The Correlation Between Lesson Planning and Knowledge in Order to Use TPACK in School Teachers in Makassar City

Arsad Bahri
Asham Bin Jamaluddin
Saparuddin
Nur Aisyah Ainun
Muh Arifuddin

Introduction

Education plays a crucial role in a nation's development. Enhancing human resource quality is a major focus of education in the twenty-first century. Education is also necessary to guarantee that students have the capacity to learn and think creatively, to use technology and information media, and to be able to work and survive throughout their lives (Bahri et al., 2021). This is stated in Law Number 20 of 2003 about the National Education System, which highlights that education should develop students' potential to benefit the nation, state, society, and themselves. Teachers must be proficient in the use of technology, information, and communication in order to implement the 21st century learning paradigm. In order to create innovative learning experiences, teachers must possess expertise in pedagogy, content, and technology (Bahri et al., 2018). Technology-based learning is an emerging learning innovation that is growing quickly. According to Hasmunarti et al. (2018), there is a growing expectation on the part of the global education community to constantly adjust to technological advancements in order to actively participate in efforts to raise educational standards. Technology should be able to help students learn in an efficient manner. Information and communication technology (ICT) advancements have the potential to greatly enhance constructivist learning environments and speed up the learning process (Muis & Bahri, 2018). But in practice, a lot of teachers continue to not make use of this infrastructure. According to Ismail and Muis (2021) a lot of teachers still struggle to incorporate ICT into their lesson plans. Rosenberg & Koehler (2015) state that in order to achieve quality learning, a framework for the development of pedagogy, technology, and instructional materials is necessary. According to Minister of Education and Culture Regulation No. 22 of 2016 concerning Primary and Secondary Education Process Standards, this is in accordance with Chapter III, which explains the principles of

Abstract. *Innovative and creative teaching methods are prioritized in 21st century education. Many teachers still do not fully utilize technology, despite the fact that it is accessible to help learning. Therefore, a framework is required for the integration of pedagogy, technology, and educational resources. Technological Pedagogical and Content Knowledge is one pertinent strategy (TPACK). An overview of the relationship between teachers at Makassar's Sekolah Penggerak knowledge and their capacity to apply TPACK is the goal of this quantitative descriptive study. The following result were reached: 1) The percentage of Sekolah penggerak Teachers in Makassar who possess TPACK knowledge is 92%; 2) The percentage of Sekolah penggerak Teachers in Makassar who possess TPACK ability is 92%; 3) The percentage of Sekolah penggerak Teachers in Makassar who can develop teaching modules using the TPACK approach is 94%; and 4) There is a significant correlation between TPACK knowledge and the ability to implement the TPACK framework through the development of learning tools, with a large relationship of 0.608 x 0.591 = 0.359 with a total effect of 0.518 + 0.359 = 0.87 at a significance level of 0.047 (<0.05). In general, the categories of knowledge and skills of the TPACK teachers of the Sekolah penggerak in Makassar include very good and the knowledge of TPACK has a significant relationship to the ability to implement a TPACK framework through the capacity to develop learning devices at the Sekolah penggerak in Makassar.*
Keywords: *Implementation Ability, Learning Planning, Sekolah penggerak, TPACK.*

Arsad Bahri
Universitas Negeri Makassar
Indonesia

Asham Bin Jamaluddin
Universitas Negeri Makassar
Indonesia

Saparuddin
Universitas Negeri Makassar
Indonesia

Nur Aisyah Ainun
Universitas Negeri Makassar
Indonesia

Muh Arifuddin
Universitas Negeri Makassar
Indonesia

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creating teaching modules and emphasizes the need to apply information and communication technology in a way that is integrated, methodical, and effective given the circumstances.

Teachers and students both need to integrate ICT (Santosa et al., 2022). Technological Pedagogical and Content Knowledge (TPACK), or the knowledge of technology, pedagogy, and content, is the method that educators can use to incorporate technology into the classroom in the twenty-first century. According to Harfiani et al. (2022), educators who put students' needs ahead of their own, act as learning facilitators, and take the initiative to implement change are essential for teaching in the twenty-first century. Teachers who are having trouble figuring out how to incorporate material into their lessons can find fresh perspectives from the TPACK framework.

Technology-mediated instruction and learning (TPACK) is the knowledge base that requires. Teachers need to be proficient in organizing technology, pedagogy, and learning content both theoretically and practically because it is part of their professional nature. The explanations provided by a number of experts above lead one to the conclusion that TPACK is the understanding of how to use current technology to enhance the learning process. Shulman (1986) initially used the term "TPACK," and Koehler & Mishra (2008) developed it.

In the field of educational research, TPACK is recognized, according to Suyamto et al. (2020), as a framework for creating learning models that integrate pedagogy, content, and technology. Seven knowledge components make up TPACK. In order to facilitate successful technology-based learning, this framework was developed to ascertain how educators perceive the relationship between technology and PCK. TCK (Technological Content Knowledge), TPK (Technological Pedagogical Knowledge), and PCK (Pedagogical Content Knowledge) are the three main components of the TPACK scheme. TK, PK, and CK interact with each other and are integrated into these three components. Based on the viewpoint of Koehler and Mishra (2013), the TPACK scheme is as follows.

Figure 1: TPACK model with its knowledge components.
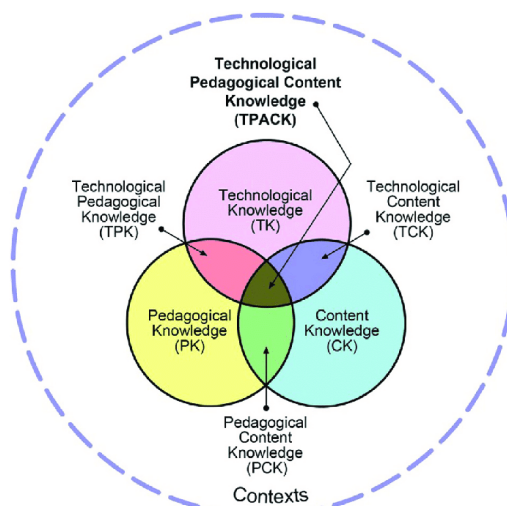
Source: Koehler and Mishra (2008)

The ability to integrate technology into the teaching of specific subjects to students is known as technology-presumption-and-knowledge, or TPACK (Schmidt et al., 2009). Age and the way that a teacher uses technology in the classroom are two factors that affect their TPACK skills. An educator's capacity to absorb new information and knowledge increases with their age. The use of technology in daily life can help teachers become more proficient in TPACK (Kazu, 2014).

There are multiple factors that impact each variable in TPACK. For example, TK is influenced by technological skills and methods. Students' group activity planning has an impact

on the PK component. In terms of helping students grasp the subject matter during the learning process, the CK element has the biggest impact. The TPK component teaches students how to modify technology to perform various learning tasks. TCK is knowledgeable about how best to integrate technology into the curriculum to facilitate students' understanding of the subject matter. The implementation of educational and dialogical learning, which allows students to actively participate in the learning process, has the biggest influence on PCK. TPACK, on the other hand, combines pedagogy, technology, and teacher-presented content in learning activities in a way that is harmonious (Puspitarini, 2013).

Knowledge of TPACK also affects a teacher's capacity to create instructional materials. As long as aspiring educators can incorporate technology into the lesson plans they create, they will be able to use it effectively in the classroom. This claim indicates that TPACK possesses by an instructor is reflected in learning aids. Kurniasih and Sani (2017) contend that incorporating technological components into instruction can improve the efficacy of instructional activities.

Problem of Research

The problem in this study is formulated as follows: 1) How much do the biology teachers at the Sekolah penggerak in Makassar know about Technological Pedagogical and Content Knowledge (TPACK)? 2) How skilled are the teachers in TPACK?; 3) How well-equipped are the biology instructors at Sekolah Penggerak in Makassar to create lesson plans utilizing the Technological Pedagogical and Content Knowledge (TPACK) framework? and 4) How do biology teachers at the Sekolah penggerak in Makassar relate their knowledge to their capacity to apply Technological Pedagogical and Content Knowledge (TPACK)?

Research Focus

The following are the goals this study is trying to achieve. 1) to ascertain the biology instructors at the Sekolah penggerak in Makassar's level of Technological Pedagogical and Content Knowledge (TPACK) proficiency; 2) To assess the Technological Pedagogical and Content Knowledge (TPACK) competencies of the biology instructors at Makassar's Sekolah penggerak; the Sekolah penggerak in Makassar in order to assess the teacher's capacity to create lesson plans and instructional materials utilizing the Technological Pedagogical and Content Knowledge (TPACK) framework; and 4) to ascertain the connection between biology instructors at the Sekolah penggerak in Makassar's knowledge and their capacity to apply Technological Pedagogical and Content Knowledge (TPACK).

Methodology of Research

General Background of Research

Technology-mediated instruction and learning (TPACK) is the knowledge base that requires. Teachers need to be proficient in organizing technology, pedagogy, and learning content both theoretically and practically because it is part of their professional nature. The explanations provided by a number of experts above lead one to the conclusion that TPACK is the understanding of how to use current technology to enhance the learning process. Knowledge of TPACK also affects a teacher's capacity to create instructional materials. As long as aspiring educators can incorporate technology into the lesson plans they create, they will be able to use it effectively in the classroom. This claim indicates that TPACK possesses by an instructor is reflected in learning aids. The purpose of this study is to describe how Sekolah penggerak teachers in Makassar relate to knowledge, learning planning, and the capacity to apply TPACK.

Sample of Research

All of the biology teacher at sekolah penggerak made up the study's population. Purposive sampling, or sampling based on specific considerations, is the sampling technique

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used in this study. School accreditation was the basis for the researchers' decision. The educational institutions utilized for the study encompass all current accreditations. Using instruments for collecting data, each school chose a number of its teachers to be observed as informants. Teachers of biology at the school where the research is being conducted served as the informants; fifteen teachers in all answered the survey.

Instrument and Procedures

Instruments for collecting data include observation sheets, questionnaires, and supporting documentation. The two variables in this study are the biology teachers' TPACK proficiency at the Sekolah penggerak in Makassar and their TPACK knowledge, which is the independent variable. The observation sheet was used to gauge the degree of mastery of biology teachers' TPACK abilities as directly observed by the researcher, the teaching module assessment sheet gauged teachers' TPACK abilities in creating teaching and learning modules with supporting documentation, and the questionnaire instrument gauged biology teachers' TPACK knowledge through self-assessment. in the shape of lesson plans from every biology instructor.

Data Analysis

Three categories of data analysis techniques are employed: path analysis, inferential statistical analysis, and descriptive analysis. The following formula can be used to determine the TPACK knowledge and ability values:

$$P = \frac{\text{score obtained}}{\text{maximum score}} \times 100\%$$

The percentage criteria are described in Table 1.

Table 1. Criteria for the percentage of TPACK knowledge and abilities.

Total score (%)	Criteria
81-100	Very good
61-80	Good
41-60	Enough
21-40	Enough less
0-20	Not enough

Results of Research

The results of data analysis of the relationship of knowledge and learning planning with the ability to implement Technological Pedagogical and Content Knowledge (TPACK) of teachers of the Sekolah Penggerak in Makassar are carried out with techniques of statistical data analysis descriptive and statistical analysis inferential are as follows.

Table 2. Knowledge data from the TPACK on the teachers of Sekolah Penggerak in Makassar.

Category	TK (%)	PK (%)	TPACK Component				
			CK (%)	TCK (%)	PCK (%)	TPK (%)	TPACK (%)
Very Good	66.7	73,3	80	60	60	60	100
Good	33.3	26,7	20	40	40	40	0
Enough	0	0	0	0	0	0	0
Less	0	0	0	0	0	0	0
Very Less	0	0	0	0	0	0	0

The knowledge of the TPACK Teachers School in Makassar shows that the Technological Pedagogical and Content Knowledge component (TPACK) has a 100% percentage of the 15 respondents or belongs in the category very good.

Analysis of the data obtained from the data on the ability to implement TPACK on learning in class by the Teacher of the Sekolah Penggerak in Makassar obtaines the data of the TPACK Teacher's ability in table 3.

Table 3. Ability data implementing TPACK on classroom learning.

Category	TPACK Component						
	TK (%)	PK (%)	CK (%)	TCK (%)	PCK (%)	TPK (%)	TPACK (%)
Very Good	86,7	80	100	66.7	86.7	80	73.3
Good	13.3	20	0	33,3	13.3	20	26.7
Enough	0	0	0	0	0	0	0
Less	0	0	0	0	0	0	0
Very Less	0	0	0	0	0	0	0

Analysis of the data obtained from the ability to develop the learning device (teaching module) data created and applied to the learning process of the teachers of the Sekolah Penggerak in Makassar, then obtains the data of the skills of the TPACK Teachers in Table 4.

Table 4. Data ability to develop learning devices.

Category	TPACK Component						
	TK (%)	PK (%)	CK (%)	TCK (%)	PCK (%)	TPK (%)	TPACK (%)
Very Good	86.7	100	100	100	100	100	13,3
Good	13.3	0	0	0	0	0	86,7
Enough	0	0	0	0	0	0	0
Less	0	0	0	0	0	0	0
Very Less	0	0	0	0	0	0	0

Based on the above table, the capabilities of the TPACK on the teacher of Sekolah Penggerak in Makassar from the observation results, the component that has the highest rating in the category very good is Content Knowledge (CK) is 100% and on the evaluation of the teaching module are the components Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), and Technological pedagogical knowledge (TPK) are 100%. Whereas for the remaining components fall into the category Good.

Results of the normality test of the knowledge and ability of the TPACK in the teachers of the Sekolah Penggerak in Makassar using SPSS 26 in table 5.

Table 5. Results of the normality test of the knowledge and abilities of the TPACK on the teacher of Sekolah Penggerak in Makassar.

Variable	Sig. (2-tailed)	Description
TPACK Knowledge	0,200	Normal distribute
TPACK Ability	0,200	Normal distribute

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From the above table it is shown that the knowledge variable of the TPACK teacher of the Sekolah Penggerak with a value of 0.200 > 0.05 and the ability variable TPACK of the teacher of a Sekolah Penggerak with the value of 0.02 > 0.05. Normal distributed data has a significance value greater than 0.05 (sig. > 0.05) so it can be concluded that all the data variables, both on the knowledge variable and on the ability TPACK are distributed normally.

The linearity test results are used to determine whether or not two variables have a linear relationship, i.e. if the significant value obtained is > 0.05.

Table 6. Results of the linearity test of knowledge and the ability to develop the integrated learning device TPACK.

			Sum of Squares	df	Mean Square	F	Sig.
Ability_LDD * Knowlwdge	Between Groups	(Combined)	36.100	8	4.512	2.006	.206
		Linearity	18.332	1	18.332	8.147	.029
		Deviation from Linearity	17.768	7	2.538	1.128	.450
	Within Groups		13.500	6	2.250		
	Total		49.600	14			

The results of the analysis showed that in the ANOVA table the value of F on the deviation from linearity of 1,128 with a significance of 0,450, then the conclusion was obtained that the significant value of 0.450 > 0,05, which means two variables have a linear relationship.

Table 7. Results of the linearity test of knowledge and the ability to implement the TPACK framework in the classroom.

			Sum of Squares	df	Mean Square	F	Sig.
Ability_MK* Knowledge	Between Groups	(Combined)	2442.233	8	305.279	1.231	.411
		Linearity	1054.682	1	1054.682	4.252	.085
		Deviation from Linearity	1387.551	7	198.222	.799	.616
	Within Groups		1488.167	6	248.028		
	Total		3930.400	14			

The results of the analysis showed that in the ANOVA table the value of F on the deviation from linearity of 0.799 with a significance of 0.616, then the conclusion was obtained that the significant value is 0.616 > 0.05, which means two variables have a linear relationship.

Table 8. Results of the linearity test of ability to develop learning tools and the ability to implement the TPACK framework.

			Sum of Squares	df	Mean Square	F	Sig.
Ability_MK* Ability_MPP	Between Groups	(Combined)	28.600	10	2.860	.545	.801
		Linearity	17.305	1	17.305	3.296	.144
		Deviation from Linearity	11.295	9	1.255	.239	.965
	Within Groups		21.000	4	5.250		
	Total		49.600	14			

The results of the analysis show that in the ANOVA table the value of F on the deviation from linearity of 0.239 with a significance of 0.965, then it is concluded that a significant value of 0.965 > 0.05, which means two variables have a linear relationship.

Linear regression analysis results are used to determine the great influence between two variables by looking at the significant value obtained > 0.05.

Table 9. Anova results linear regression analysis of knowledge and the ability to develop integrated learning devices TPACK.

ANOVAa					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	18.332	1	18.332	7.622	.016
Residual	31.268	13	2.405		
Total	49.600	14			
Ket.a. Dependent Variable: Ability to Develop Learning Devices b. Predictors: (Constant), Knowledge					

Based on the significance value of Knowledge obtained of 0.016 < 0.05 then we can conclude that Knowledge has an influence on learning device development ability while F counts of 7.622.

Table 10. Results of linear regression analysis of knowledge and the ability to develop integrated learning devices TPACK.

Coefficientsa					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	65.078	10.267		6.339	.000
Knowledge	.190	.069	.608	2.761	.016
Ket. Dependent Variable: Ability to Develop Learning Devices					

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Based on the significance value of knowledge obtained at 0.016 < 0.05 then we can conclude that knowledge has a significant influence on learning device development ability with an influence of 0.608. Can be written in the regression model as follows.

$$Y = 65,078 + 0,190X.$$

Ket. Y = Ability to Develop Learning Devices
     X = Knowledge

Table 11. Model summary knowledge and ability to develop integrated learning tools TPACK.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.608[a]	.370	.321	1.55089
Ket. Predictors: (Constant), Pengetahuan				

Table 11. indicates that R square is (0,370), indicating a relationship between the knowledge of TPACK and the ability to develop an integrated learning device TPACK Teacher Biology of 37% and the value of error (e) model can be searched by formula $e^1 = \sqrt{1-R^2} = \sqrt{1-0,370} = 0,794$.

Table 12. Anova results linear regression analysis of knowledge and the ability to implement the TPACK framework in the classroom.

ANOVA[a]					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1054.682	1	1054.682	4.768	.048
Residual	2875.718	13	221.209		
Total	3930.400	14			
Ket. a. Dependent Variable: Ability to implement the TPACK framework
b. Predictors: (Constant), Knowledge					

Based on the significance value of Knowledge obtained at 0.048 < 0.05 then we can conclude that Knowledge has a significant influence on the Ability to Implement the TPACK Framework variable with an F count of 4,768.

Table 13. Results of linear regression analysis of knowledge and the ability to implement the TPACK framework in the classroom.

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	15.379	98.457		.156	.878
Pengetahuan	1.442	.661	.518	2.184	.048
Ket. Dependent Variable: Ability to implement the TPACK framework.					

Based on the significance value of knowledge obtained at 0.048 < 0.05 then we can conclude that knowledge has a significant influence on the ability to implement the TPACK

Framework variable with an influence of 0.518. Can be written in the regression model as follows.

$$Y = 15,379 + 1,442X.$$

Ket.   Y = Ability to implement the TPACK framework
        X = Knowledge

Table 14. Model summary knowledge and ability to implement the TPACK framework in the classroom.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.518[a]	.268	.212	14.87310
Ket. Predictors: (Constant), Knowledge				

Table 14. indicates that R square is (0,268), indicating a relationship between the knowledge of TPACK and the ability to implement the TPACK framework in class 27% and the value of error (e) model can be searched by formula $e^1 = \sqrt{1-R^2} = \sqrt{1-0,268} = 0,855$.

Table 15. Anova results linear regression analysis ability to develop learning devices and ability to implement TPACK frameworks.

ANOVA[a]					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1371.303	1	1371.303	6.966	.020
Residual	2559.097	13	196.854		
Total	3930.400	14			
Ket. a. Dependent Variable: Ability to implement the TPACK framework b. Predictors: (Constant), Ability to Develop Learning Devices					

Based on the significance value of the learning device development ability obtained at 0.020 < 0.05 then we can conclude that the learning device developing ability has a significant influence on the TPACK framework implementation ability variable with an F count of 6,966.

Table 16. Results of linear regression analysis ability to develop learning tools and ability to implement the TPACK framework.

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	-260.903	186.106		-1.402	.184
Ability to Develop Learning Devices	5.258	1.992	.591	2.639	.020
Ket. Dependent Variable: Ability to implement the TPACK framework.					

Based on the significance value of the learning device development ability obtained at 0.020 < 0.05 then we can conclude that the learning device developing ability has a significant influence on the TPACK framework implementation ability variable with an influence of 0.591. Can be written in the regression model as follows.

$$Y = -260{,}903 + 5{,}258X.$$

Ket.   Y = Ability to implement the TPACK framework
          X = Knowledge

Table 17. Model summary ability to develop learning tools and ability to implement the TPACK framework.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.591[a]	.349	.299	14.03045
Ket. Predictors: (Constant), Ability to implement the TPACK framework.				

Table 17. Indicates that the R square is (0, 349), indicating a relationship between the knowledge of TPACK and the ability to implement the TPACK framework within the class of 35% and the value of error (e) model can be searched by the formula $e^1=\sqrt{1-R^2}=\sqrt{1-0{,}349}=0{,}807$.

Based on the regression calculations, we obtained a magnitude of influence of 0.608 on the Knowledge variable on the learning device development ability variable and got the magnitudo of influency of 0.591 on the learning devices development ability variable against the implementing the TPACK Framework ability variable. To see the relationship between the knowledge to the ability to implement the TPACK Framework through the learning device development ability is the overlap between the knowledge of the learning device developing ability and the implementation ability of the TPACK framework is 0.608 x 0.591 = 0.359.

Table 18. Sobel Tests the influence of knowledge through the ability to develop learning device on the ability to implement the TPACK framework.

		Test Statistic	*p*-value
a	0,190	1,905	0,047
b	5,258		
S_a	0,069		
S_b	1,992		

From the results of the calculation sobel test obtained p-value of 0.047 < 0.05 which means Knowledge has a singular relationship to the ability to implement the TPACK framework through learning device development ability with a large volume of 0.608 x 0.591 = 0.359. Then the total influence given knowledge on the ability to implement TPACK framework through learning device development ability is 0.518 + 0.359= 0.877.

Discussion

Technological Pedagogical and Content Knowledge (TPACK) is a framework designed to understand teacher's knowledge of the relationship between technology, pedagogy, and content and how the interactions of the three can produce effective learning with the use of technology (Suyamto et al., 2020). Technological Knowledge (TK) is the knowledge of an educator about technological knowledge that consists of its application, approach and development for the world of education. Based on technological knowledge data obtained through hoisting, it shows

that the knowledge of teachers on the Sekolah Penggerak in Makassar has a percentage of 100% of 15 respondents or belongs in a very good category. It shows that this teacher of the Sekolah Penggerak in Makassar has had a good confidence in the knowledge of technology. The high component of this TK is in line with the results of Zulfitria et al. (2020), which notes that the impact of the Covid-19 pandemic has promoted the use of technology and the internet in the learning process that ultimately improves the technical skills of teachers.

The survey results on the knowledge of Pedagogical Knowledge (PK) acquired through lifting were 73.3% or 11 respondents including the category excellent and 26.7% or 4 respondents included the category good. It shows that not all of the teachers in Makassar are in the very good category, there are still those in the good category. The ability of the teacher of Sekolah Penggerak in Makassar is based on the observation of the learning process obtained 80 % or 12 respondents including the category very good and 20 % or 3 respondents include the category good. While the teacher's abilities were assessed through the evaluation of the teaching module, there were 100% or 15 respondents in the category of excellent. Based on the observations carried out by the researchers, the teachers of the Sekolah Penggerak in Makassar have implemented excellent pedagogics only there are still things to be maximized such as the evaluation of student performance while in the classroom, knowing the possibility of misconception or learning difficulties of students and the need to clarify the guidelines of evaluation in the teaching module.

Based on the Content Knowledge (CK) data obtained, it can be found that 12 respondents or 80% have knowledge of content that belongs to the category of excellent and 3 respondents, or 20% belong to the Category of good. Based on the data analysis of observations of the ability of the teacher of the Sekolah Penggerak in Makassar, as many as 15 respondents or 100% belonging to the category very good on the content of the skills of the teachers of the Sekolah Penggerak in Makassar. While the skills of biology teachers through the evaluation of teaching modules obtained 100% or 15 respondents included the category excellent. The researchers observed that biology teachers in the learning process have understood the matter well, especially the matter of Biodiversity.

Based on the results of the study of the knowledge of biological teachers obtained through the survey that the knowledge rating of the Teachers of Sekolah Penggerak in Makassar, 9 respondents or 60% belong to the category very good and 6 respondents, or 40% belongs to the categories good. Results of the analysis of the data of the skills of the TCK acquired from the observation of the teacher of biology Sekolah Penggerak in Makasar, as many as 10 respondences or 66.7% belonging to the kategories very good, 5 respondents or 33.3%, which belong in the category good. On the technological and contents capabilities of the teacher of the Sekolah Penggerak in Makassar. While the skills of the TCK teachers of biology through the evaluation of the teaching module obtained 15 respondents or 100%. These findings support Yurinda and Widyasari (2022) claims that matter and technology must interact with each other in order to make it easier for teachers to convey material. Teachers must be able to associate learning material with technology so that students are not confused.

The results of the research has been conducted show that the level of knowledge of the entire PCK of the Sekolah Penggerak in Makassar is in the very good category with a percentage of 60% or 9 respondents and 6 respondents or 40% are in the good category. This shows that respondents have had a very good confidence in the knowledge of PCK although there are still some who belong to the good categories. Whereas the observational analysis of the ability of the teachers of the Sekolah Penggerak in Makassar showed that 66.7% or 10 respondents belonged to the category of very good and 33.3% or 5 respondents were in the categories of good. The ability of the biology teacher assessed through the evaluation of the teaching module was 100% or 15 respondents including the category of excellent. Based on the observations of the researchers, the knowledge and abilities of the PCK teacher of the Sekolah Penggerak in Makassar are already very good, but of course there is still something to be improved such as

the use of approaches, models, learning methods with the characteristics of the students so that the learning process is more systematic and more directed.

Based on the results of the research obtained through the lift, it is known that 9 of the 15 respondents or 60% belong to the category very good and 6 responders or 40% belong in the category good. According to the observations of the teacher of the Sekolah Penggerak in Makassar, the ability of teachers in the selection of technology used in the learning process there are 80 % or 12 respondents belonging to the categories very good, 20% or 3 responders belonged to the category good. Meanwhile, the results of the teacher's skills performed in the evaluation of the teacher's teaching module at the Sekolah Penggerak in Makassar were obtained 100% or 15 respondents included in the category very good. The researcher's observations in the application of the TPK in the biology learning process, teachers are good but still need to learn about technology so that the learning process can be maximized as in terms of the use of Learning Management System and application of learning evaluation which can of course make it easier for teachers in evaluating tasks or exams for students.

Based on the research data obtained through the lift, it can be seen that the technical knowledge, pedagogical and biological content of the teacher of the Sekolah Penggerak in Makassar reached 100% or the knowledge of the whole respondents as many as 15 people belong to the category very good. This indicates that the teacher of biology has had a very good confidence in the TPACK or knowledge of technology, pedagogy, and biology content. According to the results of the observations of teachers at the Sekolah Penggerak in Makassar, 73.3% or 11 respondents included very good categories, 26.7% or 4 respondents were included in the good category. Then the evaluation of the teaching module of teachers of biology at Sekolah Penggerak in Makassar obtained data of 13.3% or 2 respondents in the very good category and 86.7% or 13 respondents belonged to either category, although in the assessment of the learning module created and used by the teacher showed that the teacher's ability was still well categorized due to the fact that in the drafting of the module the teacher had not fully used the TPACK approach.

As for the average grade of knowledge of the TPACK teacher of the Sekolah Penggerak in Makassar is 92% and the average rating of the ability of TPACK the teacher of Sekolah Penggerak in Makasar is 93%. This figure reflects a very high level of ability in integrating technology, pedagogy, and content knowledge. Interestingly, these findings can be compared to similar research by Hasrul et al. (2022). According to the research, the skills of the TPACK teacher are in the good category. A comparison between these findings and previous research provides valuable insights into the development of TPACK skills among teachers of the Sekolah Penggerak in Makassar. This is definitely influenced by many factors, for example teaching experience of teachers, the level of education as well as the training-training or seminars that have been attended by the teacher concerned.

In general, it can be concluded that the category of knowledge and capabilities of the TPACK of teacher of the Sekolah Penggerak in Makassar includes very well, it is shown according to the results of the analysis of research data and the test of the hypothesis that the knowledge of TPACK has a singular relationship to the ability to implement TPACK framework through the abilities to develop learning devices with a large relationship is $0.608 \times 0.591 = 0.359$. Then the total influence given of knowledge on the ability to implement TPACK through the teaching module is $0.518 + 0.359 = 0.877$. So, the hypothesis on this study was accepted because there was correlation between the knowledge of the TPACK teacher of biology through the ability to develop learning devices at the Sekolah Penggerak in Makassar.

Conclusion

Technological Pedagogical and Content Knowledge (TPACK) is one of the important frameworks that covers the competence of a teacher. Teachers in TPACK perspective are teachers who understand the pedagogics and characteristics of the right concepts to be

integrated with technology in the learning process. This research requires knowledge data, skills, and teaching modules that are the source of data. Based on the data obtained from the lift, observations and documentation (evaluation of the teaching module), the following conclusions can be drawn. 1) The knowledge of the TPACK teacher of the Sekolah Penggerak in Makassar is in very good category with a percentage of 92%, 2) the ability of TPACK in the teachers of the Sekolah Penggerak in makassar is in the category of very good with a percentage of 92%. 3) The ability of the teacher in developing the teaching module with the approach TPACK to the Teachers of Sekolah Penggerak in Makasar is in a very good category with a percentage of 94%, and 4) the knowledge of TPACK has a relationship with the ability to TPACK of the teacher of the Sekolah Penggerak in Makasar of 56.5% with a significance of 0.002 < 0.05 with the line equation $= 0.3493x + 61.901$. Overall, the category of knowledge and capabilities of TPACK teachers in Makassar is very good in line with the results of the analysis of research data and the test of the hypothesis that TPACK knowledge has a significantly relationship to the ability to implement the TPACK framework through the abilities to develop learning devices of Sekolah Penggerak in Makassar.

Acknowledgements

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Arsad Bahri	Prof. Dr. S.Pd. M.Pd. Lecturer of Biology Department. Universitas Negeri Makassar, Makassar, Indonesia. E-mail: arsad.bahri@unm.ac.id
Asham Bin Jamaluddin	Dr. S.Pd. M.Pd. Lecturer of Biology Department. Universitas Negeri Makassar, Makassar, Indonesia. E-mail: ashambj@unm.ac.id
Saparuddin	S.Pd. M.Pd. Lecturer of Biology Department. Universitas Negeri Makassar, Makassar, Indonesia. E-mail: saparuddin@unm.ac.id
Nur Aisyah Ainun	S.Pd. M.Pd. Postgraduate Student of Biology Department. Universitas Negeri Makassar, Makassar, Indonesia. E-mail: nuraisyahainunbaso@gmail.com
Muh. Arifuddin	S.Pd. M.Pd. Postgraduate Student of Biology Department. Universitas Negeri Makassar, Makassar, Indonesia. E-mail: nuraisyahainunbaso@gmail.com