

Exploration the Skills of Teachers: Implementation Technological Pedagogical Content Knowledge

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Exploration the Skills of Teachers: Implementation Technological Pedagogical Content Knowledge

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Abstract

Technological pedagogical content knowledge (TPACK) is urgently needed by science teachers in schools in the 21st century. This study aims to describe the effectiveness of teachers in applying the TPACK model. Regarding effectiveness, there is a statistically significant increase in alpha 0.05, which is the average score of teacher skills for classes A and B; the average normalised gain (*n*-gain) score for minimum teacher skills is in the medium category; statistically alpha 0.05 score *n*-gain skills of teachers of classes A and B; the minimum effect size is in the medium category. The research sample consisted of 70 junior high school natural science teachers, each class with 35 teachers. The collected data were analysed using paired sample *t*-test, *n*-gain calculation and effect size. The results showed that the increase in teacher skill scores was significant; the average *n*-gain score of teachers' skills was in the medium category; the average score of the average *n*-gain of teachers' skills was not different between classes A and B; and the effect size is in the moderate effect category. The conclusion of this study is that teacher professional education programme activities are effective in implementing the TPACK model. The TPACK model can improve the skills of teachers' higher-order thinking skills in teaching science in schools.

Keywords: Science, teacher, technological, pedagogical, content knowledge

1. Introduction

1.1. Conceptual or theoretical framework

The Teacher Education Programme in Position is a professional education programme, with level 7 in the Indonesian National Qualifications Framework. The programme is held after the undergraduate or applied undergraduate programme, which demands different competency

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standards for graduates with applied undergraduate or graduate programmes. The competency standards of graduates in this programme which in the programme.

The lack of knowledge in the preparation of teaching plans and the lack of professional development work show that the ability of teachers to change the paradigm from teacher-centred learning to student-centred learning is still low and the results of the written exam show that the participants of teacher professional education (TPE) and training achieved a minimum average pass score for the whole aspects which include general pedagogy, teaching process, field of study, classroom action research and scientific writing (Irfan, 2020).

The government of the Republic of Indonesia, starting in 2019, implemented in-service TPE to select teachers, especially science teachers in Indonesia, to obtain professional degrees. One of the activities in this TPE is that the participants are required to carry out teaching practicum activities by applying teaching materials, teaching plans, student worksheets and teaching media.

The requirement to use teaching materials in teaching practicum activities in schools has an internal consistency coefficient value above 75%. In the teaching practice process, teachers apply technological pedagogical content knowledge (TPACK) based on the Industrial Revolution 4.0 platform, which is assessed by education experts and natural science experts using an assessment rubric. The results of research by Soenarno (2019) and Dais et al. (2020) found that teachers still had difficulty implementing TPACK.

TPACK based on the Industrial Revolution 4.0 platform is an approach model in learning that has several phases, namely: analysis, design, development, implementation and evaluation (Hidayu., et al., 2019; Joseline., et al., 2021; Oktasari., et al., 2020).

The design of TPACK teaching materials based on the Industrial Revolution 4.0 platform is interpreted as a preparatory activity for the implementation of learning that applies the latest learning elements in the 21st century and is integrated in the components and stages of teaching that will be the set.

TPACK is a basic framework integrating technology in the teaching process, including neuroscience-based teaching, teaching approach (Science, Technology), 21st-century competency demands, creativity, literacy. Hidayu., et al (2019) stated that TPACK is very much needed by teachers to deal with teaching 21st-century skills.

1.2. Related research

A teacher in Era of expected to be an agent of reform. The reforms that can be carried out can start from teaching planning activities, implementation and evaluation to follow-up activities. For this reason, it is necessary to understand some of the characteristics of 21st-century innovative learning designs that will be applied in making teaching plans.

The implementation of the latest elements in the teaching plan component lies in indicators of competency achievement, teaching objectives, preliminary, core and closing activities and teaching assessments. This is in line with the plan to strengthen student characteristics in the 2013 curriculum (Kemendikbud, 2018).

The difference is in the TPACK element. One of the characteristics of teaching natural science is applying the TPACK approach based on Revolution 4.0 of , namely the collaboration of students and teachers in terms of, technology, content, pedagogical (Hidayu et al., 2019; Koehler, 2014; Miyarso, 2019).

The problem in this research is how is the effectiveness of teachers in applying the TPACK in teaching natural science materials. Regarding effectiveness, (1) there is a statistically significant increase in alpha 0.05 the average score of teacher skills for classes A and B; (2) average normalised gain (*n-gain*) score for minimum teacher skills is in the medium category; (3) statistically alpha 0.05

score *n*-gain skills of teachers of classes A and B; and (4) the minimum effect size is in the medium category.

1.3. Purpose of the study

This study aims describe effectiveness in applying the TPACK model, namely: (1) to describe the improvement of teachers' skills in applying the TPACK model in teaching sciences, (2) to analyze the effect size applying the TPACK in classroom learning. Regarding effectiveness, there is a statistically significant increase in alpha 0.05 the average score of teacher skills for classes A and B; the average normalised gain (*n*-gain) score for minimum teacher skills; statistically in the alpha 0.05, *n*-gain skills of teachers of classes A and B; and the minimum effect size is in the medium category.

2. Methods

2.1. Research model

Pre-experimental using a one-shot case with a non randomised control group pretest and posttest, as shown in Table 1(Allen, 2017; Ramdani et al., 2021). Based on this design, each class is given a pretest and post-test and application of the same TPACK media.

Table 1
Research Design (Ramdani et al., 2021)

Group	Pretest	Treatment	Posttest
A	O_1	X	O_2
B	O_3	X	O_4

Remarks: O_1 and O_3 pre-test; O_2 and O_4 post-test; and X is the same treatment.

2.2. Participants

The sample consisted of 70 junior high school natural science teachers who took part in TPE activities in 2020–2021, with class A and class B having 35 teachers each. (1) there is a statistically significant increase in alpha 0.05 the average score of teacher skills for classes A and B; (2) the average normalised gain (*n*-gain) score for minimum teacher skills is in the medium category; (3) there is no statistically alpha 0.05 score *n*-gain skills of teachers of classes A and B; and (4) the minimum effect size is in the medium category.

2.3. Data collection tools

In used observation sheet on the ability to apply TPACK with procedures, namely 1) observing the implementation of TPACK when the teacher taught in class; 2) check the list of scores (1,2,3,4 and 5) on the list of observation sheets according to the teacher's ability level; and 3) analyse the teacher's ability to apply TPACK.

2.4. Data collection process

Included (1) validating learning tools and research instruments, (2) science teachers teaching in class by applying TPACK, (3) observers giving scores on observationsheets according to teacher activities, (4) data tabulation and (5) data analysis using SPSS 21.

2.4.1. Implementation of the TPACK model based on the Industrial Revolution 4.0 platform

The implementation of the TPACK model based on the Industrial Revolution 4.0 platform consists of five steps of activities:

1. Analysis. Natural science teachers analyse, i.e: competencies, teaching, strategies, methods, natural science materials, TPACK platform and evaluation techniques.
2. Design. Natural science teachers design teaching plans, student worksheets and TPACK media platform and evaluation techniques.
3. Development. Natural science teachers make teaching plans, student worksheets and TPACK media platform and evaluation questions that are validated by two assessors.
4. Implementation. Natural science teachers apply teaching plans, student worksheets and TPACK media platform and evaluate teaching practice activities in the classroom.
5. Evaluation. The natural science teacher evaluates after applying the TPACK model based on platform.

The natural science teachers' skills in applying the TPACK model the total score obtained by the teacher after carrying out teaching practice in class, with a total of three cycles. The skills of implementing TPACK based on the Industrial Revolution 4.0 platform were assessed by two assessors using the rubric for assessment of teaching practice in the classroom using scores: 1 (very poor), 2 (less), 3 (enough), 4 (skilled) and 5 (very skilled).

2.4.2. Learning tool validation and reliability

The learning tools applied by the teacher in carrying out teaching practices in the classroom consist of two sets. All sets of learning tools were validated by two expert assessors of science education. Validation analysis used the Gregory analysis (Arlini et al., 2017), as shown in Table 2, to calculate the value of the coefficient of internal consistency (internal validation) using Equation (1) and to determine the category in Table 2.

The results of the average internal validation scores show that (1) lesson plan = 87.00, (2) student worksheets = 90.33 and (3) instructional media = 87.33, which is greater than 0.8 including the high category. This is eligible for use in research.

Table 2
Gregory Validation Analysis Tabulation

	Expert assessment	
	Weak relevance (score 1 or 2)	Strong relevance (score 3 or 4)
Weak relevance expert assessment (item is worth 1 or 2)	A	B
Strong relevance expert assessment (item is worth 1 or 2)	C	D

$$\text{Internal consistency coefficient (internal validation)} = \frac{D}{A + B + C + D} \quad (1)$$

Remarks:

- A = Both experts give weak relevance.
- B = The first expert gives strong relevance.
The second expert gives weak relevance.
- C = The first expert gives weak relevance.
The second expert gives strong relevance.

D = Both experts give strong relevance.

Table 3
Content Validation Category (Arliniet al., 2017, p. 184)

Interval	Category
>0.8	High
0.4–0.8	Medium
<0.4	Low

Analysis of the reliability of the device to calculate the level of percentages of agreements between the two raters choosing 'yes' or 'no' used formula (2) (Grinnell, as cited in Sumaryanto and Lestari, 2015).

The results of the analysis of the reliability of teaching devices show that (1) lesson plans = 99.85, (2) student worksheets = 98.85 and (3) instructional media = 96.88, which is greater than the lower limit of the reliability coefficient of 0.75, meaning that all instruments have reliable research.

$$\text{Percentage of agreement } (R) = \frac{\text{Agreement}}{\text{Disagreement} + \text{Agreement}} \times 100\% \quad (2)$$

The scores obtained from three cycles of teaching practice in the classroom are *n*-gain (3), and categories, as shown in Table 3 (Lestari., et al (2021)).

$$n - g = \frac{x_m - x_n}{100 - x_n} \quad (3)$$

Remarks:

n-gain = normalised gain.

X_m = Industrial Revolution 4.0 platform TPACK application skill pretest score.

X_n = Industrial Revolution 4.0 platform TPACK application skill posttest score.

Table 4
The n-gain Categories (Lestari et al., 2021, p. 2007)

Interval	Category
$n\text{-gain} > 0.7$	high
$0.3 \leq n\text{-gain} \leq 0.7$	medium
$n\text{-gain} < 0.3$	low

The significance between the teacher skill scores of implementing TPACK based on the early Industrial Revolution 4.0 platform and the teacher skill scores of the last Industrial Revolution 4.0 platform conducting important know implementing TPACK based on Industrial Revolution 4.0 platform is.

The normality test, had to carried out. After was performed (Lestari et al., 2021). Equation (4) the effect size and the categories are shown in Table 4.

$$\text{Effect size} = \frac{\text{mean of posttest score} - \text{nean of pretest score}}{\text{Standard deviation}} \quad (4)$$

Table 5*The Effect Size Categories (Lestari et al., 2021, p. 2008)*

Interval	Category
0 – 0.20	weak effect
0.21 – 0.50	modest effect
0.51 – 1.00	moderate effect
> 1.00	strong effect

2.5. Data analysis

For the purpose of paired data testing, performed statistics. Normality tests for pretest, posttest and *n*-gain skills of teaching practicum teachers in classes A and B are in Tables 5 and 6, respectively.

Table 6*Normality Test on the Values of Pretest, Posttest and n-Gain*

Teacher skills	Kolmogorov–Smirnov			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	0.115	35	0.136	0.938	35	0.062
Posttest	0.172	35	0.010	0.929	35	0.060
<i>n</i> -gain	0.131	35	0.137	0.943	35	0.068

Values are 0.062 and 0.060. While of 0.068, pretest, posttest, *n*-gain

Table 7*Values of Pretest, Posttest, n-gain*

Teacher skills	Kolmogorov–Smirnov			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	0.115	35	0.136	0.938	35	0.062
Posttest	0.154	35	0.034	0.946	35	0.086
<i>n</i> -gain	0.133	35	0.134	0.945	35	0.062

Values are 0.051 and 0.086. While of 0.068, pretest, post-test and *n*-gain.

For purpose of testing the independent data variable score classes A and B teachers, *n*-gain normality of teacher skills in classes A and B, are in Table 8.

Table 8*Values n-Gain*

Class	Kolmogorov–Smirnov			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
A	0.131	35	0.137	0.943	35	0.068
B	0.133	35	0.134	0.945	35	0.062

As shown in Table 8, the significance values for the *n*-gain data for classes A and B are 0.068 and 0.062, respectively. *n*-gain data for class A and class B.

n-gain homogeneity test of teacher skills is shown in Table 9.

Table 9
Test of Homogeneity of Variances of n-Gain

	<i>N</i>	<i>F</i>	<i>Sig.</i>
Teachers' skills in applying TPACK platform	30	0.000	0.990

Table 9, the *n*-gain data is above 0.05. These results indicate that the homogeneous.

3. Results

3.1. TPACK platform

The TPACK platform is an alternative learning model to improve teacher skills using TPACK. There are five phases of the TPACK platform, namely: analysis, design, development, implementation and evaluation.

The explanation the stages of the practicum virtual lab model and its relationship to each of the indicators of scientific attitudes and science process skills being trained is presented in Table 10.

Table 10
Phases of the TPACK-based Industrial Revolution 4.0 Platform Model

Phase	Teaching activities skills	Students activities
Phase 1: analysis	Skills in analysing core competencies, basic models, teaching approaches, teaching strategies, teaching methods, natural science materials, TPACK media platform and evaluation techniques	Observing core competencies, competencies, competency achievement indicators, objectives, identifying TPACK media platform. science material
Phase 2: design	Skills in designing teaching plans, student worksheets, and TPACK media platform and evaluation techniques	Reviewing teaching plans, student worksheets and TPACK media platform
Phase 3: development	Skills in making teaching plans, student worksheets, and TPACK media and evaluation questions	Validating the readability of the contents of teaching plans, student worksheets and TPACK media platform
Phase 4: implementation	Skills in applying teaching plans, student worksheets, and TPACK media platform: (1) CK, (2) PK, (3) TK, (4) PCK, (5) TCK, (6) TPK, (7) TPCK and evaluation of teaching practice activities in the classroom	Working on projects on student worksheets, using TPACK based on the Industrial Revolution 4.0 platform to understand concepts, principles and laws in the natural sciences, doing practice questions.
Phase 5: evaluation	Skills in evaluating after applying the TPACK media platform.	Conduct group discussions on project performance reports and work on evaluation questions

3.2. Results of effectiveness analysis of TPACK implementation platform

The effectiveness of the TPACK media platform was evaluated using a teacher skill test applying TPACK platform before and after the application of the TPACK media platform given pretest and

posttest. Teachers' applying TPACK based on the Industrial Revolution 4.0 platform in classes A and B are in Table 11.

Table 11

Mean of Pretest, Posttest and n-Gain

Aspects of calculation	Average score	
	Class A	Class B
Pre-test	49.14	49.28
Post-test	65.71	64.85
n-gain	0.46	0.48

Table 11 shows that the posttest value of the teacher's in applying the TPACK media platform in classes A and B. Implementing TPACK based on the Industrial Revolution 4.0 platform, for classes A and B, are in Table 12.

Table 12

The Results of the Paired t-Test

Pre-test-Post-test	Class	N	Mean	S	df	t	Sig. (p)*
	A	35	-16.57	8.38	34	-11.67	0.000
	B	35	-16.38	8.66	35	-11.34	0.000

* $p = 0.05$.

Teacher in applying TPACK media platform for classes A and B, with a sig value 0.000, score is greater teacher applying the TPACK media platform for classes A and B.

Then conducted average-gain score to test the hypothesis alpha 0.05 average score of n-gain skills of teachers in applying the TPACK media platform for classes A and B with using SPSS version 21, are in Table 13.

Table 13

The Results of the Independent Samples t-test

Teachers' skills in applying the TPACK media platform		α	Sig. (2 tailed)
		Equal variance not assumed	0.05
	Equal variance not assumed	0.05	0.708

Teacher skills in applying the TPACK media platform for classes A and B, with a sig value (2-tailed) is greater than 0.05, which that n-gain mean score of teachers' skills in applying the TPACK media platform that is significant between classes A and B.

The results determine TPACK medial based on the Industrial Revolution 4.0 platform are in Table 14.

Table 14
The Results of the Effect Size

Class	Effect size of the teachers' skills	Category
A	0.65	Moderate effect
B	0.57	Moderate effect

Table 14 shows the effect size values of teacher skills in applying the TPACK media platform in classes A and B are 0.65 and 0.57, respectively, including in the moderate effect category, fulfilling the requirements for the effectiveness of the TPACK media platform.

Based on the analysis of the data and findings, the following is a discussion of the research results. The TPACK media platform, as shown in Table 10, phases, namely analysis, design, development, implementation and evaluation; the training for natural science teachers resulted in an increase in teacher skills in applying the TPACK model based on the Industrial Revolution 4.0 platform.

Farikah and Malik (2020) stated that the ability of teachers to apply TPACK was at sufficient criteria. Koehler (2014) stated that in the Industrial Revolution 4.0, graduates of junior high school, high school, college institutions need to master data literacy skills, technological literacy and human science. With the presence, one way improve quality of science learning is the application of TPACK (Ramamurthy et al., 2021).

Natural science teachers who took part in the TPE activities in 2020–2021, Indonesia, are required to carry out teaching practices in junior high schools. Natural science materials made by the teacher include (1) temperature and heat, (2) energy, (3) structure and function of plant tissue, (4) digestive system, 5) inheritance, static electricity and (6) dynamic electricity. Based on the material, student worksheets, teaching media and evaluation were made.

These teaching materials were developed into teaching materials adapted to the applicable science curriculum in Indonesia. Teaching materials consist of teaching plans, student worksheets, TPACK media platform and evaluation. The product teaching materials is guided by assessors and the product is validated by education experts and science experts. The requirements for teaching materials applied in teaching practice in junior high schools are to meet the internal consistency coefficient with a high category.

4. Discussion

Coefficients internal consistency reliability, it was found that the average value of internal validation was (1) lesson plan = 87.00, (2) student worksheets = 90.33 and (3) instructional media = 87.33, which was greater than 0.8 and included in the high category; it qualifies for use in research.

The reliability devices showed that (1) lesson plans = 99.85, (2) student worksheets = 98.85 and (3) instructional media = 96.88, which is greater than the lower limit of the reliability coefficient of 0.75, meaning that all research instruments are reliable.

This means that the assessors in charge of the 2020–2021 Teacher Profession Programme activities at Makassar State University have succeeded in fostering natural science teachers in making quality teaching material products. The product is feasible to be applied in teaching practice activities in junior high schools.

This finding is supported by several research results including that the inquiry-based teaching materials, creative techniques, integrated science and social meet the validity requirements

(Abdigapbarova et al.,2022;Cahyati&Yohandri, 2020; Habibi et al, 2018; Hartati et al, 2019; Wahyu, 2016).

The integration of technology into teaching has become increasingly common in the educational environment in the 21st century. Natural science teachers in junior high schools need to be more creative in designing lessons that are integrated with technology and have the ability to choose the type of technology to be used in the classroom.

TPACK can serve as a beneficial framework for science teachers who wish to incorporate technology into their natural science lessons as a process of designing at once and integrating technology into natural science lessons.

Natural science teachers who took part in teaching practice activities in junior high schools in TPE are required to have the skills to apply the TPACK media platform so that students understand more quickly the concepts of natural science subject matter and can find out the benefits in everyday life, in the fields of technology, social and economics. If students understand and know these benefits, it will increase their interest and motivation in studying natural sciences and will improve their learning outcomes.

Table 10 shows for skills of teachers to apply the TPACK media platform in classes A and B scores. This shows an increase in teacher skill scores after implementing TPACK media platform, in the medium category.

TPACK platform can train teachers' skills in applying TPACK in teaching natural sciences, such as research by Akhwani and Rahayu (2021) found that the average score skills of teacher in applying TPACK is still in the low category of 3.02.

Statistically significant increase in post-test scores with of normality to increase teachers' skills in applying the TPACK model based on the Industrial Revolution 4.0 platform with the Kolmogorov-Smirnov test.

Tables 7 and 8 show that normality teachers' applying the TPACK platform for scores for class A were 0.051 and 0.086 and class B were 0.068 and 0.062.

Table 12 showed that the value of sig. 0.000 is smaller than the value of .05. In addition, in Table 12, *t* is negative, namely -11.67 in class A and -11.34 in class B, skill scores of classes A and B teachers after applying the TPACK platform.

This shows that the stages in implementing the TPACK platform can practice TPACK steps platform. This is in line with Akhwani and Rahayu (2021), who stated that TPACK can be trained to teachers, although (Azhar et al., 2022; Muñoz-Martínez et al., 2022).

The test *n*-gain score with SPSS version 21. Before the independent variable, first test and homogeneity test were carried out for the *n*-gain score for the teacher's skills in applying platform-based TPACK Industrial Revolution 4.0 with the Kolmogorov-Smirnov test.

Table 8 results normality test for teachers' skills in applying TPACK platform for the *n*-gain values for classes A and B are 0.068 and 0.062, respectively.

Table 8 results homogeneity test of the *n*-gain significance value of teachers' skills in applying TPACK based on the Industrial Revolution 4.0 platform are above 0.05. These results indicate that the *n*-gain data on teacher skills in applying TPACK based on the Industrial Revolution 4.0 platform comes from a homogeneous population.

The application of the TPACK platform in classes A and B resulted in an average score of *n*-gain skills of teachers applying the same TPACK. This is evidenced by the results of Table 12, showing the results of the independent *t*-test of teacher skills in applying platform-based TPACK Industrial Revolution 4.0 classes A and B with a sig. (2-tailed) is greater than 0.05, which means that there is no significant difference in the average *n*-gain score of teachers' skills in applying TPACK based on the Industrial Revolution 4.0 platform that is significant between classes A and B.

In other words, there is no difference in scores. The average-gain skill of teachers in applying TPACK for classes A and B after teachers are trained in TPACK based on the Industrial Revolution 4.0 platform. Sariet al. (2021) stated that TPACK can be trained in teacher reflective practice activities in office, so that teachers become proficient in integrating technology.

Furthermore, application of the TPACK platform on improving teacher skills in applying TPACK classes A and B, an effect size analysis in Table 13 show that the effect size value of the teacher's skills in applying TPACK in classes A and B are 0.65 and 0.57, respectively, which are included in the moderate effect category, fulfilling the requirements for the effectiveness of the TPACK platform.

This finding proves that TPACK platform is effective in improving the skills of teachers in implementing TPACK. This is because teachers directly receive guidance from UNM assessors in making learning tools and implementing TPACK media platform as long as teachers participate in the preservice teachers education programme activities.

This is in line with Adipat (2021), who stated that TPACK is an innovative technology that can improve the skills of preservice teachers in teaching subject matter at certain time intervals. Although the application of the TPACK platform can improve the skills of teachers in applying TPACK, teachers to implement TPACK tools.

This research TPACK based on the Industrial Revolution 4.0 platform has proven effective to improve the skills of teachers in applying TPACK in science learning. Teacher skills in applying TPACK include seven skill domains that are interrelated with one another, namely CK, mastery skills in the field of study and PK.

The most optimum skills and so that students' creativity increases and learning objectives can be achieved, TK, skills and PCK, skills and strategies.

Istiningsih (2020) stated that by training TPACK to teachers, it will have, namely able to solve problems that arise during online learning activities, provide authentic assessments in learning, improve teacher skills can using technology in the 21st century, where the use of TPACK has nothing to do with gender differences (Cahyani et al., 2021; Istiningsih, 2022; Septiyanti, et al., 2020; Tashbolatovna et al., 2022).

This finding is also supported by several research results, namely science teachers have a skill level in applying TPACK in teaching science, improving the quality of teaching in the classroom, increasing HOTS, increasing scientific literacy students, creating an effective, fun, interesting and creative learning environment (Dais et al., 2020; Dinara et al., 2022; Ella, 2019; Hartati et al., 2019; Joseline et al., 2021; Leni et al., 2021; Sarjoni et al., 2019).

TPACK platform can affect society and the economy in various ways, communicate on social media, facilitate access to various producers, innovative competitors, increase the use of digital marketing, creative industries, improve the quality of public services, improving the quality of the business environment, collaborative innovation and innovation in various forms of organisation (Amran et al., 2020; Arifin et al., 2022; Mohamad et al., 2019; Prisecaru, 2016; Saria et al., 2021; Seraliyev et al., 2022).

5. Conclusion

In this study, TPACK platform in science class. TPACK based on the Industrial Revolution 4.0 platform which was implemented effectively in improving teacher skills in applying TPACK compared to the application of other science learning media.

TPACK platform is effective as indicated by an increase in the skills of teachers in applying TPACK, which is statistically significant (at = 0.05), and the average *n*-gain of teacher skills in applying TPACK for classes A and B is 0.46 and 0.48, respectively.

Teachers' skills in applying TPACK for classes A and B is 0.65 and 0.57, respectively, with a moderate. The TPACK platform is strong, and so the TPACK platform as an alternative a virtual science teaching model in training teacher skills in applying TPACK platform in schools.

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