

# ANALYSIS OF TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE CAPABILITIES OF TADRIS SCIENCE TEACHER PROSPECTIVE STUDENTS AT UIN FATMAWATI SUKARNO BENGKULU

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## ABSTRACT

This research aims to describe the Technological Pedagogical Content Knowledge abilities of Tadris Science Teacher Candidate Students at Fatmawati Sukarno State Islamic University, Bengkulu. This research is a type of Mixed Methods research which combines quantitative and qualitative methods. The overall research results show that the abilities of Tadris Natural Sciences students at Fatmawati Sukarno Bengkulu State Islamic University are relatively good with an average percentage of 80.5%. It can be concluded that the level of Technological Pedagogical Content Knowledge ability of Tadris Science teacher candidates as a whole is relatively good with an average score of Technological Knowledge 80.9%, Pedagogical Knowledge 78.9%, Content Knowledge 81.3%, Technological Content Knowledge 80.6 %, Pedagogical Content Knowledge PCK 80.4%, Technological Pedagogical Knowledge 80.9% and Technological Pedagogical Content Knowledge 80.5%.

**Keywords** : science teacher candidates; technological pedagogical content knowledge

## INTRODUCTION

One of the success factors in education is the teacher. Therefore, professional teachers must be trained from the start, namely during the teacher training period. Student teachers should be offered teaching methods, the use of information and computer technology (ICT), management of academic content, and student thinking and learning. High quality training can also be provided by high quality trainers, ie. specialists with standard qualifications. and has a strong commitment to creating world-class human resources (HR). One of the keys to success in the world of education is the teacher (Kariadinata et al., 2018). Prospective teachers must pay attention to their qualities

to become teachers, how to realize their position in the current era of the industrial revolution (Azizah et al., 2021).

Technology has a strong influence in schools as a tool that can change the way subjects are taught in the learning process, and good teaching requires teachers and students to use technology to collect, organize and evaluate information to solve problems. (Sumiyati Sa'adah et al., 2018). In implementing the 2013 curriculum, teachers must master technology in learning and be able to use/apply information technology in learning. Current learning problems require teachers to have good technical knowledge of pedagogy and content or TPACK knowledge. TPACK is

an integrated conceptual framework of interconnected technology, pedagogy and content (material) knowledge proposed by Misra and Koehler in 2006. (National & Science, 2017).

The use of technology in learning requires competent teachers. These are teachers who understand how to integrate professional skills, pedagogical skills and technology into learning. According to Koehler & Mishra, these three skills are called technology pedagogy content knowledge (TPACK). (Sintawati & Indriani, 2019). The very rapid development of science and technology (IPTEK) has greatly influenced the development of educational science, especially in developed countries. The relationship between science, technology and society is becoming increasingly apparent. Through science education, a person can improve their ability to adapt to change and enter the world of technology, including the world of information, their ability to work, be knowledgeable and develop. The personality of the Indonesian nation hopes to continue and guarantee the level of general prosperity (Ali et al., n.d.).

The presence of technology in the digital era has had a huge impact on changing the learning paradigm. The real impact is changes in learning planning, strategies, standards and interaction

models. The use of technology in various forms is expected to provide many benefits for various learning problems. The integration of technology into learning is starting to develop at this time. This integration is called Technology Pedagogy Content Knowledge (TPACK). (Irfan Yusuf, et al., 2022). TPACK is the integration of science and technology in teaching various scientific disciplines. The complex relationship between the basic components of CK, PK and TK knowledge must be managed by teachers by teaching appropriate pedagogical methods and techniques. Saadah in his research stated that efforts are needed to overcome the difficulties of teachers and educators in integrating TPACK into learning. Student TPACK plays a very important role because it influences the way students are taught. With the help of learning tools, prospective teachers can systematically carry out an effective learning process and respond to students' learning needs. (Roisatun Nisa', et al., 2021). It is very necessary to hone it to improve the TPACK abilities of prospective science teacher students, in order to improve the quality and professionalism in teaching and learning activities in order to achieve national education goals and fulfill the educational demands stated in the 2013 curriculum, by knowing the level of ability possessed as evaluation material.

## **METHOD**

This research is a mixed method research that combines quantitative and qualitative methods. This research is a stage research that combines two existing forms of research, namely quantitative research and qualitative research. According to

(Creswell 2010) mixed research is a research approach that combines qualitative and quantitative research. (Sugiyono 2012) states that mixed research methods are quantitative and qualitative research methods that are used together in a research

activity to obtain more complete, valid, reliable and objective information. All Tadris IPA students from the class of 2019 who were research subjects totaled 62 students. The sampling technique used in the research was purposive sampling. The questionnaire instrument contained statements to measure the Technological Pedagogical Content Knowledge (TPACK) abilities of prospective science teacher students in science learning. The statement items in the questionnaire are divided into 7 components, namely Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and Technological Pedagogical Content Knowledge (TPACK). The aim of the interview was to obtain data that could strengthen the results of the questionnaire data regarding the Tadris IPA Study Program students' ability in Technological Pedagogical Content Knowledge (TPACK).

**Total Population  
Tadris Science Student Class of  
2019**

No	Class	Number of Students
1.	A	21 person
2.	B	21 person
3.	C	20 person

Data analysis techniques include questionnaire analysis and interview analysis. The questionnaire analysis used in this research is descriptive statistical analysis using the formula:

$$NP = \frac{R}{SM} \times 100\%$$

Information :

NP = Percentage Value

R = Raw score obtained by prospective science teacher students

SM = Ideal maximum score

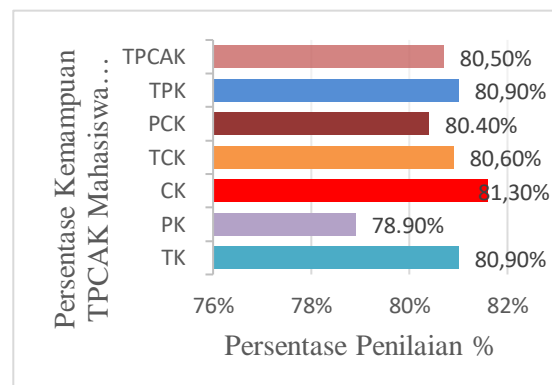
**Interpretation Criteria Table  
Score**

Rentang	Kategori
≤ 20%	Sangat Kurang
> 21% - ≤ 40%	Kurang
> 41% - ≤ 60%	Cukup
> 61% - ≤ 80%	Baik
≥ 81%	Sangat Baik

(Source : Eka Ariyati. 2018)

## RESULTS AND DISCUSSION

The following are the results of the recapitulation or overall analysis of Tadris IPA students' Technological Pedagogical Content Knowledge (TPACK) abilities which have been presented in the form of a bar chart showing the average percentage value of Tadris IPA students' TPACK abilities for each component.



The results of research on the TPACK abilities of Tadris IPA students achieved various grades. This is the result

of the research that has been carried out, which will be discussed one by one and supported by the results of respondent interviews.

a.) *Technological Knowledge*

Obtained an overall average score of 80.90% with good criteria. There are seven statements from the Technological Knowledge questionnaire, namely ease of learning and using computer technology, following developments, adapting to updates, differences in technology, software, applications, application technology that is suitable for use in science learning, use of power points in learning and ease of learning science with technology. The statement with the highest score of 87.4% is the statement using power point in science learning. This means that using power points in learning can make it easier for students to explain the material because it can save learning time, power points can also insert images related to the learning material, and summarize explanations of the material in a structured manner. Meanwhile, the statement with the lowest score of 76% was the statement knowing the differences in technology, software and applications.

According to Sherly, Tadris Science Student (Interview, 23 May 2023) "Technology in education is very important, because technology can support the learning process, especially science learning, to be much more effective and make

students more interested in learning with the help of technology."

b.) *Pedagogical Knowledge (PK)*

The Pedagogical Knowledge component received an average of 78.9% with good criteria. The results obtained show that Tadris Science student teacher candidates have good pedagogical knowledge. Of the seven Pedagogical Knowledge statements, there is a statement with the highest score of 81.9%, namely assessing student performance in class, meaning that it shows that prospective Tadris Science teacher students have mastered basic educational knowledge, one of which is assessing student performance in class. Meanwhile, the statement with the lowest score of 76.4% was the statement on managing the class well. Tadris Science student teacher candidates are being prepared to become teachers, so Tadris Science teacher candidate knowledge regarding the pedagogical component is an important thing for student Tadris Science teacher candidates to master.

It can be seen that prospective Tadris Science teachers have already selected knowledge regarding strategies and methods that can be used in science learning. (Muhtarom 2020) states that pedagogical knowledge refers to the teacher's ability to choose tasks, examples, and representations as well as appropriate strategies for teaching students. Muhtarom also emphasized that pedagogical knowledge depends on the ability to explain material through various learning media so that students are able to understand learning.

c.) *Content Knowledge (CK)*

The Content Knowledge component obtained a percentage score of 81.3% with very good criteria. The CK component is very high, indicating that prospective Tadris Science teacher students have mastered the science material that will be taught. Of the seven Content Knowledge statements, there is a statement with the highest score of 84.5%, namely attending seminars or workshops related to science learning. Meanwhile, the statement with the lowest score of 77.4% was the statement about thinking like a science expert when teaching. Students still lack or still don't really understand how to think like science experts when teaching, because this requires more learning and sufficient teaching experience. According to Riawan Yudi Purwoko (2017) CK is knowledge that must be mastered by teachers and prospective teachers. Because CK is one of the demands of the teacher competency standards so that teachers become professional teachers.

d.) *Technological Content Knowledge (TCK)*

The Technological Content Knowledge (TCK) component obtained an average percentage of 80.6% which is in good criteria. This shows that prospective Tadris Science teacher students are able to understand the concepts in the content with the help of technology. Of the seven statements, there is a statement with the highest score of 83.2%, namely developing learning activities and student assignments involving technology. Meanwhile, the statement with the

lowest score of 79.3% is using technology, understanding the concept of learning theory and choosing technology that is appropriate to the science material to be taught. The results of the interview with Petri (Interview 24 May 2023) were:

"Choosing technology that is easy to understand and feels fun for students, such as delivering lesson material through Power Point presentations so that science learning is easier for students to understand."

Based on the interview results from Tadris IPA students above, it can be concluded that prospective Tadris IPA teacher students already know the technology that can be integrated with science material. Mishra Koehler (2008) added that teachers must understand the appropriate use of technology in delivering certain material.

e.) *Pedagogical Content Knowledge (PCK)*

The Pedagogical Content Knowledge (PCK) component obtained a percentage score of 80.4% which is in the good criteria. Of the seven Pedagogical Content Knowledge statements, there is a statement with the highest score of 82.5%, namely making lesson plans with a good understanding of science learning material. Meanwhile, the statement with the lowest score of Pedagogical Content Knowledge of 78.3% is choosing learning approaches and strategies in accordance with science learning material. Widawati (2021) in her research stated that there needs to be cooperation between teachers and students. A good relationship between teachers and students can make teachers better understand the situation of the class and

their students, so they can find appropriate teaching methods.

f) *Technological Pedagogical Knowledge (TPK)*

The Technological Pedagogical Knowledge (TPK) component received a percentage score of 80.9% with good criteria. Of the seven Technological Pedagogical Knowledge statements, there are two statements with the same highest score of 82.9%, namely using computer applications in science learning. As the results of an interview with Rafikan (23 May 2023) stated that: "Learning with technology makes science learning very effective and efficient, because students look more focused and pay attention to what the teacher is saying."

Meanwhile, the statement with the lowest score of 78.7% is doing quizzes online, such as using Edmodo and quizizz in the science learning process, meaning that students are still lacking and need to study more and look at the situation and conditions of students to do quizzes online. Based on the results of the interviews above, it shows that the majority of Tadris IPA students are of the opinion that technology in learning makes learning effective and efficient, because technology makes it very easy for teachers to convey material and nowadays, the majority of people use technology without exception in education.

g) *Technological Pedagogical Content Knowledge (TPACK)*

The Technological Pedagogical Content Knowledge

(TPACK) component obtained a percentage score of 80.5% with good criteria. The results obtained show that Tadris IPA students are able to integrate technology, content and pedagogy in the science learning process. Of the seven Technological Pedagogical Content Knowledge statements, there is a statement with the highest score of 81.6%, namely knowing how to combine science, pedagogy and technology knowledge and the statement understanding how to combine science knowledge, pedagogy and technological knowledge in science learning. Meanwhile, the statement with the lowest score of 79% was using a strategy of combining technology with a classroom teaching approach during internship 3 at school.

The results of the interview with Petri (Interview 23 May 2023) stated that:

"Part of the learning I did during internship 3 involved the use of technology, and in my opinion, the factor that supports being able to integrate technology with learning management is the experience factor, namely experience that has been carried out, so that it can increase knowledge about integrating technology in learning."

This means that students need to increase awareness by understanding the integration of technology with teaching approaches. Suyanto stated that the development of science and technology could be one way to improve the quality of learning carried out by a teacher.

## CONCLUSION

The level of Technological Pedagogical Content Knowledge ability of Tadris Science teacher candidates as a whole is relatively good with an average score of Technological Knowledge 80.9%, Pedagogical Knowledge 78.9%, Content Knowledge 81.3%, Technological Content Knowledge 80.6%, Pedagogical PCK Content Knowledge 80.4%, Technological Pedagogical Knowledge 80.9% and Technological Pedagogical Content Knowledge 80.5%. The highest percentage score was obtained by the Content

Knowledge component, 81.3%, this is because students have been provided with science courses which include science material, so students are able to master the material very well. Meanwhile, the lowest percentage value is found in komponen *Pedagogical Knowledge* 78,9%, This shows that Tadris IPA students are quite good at understanding the abilities that must be developed by a teacher or student teacher to be able to manage the class in learning activities.

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