

The Development of an Elementary School Teacher Training Program to Improve TPACK Literacy in Indonesia

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Abstract. The major purpose of the study was to develop an elementary school teacher training program to improve TPACK literacy in Indonesia. The method used is ADDIE model (Analyze, Design, Develop, Implementation, and Evaluation). The collected data were analyzed using descriptive and inferential statistics. There are 31 statements related to TPACK literacy including: Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK) dan Technological Pedagogical Content Knowledge (TPACK). The results showed that the average of pretest is 67.70% and the average of posttest is 71.84%. This result showed that the percentage of elementary school teacher's of TPACK literacy in the posttest is higher than in the pretest. The conclusion of this study is elementary school teacher training program can improve TPACK literacy in Indonesia.

Key words: tpack literacy, training program, elementary school teachers.

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INTRODUCTION

The 21st century learning process always involves students' involvement in collaborative work and real-world problem solving through the effective exploitation of Information and Communication Technology (ICT) (Palova et al., 2020; Chai et al., 2019). Due to the advancement and development of industrial revolution and technology, the education scenario also changes towards 21st century education (Oliveira & De Souza, 2022), whereby more focus is given on the use of technology and 21st century skills (Shafie et al., 2019). The development of technology in the 21st century is called the industrial revolution 4.0 and society 5.0 has a major impact on the world of education (Yamada, 2021). One of the learning approaches that emerged as a result of this development is Technological Pedagogical Content Knowledge (TPACK) approach (Shafie et al., 2019). This approach has attracted much attention in recent years (Putri et al., 2022; Dewi et al., 2021; Irwanto, 2021; Setiawan et al., 2019).

This is in accordance with the research conducted by Putri et al. (2022) which shows that the trend of STEM Education research has increased internationally in recent years. The teachers' roles change (Keiler, 2018), and they are required to not only teach the core subject

matters, but they also have to teach and train the students with the 21st century skills (Tican & Deniz, 2019). However, not all teachers are well-trained on how to teach those skills to the students, especially when they also have to integrate technology in their teaching as well. Therefore, it is crucial to investigate whether the teachers understand and know how to teach the 21st century skills while integrating technology at the same time. Teachers need a special form of professional knowledge called Technological Pedagogical Content Knowledge (TPACK) to support ICT integration (Tseng et al., 2022; Fernández et al., 2020; Chai, 2019). Teacher training Program is one of solution to improve TPACK literacy of teachers in Indonesia.

Based on the results of interviews with the head of teacher in LABSCHOOL Elementary School UNNES, teachers in LABSCHOOL Elementary School UNNES have not implemented TPACK-based learning. Therefore, teachers should be able to design a learning that uses a TPACK approach. However, teachers are not ready to face this TPACK-based learning. These problems include (1) teachers do not have adequate insight into TPACK-based learning, (2) teachers do not have skills in compiling TPACK-based learning tools, and (3) lack of knowledge of TPACK literacy that can be used to implement

TPACK-based science learning. TPACK literacy including: Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK) dan Technological Pedagogical Content Knowledge (TPACK) (Shafie et al., 2019).

Based on the problems that have been identified and after assessing the potential of facilities and infrastructure resources as well as human resources, the solution offered and agreed upon with partners is develop an elementary school teacher training program to improve TPACK literacy in Indonesia. The research objective in this research is to develop an elementary school teacher training program to improve TPACK literacy in Indonesia. Elementary School Teacher training Program is expected to be effective in improving TPACK literacy of teachers in Indonesia.

METHODS

Research Design

This study aims to develop an elementary school teacher training program to improve

TPACK literacy in Indonesia. The method used is ADDIE model (Analyze, Design, Develop, Implementation, and Evaluation). The collected data were analyzed using descriptive and inferential statistics. There are 31 statements related to TPACK literacy including: Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK) dan Technological Pedagogical Content Knowledge (TPACK). The sample of this study consisted of 26 teachers in Semarang city, Central Java Province, Indonesia. The research was conducted offline in LabSchool Elementary School, Universitas Negeri Semarang. The material that used in this research is integrated with TPACK literacy. The research started with a pretest, the delivery of the first material "implementation of learning and character building of students in Malaysia", the second material "innovative learning models", the third material "TPACK 21st century teacher competence", mentoring learning models and TPACK, peer-teaching, and posttest. The research procedure is presented in Figure 1.

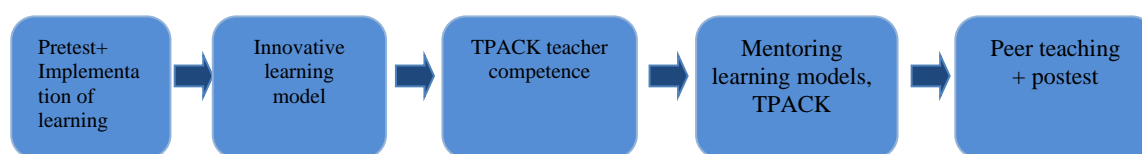


Figure 1. Research procedure

Research Instruments

The instruments used in this research are (1) an elementary school teacher training program; and (2) Teacher response questionnaire to measure teacher's TPACK literacy before and after elementary school teacher training program.

(1) Elementary School Teacher Training Program

The elementary school teacher training program was start with a pretest. Then the delivery of the material from professional speaker

from Malaysia and Indonesia. The first material was implementation of learning and character building of students in Malaysia, the second is innovative learning models, and the third material is TPACK 21st century teacher competence. The next session in teacher training program were mentoring learning models and TPACK, peer-teaching, and posttest. Elementary school teacher training program procedure is showed in Figure 2.



Figure 2. Elementary school teacher training program

(2) Teacher response questionnaire to measure teacher's TPACK literacy

Teacher response questionnaires were used in this study to measure teacher's understanding of TPACK literacy. Teacher response questionnaire consisted of thirty one items and was administered as pre-test and post-test. The questions used in the teacher response questionnaire is related to TPACK literacy, which

is Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK) dan Technological Pedagogical Content Knowledge (TPACK). The example of questions in the teacher response questionnaires are shown in Figure 3.

Nu.	TPACK Aspect	Criteria				
		1	2	3	4	5
1	I can arrange the form of assessment correctly according to the characteristics of the learning material.					
2	I can manage the class so that students are not bored in learning.					
3	I can choose learning strategies according to student needs.					
4	I can arrange the steps of the learning method to make it easier for students to understand the material.					
5	I can solve various kinds of problems from various content of subject matter.					
6	I can develop various kinds of problem solving from low to high cognitive level.					
7	I can evaluate students' understanding of content.					
8	I can develop project and performance appraisal forms to measure student skills.					
9	I can make a variety of precise judgments.					
10	I can use appropriate technology into learning.					

Figure 3. The example of questions in the teacher response questionnaires

The interval average scores of Teacher's TPACK literacy were analyzed with the criteria in Table 1.

Table 1. Interval average score of teacher's TPACK literacy

Interval average score (%)	Criteria
80 < average score ≤ 100	Very Good
60 < average score ≤ 80	Good
40 < average score ≤ 60	Poor
20 < average score ≤ 40	Very poor

RESULTS AND DISCUSSION

The results of teacher's TPACK literacy were obtained from the analysis of the results of the pretest and posttest on each indicator of TPACK that had been done. The question instrument used in this study was Teacher response questionnaire with a total of 31 questions related to TPACK literacy. Data analysis of teacher pretest and posttest are presented in Table 2.

Table 2. The average of pretest and posttest

The average of Pretest	The average of Posttest
67.70	71.84

The results in Table 2 show that the average percentage of correct answers in the pre-test is 67.70 and in the post-test is 71.84. It means

elementary school teacher training program is effective to improve teacher's TPACK literacy. The elementary school teacher training program started with pretes. Then the delivery of the material from professional speaker from Malaysia and Indonesia. The first material was implementation of learning and character building of students in Malaysia, the second is innovative learning models, and the third material is TPACK 21st century teacher competence. The next session in teacher training program were mentoring learning models and TPACK, peer-teaching, and posttest. In the mentoring learning models and TPACK, teachers are accompanied by professional speakers to develop TPACK-based learning tools such as learning media (PPT), student worksheets, teaching modules, teaching materials, lesson plans, and learning evaluations. In the last session, teachers

Teacher response questionnaire consisted of thirty one items. The questions used in the teacher response questionnaire is related to TPACK literacy, which is Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK) dan Technological Pedagogical Content Knowledge (TPACK). The teacher conducts peerteaching to practice the

theories that have been obtained from the delivery of the previous material as well as during the mentoring session. The teacher then practices teaching according to TPACK literacy.

Teachers nowadays should be aware of the Fourth Industrial Revolution (4IR) demands, hence the need to change their way of teaching in 21st century classrooms (Hussin, 2018; Undi & Hasyim, 2021). The methods of teaching need to move towards Education 4.0, a term that emerges following the 4IR. "Education 4.0 is a response to the needs of IR4.0 where human and technology are aligned to enable new possibilities" (Bashir et al., 2022; Anealka, 2018). The most recent technology like artificial intelligence, robotics, and the Internet of Things (IoT) will replace some human jobs in the future, therefore it is crucial for the students today to possess skills that will not be replaceable by the technology (Sikhakhane; 2021). This is where the 21st century skills take place in today's education (Nouri et al., 2020; Anagun, 2018; Chalkiadaki, 2018; Asrial et al., 2020). In order for teacher to be and stay relevant at the workplace, teachers and educators have to train them with the 21st century skills demanded in the 4IR. However, teachers would not be able to develop those skills if the teachers themselves have insufficient knowledge in training those skills to the students (Sari & Nayir, 2020; Syafie et al., 2019).

CONCLUSION

The results showed that the average of pretest is 67.70% and the average of posttest is 71.84%. This result showed that the percentage of elementary school teacher's of TPACK literacy in the posttest is higher than in the pretest. The conclusion of this study is elementary school teacher training program can improve TPACK literacy in Indonesia.

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