how to make students able to understand the knowledge provided. Koehler and Mishra (2008: 12) say that Content Knowledge (CK) is knowledge about the subject matter to be discussed. The teacher must understand the lessons to be discussed including knowledge of facts, facts, theories, and procedures in a particular field, knowledge of the discussion that can be given and linking ideas and knowledge about rules and also evidence of content. Content Knowledge (CK) must be possessed by a teacher as one of mastery of competency standards. This knowledge contains how the teacher provides organizational content. Shuell and Shulman (Eggen and Kauchak, 2007) formulate that PCK is an understanding of what learning methods are effective in explaining certain material, as well as understanding what makes certain material easy or difficult to learn.

A good PCK is synonymous with a professional teacher. According to Shulman (1986: 9) PCK is knowledge that must be understood by a teacher because a teacher must be familiar with alternative concepts and difficulties that will be faced by students with diverse backgrounds and can organize, organize, run and assess subject matter, all of which are summarized in PCK.

In order for teachers to use Pedagogical Content Knowledge (PCK) knowledge optimally, teachers must learn more about content and pedagogical knowledge. As for several factors that influence the development of PCK teachers including, different teaching experiences. They are not aware of difficult concepts for students and they will have difficulty in determining the important concepts of development can be seen explicitly and able to show the teacher's role is crucial in the quality of learning. The teacher can make learning very interesting or boring, the teacher must have different teaching variations, the teacher can also direct students to learn a material in depth or just learn it on the surface. The teacher not only needs to master the material, but also has knowledge about teaching strategies, media, and components that are in it so that students can learn more easily.

The ability of Pedagogical Content Knowledge (PCK) is very important possessed by a teacher, especially by a mathematics teacher. In addition, teachers can influence teaching styles in a better direction and will be able to influence teachers in implementing learning strategies. Mathematics is one of the subjects that must be taught from elementary, secondary, to tertiary levels of education. Mathematics learning is really needed early so that students are trained to think logically, critically, creatively, and be able to work well together. Therefore, the importance of subjects that require so much thought to understand the concept. But, in reality mathematics is considered as a difficult and boring subject. This indirectly causes students to be lazy and feel compelled to learn mathematics, resulting in low student achievement. In learning mathematics, perseverance and willingness are needed to solve the problems faced in the material presented. In learning mathematics, students are accustomed to gain understanding through experience of the properties possessed and those not possessed from a group of objects.

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CODEN: IJESS7

As for some of the results of research conducted as follows. Research conducted by Riawan Yudi Purwoko (2017) CK on dominant mathematics teacher candidate students is at levels 1 and 2. However, CK knowledge is important in improving teaching and learning processes that aim to provide full understanding to students. CK is as important as knowledge of the subject matter used as the subject of the learning process. Without good CK, the process of transforming subject matter in an effort to build student knowledge, will not take place properly. Research conducted by Dazrullisa (2017) PCK prospective teachers on algebra material in junior high school students can be said to be good in learning strategies, developing learning plans and student-centered learning activities. Research conducted by Sulasmono (2017) Most of them have a high level of performance, have a high level of leadership, have a moderate level of environmental concern, and have a fairly good commitment. This study found the teacher's commitment to improving the work / school environment is a determinant of performance.

Based on the description above, this paper will discuss **"Pengaruh Penguasaan *Content Knowledge* (CK) dan *Pedagogical Content Knowledge* (PCK) Terhadap Kinerja Guru Matematika SMP Negeri Kecamatan Kuta Selatan"**

2. METHOD

This type of research is a *Mixed Method* research, with the research design is *explanatory sequential*. The research population includes everything that will be the subject of research to be examined. The population in research is a collection of individuals or objects that have common characteristic. The population in this study were all mathematics teachers at South Kuta Public Middle School. In research, the research sample has a very important role because in the study sample the data about the variables that researchers observe. The research sample consisted of 10 mathematics teachers in Kuta District Public Middle School consisting of South Kuta 1 Middle School, South Kuta 2 Middle School, South Kuta 3 Middle School, South Kuta 4 Middle School. The technique for sampling is done by purposive sampling technique with 4 schools for *research sampling.*This technique is used because all mathematics teachers at SMP Negeri Kecamatan Kuta Selatan can be given the same opportunity or opportunity to be involved in research.

Table 1 Sample Penelitian

No	Nama Sekolah	Jumlah Guru
1	SMP Negeri 1 Kuta Selatan	2
2	SMP Negeri 2 Kuta Selatan	3
3	SMP Negeri 3 Kuta Selatan	2
4	SMP Negeri 4 Kuta Selatan	3
TOTAL		**10 Guru**

According to Sugiyono (2012) research variables are attributes or properties or values of people, objects or activities that have certain variations that are determined by researchers to be studied and then conclusions drawn. This research involves independent and dependent variables. The independent variables in this study are *Content Knowledge* (X1) and *Pedagogical Content Knowledge* (X2), while the dependent variable in this study is teacher performance. This study uses instruments in the form of tests, questionnaires, interview guidelines, and observation sheets. This study uses qualitative and quantitative data collection techniques. Quantitative data collection techniques use tests and questionnaires while qualitative data collection techniques use interview and observation guidelines

Tests are generally measuring, although some forms of psychological tests, especially many personality tests that are descriptive, but the description leads to certain characteristics or qualifications so it is similar to the interpretation of the measurement results. The test used in this study aims to obtain quantitative results about CK teachers. The CK test was developed by referring to the SMP material in the OSN Mathematics Middle School book. The test used is an objective test form with multiple choice test types with the number of questions on the test as many as 20 questions consisting of algebraic material, number theory, set theory, function theory, equations and inequality, measurement, kobinatorik, opportunities and statistics, and geometry. The questionnaire used in this study was aimed at obtaining quantitative data about PCK abilities and mathematics teacher performance. For PCK questionnaire as many as 17 and 76 teacher performance items. This type of

ISSN: 2277-9655
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CODEN: IJESS7

questionnaire in this study using a Likert scale. Observation guidelines are used to guide the observations of the actions taken by teachers and students who can describe the teacher's CK and PCK.

Qualitative data collection techniques using interview and observation guidelines. Interview guidelines were made in order to obtain a picture of PCK mastery. The interview guide is answered by the teacher and the results that have been answered by the teacher are then measured using questions that will be analyzed later qualitatively. Observation guidelines are used for guidance in observing the actions taken by teachers and students who can describe CK and PCK teachers. Observation activities carried out before the implementation of research aimed at identifying problems that arise in learning activities. The form of observations made by filling in the checklist on the observations with the consideration of yes and no, carried out or not.

Data collection methods to obtain data to be analyzed it is necessary to collect data in the form of teacher CK tests, PCK questionnaires and teacher performance questionnaires. In this case data about the CK of the teacher was collected by giving a test to the teacher, the PCK of the teacher was collected using a questionnaire given to the teacher, and the performance of the teacher was collected using a questionnaire given to the teacher. This study uses instruments in the form of tests, questionnaires, interview guidelines, and observation sheets. The instrument was tested first and then the questionnaire was used to collect data from the research subjects. The trial of this instrument is intended to obtain a valid (reliable) and reliable (reliable) measurement tool.

The questionnaire format was created to collect data in the form of teacher PCK components and indicators of student material understanding. PCK questionnaires and teacher performance were measured using a Likert Scale to produce accurate data. Whereas the CK measurement is taken from giving a test to the teacher. The form of the test used in this study is the form of objective tests with multiple choice types. This test examines the mastery of CK teachers. Each question item is given a score of one if it answers correctly and a score of zero is given when answering incorrectly. The score of each answer is then added together and the sum is the score of the learning outcome variable.

According Suharsimi Arikunto (2013: 64) validity is a measure that shows the levels of validity or validity of an instrument. An instrument is said to be valid if it is able to measure what is measured and can reveal data from the variables studied appropriately. Validity shows the extent of the relevance of the question to what was asked or what you want measured in research. The test that has been compiled is then tested to determine the feasibility of the test to be used in research. The trial results are further analyzed to determine the level of validity, reliability, different power and level of difficulty. Based on the results of these calculations the instrument items developed by the researcher are selected or revised before being used as a measurement tool in research. The research instrument tested was the teacher performance questionnaire. The trial is carried out after the instrument is consulted with both supervisors and judges.

Quantitative data analysis techniques were carried out validity tests, namely content validity and empirical validity and reliability testing. After that, the path analysis is continued to estimate the causality relationship between variables that have been predetermined based on theory. Path diagram models created in this study are content knowledge, pedagogical content knowledge and teacher performance. Path analysis using normality test, linearity test, heterokedasticity test, multicollinearity test, autocorrelation test. For testing hypotheses using multiple linear regression, multiple correlations, and the coefficient of determination. Furthermore, qualitative data analysis techniques were obtained from data reduction, data display, and conclusion drawing / verification.

3. RESULTS AND DISCUSSION

The null hypothesis of this study is "there is no effect of CK and PCK on teacher performance". Test the null hypothesis, using a significant level of 5%. This means that if the significance value in the table is less or equal to 0.05, then the null hypothesis is rejected. Meanwhile, if the significance value in the table is more than 0.05, then the null hypothesis is accepted. The summary results of path analysis are shown in the following table.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

Table 1: Analysis Summary Model

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.922[a]	.851	.808	9.48762

a. Predictors: (Constant), x2, x1

In accordance with Table 1, the value of R Square, i.e. R2 = 0.851 shows the magnitude of the effect of CK and PCK on teacher performance by 85.1% and by 14.9% influenced by other factors.

Table 2: Analysis Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	142.195	25.809		5.510	.001
	x1	-6.043	2.233	-.922	-2.706	.030
	x2	3.935	.804	1.666	4.891	.002

a. Dependent Variable: y

The results of data tests with variables X1 and X2 on teacher performance obtained a value of 0.001 smaller than 0.05. The structural equation is said to be significant so that there is a relationship between X1 and X2 on teacher performance.

Based on the analysis in Table 2 above, the significance value for X1 is 0.030 less than 0.05 and the significance value of X2 is 0.002 less than 0.05. This means that at the 5% significance level, X1 and X2 have an influence on Y. The results also show that the efficiency of beta X1 is -0.922 and X2 is 1.666. Therefore, the regression model is recalculated. The results of the analysis in the table can be calculated the coefficient for error of $e_3 = \sqrt{1-R^2} = \sqrt{1-(0.851)} = 0.149$ This value is used to see the combined effect of research variables by

calculating the coefficient of determination so that the results obtained are 85.1%. These results indicate the magnitude of the effect of CK and PCK on Teacher Performance by 85.1% and 14.9% influenced by other variables.

Based on the results of the path analysis test obtained the direct effect of CK on teacher performance of -0.922 or -92.2% which is classified as low. This shows the high influence of CK on teacher performance by -92.2% and 7.8% is influenced by other factors. The p-value (Sig.) Obtained from the model test was 0.030 <0.05, which means significant. Thit <ttab value obtained for -2.706 <2.306. So, the effect that CK has on teacher performance is said to be insignificant.

Based on the results of the path analysis test obtained the direct effect of PCK on teacher performance of 1.666 or 166.6% which is relatively high. This shows the high influence of PCK on the performance of gurus at

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

166.6%. The p-value (Sig.) Obtained from the test model is 0.002 <0.05, which means that it is significant. The value of thit <ttab is 4.891> 2.306. So, the effect that PCK has on teacher performance is said to be significant.

Based on the results of the analysis in this study the results of the path analysis test with the equation obtained Y = -0.922X1 + 1.666X2 + 0.149 obtained an indirect effect of CK and PCK on teacher performance. The p-value (Sig.) Obtained from the model test was 0.001 <0.05 which means that this model is significant. In accordance with the equation shows the direct effect of CK and PCK on teacher performance by 85.1% and 14.9% influenced by other variables.

These results are supported from the results of teacher interviews. Excerpts from subject 1 teacher interviews as follows:

Researcher: "What is the difficulty of Mr / Ms in applying the relationship between a concept of teaching materials with other teaching materials?"
Teacher : "Less aware of the benefits of mathematical concepts in life and students tend to have less connection skills."
Researcher: "How do principals motivate good performance?"
Teacher: "By carrying out supervision and observation of learning and organizing workshops."
Researcher: "So far the role of Mr / Mrs as a teacher has been fulfilled in improving teacher performance?"
Teacher : "Yes, that is by attending workshops to improve performance as a teacher."
Researcher: "Are you able to apply a concept of teaching material?"
Teacher: "Poor and need to be improved." Researcher: "What do you do to overcome student difficulties?"
Teacher: "Present learning material in its entirety (less student-centered)."

In the interview excerpt above, subject 1 has CK, PCK and teacher performance scores in a very good category. In the interview excerpt above it is explained that in applying the relationship between a teaching material concept and other teaching material teachers still lack the use of mathematical concepts in daily life. so students are still lacking in connecting mathematical concepts in life. Related to the teacher's performance in the interview excerpt explained that with the holding of the workshop, the teacher can attend workshops to improve performance as a teacher. To overcome students' difficulties in the learning process the teacher can present the material intact.

Excerpts from subject 4 teacher interviews as follows:

Researcher: "What is the difficulty of Mr / Ms in applying the relationship between a concept of teaching materials with other teaching materials?"
Teacher : "Not yet, because many students don't understand the concept of mathematics teaching material."
Researcher: "How do principals motivate good performance?"
Teacher : "Give a good example to carry out the task."
Researcher: "So far the role of Mr / Mrs as a teacher has been fulfilled in improving teacher performance?"
Teacher : "It has been fulfilled by providing facilities and infrastructure in improving the quality of education one of which is in the form of teaching aids."
Researcher: "Are you able to apply a concept of teaching material?"
Teacher : "Not able to, many students who have not been able to watch math problems in accordance with the RPP."
Researcher: "What do you do to overcome student difficulties?"
Teacher : "Giving assignments and repeating concepts that are not yet understood."

In the interview excerpt above, subject 4 has CK, PCK and teacher performance scores in the excellent category. In the interview excerpt above it is explained that in applying the relationship between a teaching material concept and other teaching material the teacher has not been able to apply it because there are still students who have not understand the concept of mathematics teaching material. Ways taken by the Principal in motivating good teacher performance by providing good examples in carrying out assignments. Related to applying a

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

concept of teaching material, the teacher is still lacking in applying the concept of teaching material caused by many students who have not been able to solve mathematical problems contained in the lesson plan.

Based on observational data on the implementation of learning carried out during the study, findings were obtained about CK, PCK, and teacher performance. Excerpts of subject 3 teacher's observations as follows:

a. The teacher explains the material carefully so that students easily understand the material being taught
b. The teacher can connect the material taught with everyday life.
c. The teacher uses the lecture method but the explanation on the board is very detailed so students are easy to understand and easy to note important things.
d. The teacher gives exercises and the results of the questions being worked on can be discussed with my classmates.
e. Before ending learning, the teacher asks students if students are still experiencing difficulties.
f. The teacher responds to questions from students regarding material that is not yet understood and explains it carefully again.

Excerpts of subject 8 teacher's observations as follows:
a. Teachers provide motivation and relate it to everyday life.
b. The teacher reminds students again about the previous material.
c. The teacher forms groups and gives exercises to be discussed with group friends.
d. If students experience difficulties, the teacher is ready to explain again until students understand.
e. Before ending the learning teacher gives an evaluation to measure how capable the students are in understanding the material that has been delivered by the teacher.

4. CONCLUSION

In the world of teacher education is a success factor in the learning process. Many factors occur one of which is the teacher has not mastered the teaching material and can be said to not be able to apply the other teaching material. Teachers can be said to have a good CK if the teacher can master the material to be taught. There are levels that teachers must have in CK, namely
1. Level 0 (Inadequate)
2. Level 1 (Good)
3. Level 2 (Strong).

PCK is knowledge that must be understood by a teacher because a teacher must be familiar with alternative concepts and difficulties that will be faced by students with diverse backgrounds and can organize, organize, run and assess subject matter, all of which are summarized in PCK. A good PCK is identical with a professional teacher. As for the components in PCK, namely
1. Knowledge about the material,
2. Knowledge about the objectives,
3. Knowledge about students,
4. Knowledge about the curriculum,
5. Knowledge about teaching,
6. Knowledge about assessment,
7. Knowledge about the source power.

Ball et al. (2008) say that the MKT (Mathematical Knowledge for Teaching) component is related to knowledge for teaching mathematics. Components of Pedagogical Content Knowledge (PCK) in mathematics learning include:
1. Knowledge of content (mathematics) and students (knowledge of content and students),
2. Knowledge of content (mathematics) and teaching (knowledge of content and teaching), and
3. Knowledge of content (mathematics) and curriculum (knowledge of content and curriculum).

Teacher performance is the performance is the work that has been achieved by someone in an organization to achieve goals based on standardization or size and time that is adjusted to the type of work and in accordance

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CODEN: IJESS7

with the type of work and in accordance with established norms and ethics. To obtain data, data collection techniques use quantitative and qualitative data. Data collection methods used were CK tests, PCK questionnaires and teacher performance questionnaires. The results showed that the path analysis results obtained obtained the path equation obtained Y = -0,922X1 + 1,666X2 + 0,149 which means that every increase in 1 teacher's CK value results in a decrease in teacher performance of -0.922. Every increase of 1 teacher's PCK score there is an increase in teacher performance by 1,666. This result is supported by the magnitude of the influence of the coefficient of determination of 85.1% and 14.9% influenced by other variables.

Based on emperic data and a significance level of 5%, it can be seen that:

1. There is no influence of mastery of Content Knowledge (CK) on the performance of mathematics teachers at SMP Negeri Kecamatan Kuta Selatan. It is proven that the significance value (Sig) is 0.030 <0.05. Furthermore, the coefficient of determination (R Square) of 0.851. This shows the magnitude of the effect of CK on teacher performance of -0.922, which means the high influence of CK on teacher performance of -92.2% and 7.8% is influenced by other factors. Furthermore, according to the results of interviews conducted by researchers showed that CK teachers in understanding and connecting the concept of teaching materials is still lacking because not all concepts have a relationship so they must choose which concepts can link to other concepts. This can be seen from the results of observations made by researchers, teachers can link the material taught with everyday life.

2. There is an influence of mastery of Pedagogical Content Knowledge (PCK) on the performance of mathematics teachers at SMP Negeri Kecamatan Kuta Selatan It was proven that the significance value (Sig) was 0.002 <0.05. Furthermore, the coefficient of determination (R Square) of 0.851. This shows the magnitude of the effect of PCK on teacher performance by 1,666 or 166.6%. Furthermore, according to the results of interviews conducted by researchers showed that teachers can overcome student difficulties by presenting learning material in its entirety and providing contextual examples. In addition, the teacher also guides students by giving a re-understanding of material that is not yet understood. This can be seen from the results of observations made by researchers, teachers explain the material carefully so that students easily understand the material being taught. There are teachers who use the lecture method, it does not mean the teacher cannot apply other methods, but the teacher understands the needs of the students so that the teacher can provide an explanation on the board in great detail so that students are easy to understand and easy to note important things.

3. There is an influence of mastery of Content Knowledge (CK) and Pedagogical Content Knowledge (PCK) on the performance of mathematics teachers at SMP Negeri Kecamatan Kuta Selatan. The regression equation is Y = -0.922X1 + 1.666X2 + 0.149, then the significance value (Sig) of 0.001 <0.05 is known. Furthermore, the coefficient of determination (R Square) of 0.851, which means CK and PCK teachers have an influence of 85.1% on teacher performance while 14.9% is influenced by other factors. Furthermore, according to the results of interviews conducted by researchers of teachers who have CK and PCK with a high category because the teacher can apply teaching materials with other teaching materials besides the teacher can convey the material well and make students more comfortable and easier to understand besides, the teacher can overcome the difficulties of students by presenting learning materials in their entirety and providing contextual examples so that teachers can improve their performance.

Based on the conclusion above, the following recommendations are:

1. The teacher should be able to connect other teaching materials delain that the teacher must also guide students if students are experiencing difficulties. Teachers should better understand the state of students so that when providing examples of linking teaching materials with other teaching materials students more easily associate them in daily life.
2. Schools should be able to provide maximum facilities in the form of teaching aids or media so that students more easily understand the material to be provided so that it can support the learning process.
3. To be used as a reference for the completeness of further research and can develop this research further, especially by adding other variables that have not been included in the model that affects CK and PCK teachers

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