The Effectiveness of Online Learning on Students' TPACK based Teaching Instrument

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Article Info	ABSTRACT
Article history: Received Dec 28, 2021 Revised Apr 23, 2022 Accepted Apr 28, 2022 *Keywords:* Online Learning Teaching instrument TPACK	The aim of the study is to depict the effectiveness of online learning on the students' ability to write TPACK based teaching instruments during the pandemic. The subjects of the research were 15 students of pre-service student-teacher candidates of the Faculty of Teacher Training and Educational Science, Pakuan University, the academic year 2020-2021. The approach of the study is quantitative with questionnaires, and documents as the instruments. The result of the study shows that online learning has not reached the maximum effect on the students' ability to write TPACK-based teaching instruments, although the result is considered fair. Meanwhile, the teachers still need to get the knowledge on how to integrate materials using digital applications and mix them into interesting teaching materials and media.

Introduction

In mid-March 2020, the government via the Ministry of Education and Culture, the Directorate of Higher Education issued letter no 1, 2020 regarding the prevention of the spread of covid 19 to reduce the sufferers. The focus of the letter is to instruct the school to organize distance learning and suggest that the students should study from home. The provision of online learning materials which are needed by anyone in need can be one of the other educational services that can be accessed via the internet. Online learning is a learning system carried out virtually using a platform and helped the teaching and learning process run smoothly. Its purpose is to provide quality learning services in a massive and open network to reach more and wider interest in learning spaces (Sofyana & Rozaq 2019:82). Due to the full-size use of science in every life, profitable technology has been committed crucial in teaching and learning practices.

The pandemic also affected the lecture activities carried out for the second batch of independent pre-service students consisting of 15 students who were entering odd semester lectures. It urges the activity to be done online. Actually, their lectures have been running for one semester and they are now entering an even semester, namely the field introduction practice course (PPL). In the last odd semester, they have been trained with pedagogic theories, deepening of material, and other general knowledge. Mulyasa (2014) stated that at

least pedagogic competence includes the following aspects, namely: a) understanding of educational insights and foundations, b) understanding of students, c) curriculum/syllabus development, d) learning design, e) learning implementation which is educational and dialogical, f) the use of learning technology, g) evaluation of learning outcomes (EHB), and h) the development of students to actualize their various potential.

Now, entering this second semester which is still online, they are equipped with knowledge about TPACK and assigned to make a complete teaching instrument as well as the assessment. They have to construct 12 pieces of teaching instruments; three of them will be used for the final examination. Readiness in carrying out online learning certainly cannot be separated from the TPACK framework which integrates pedagogical abilities/skills, mastery of teaching materials, and the use of technology in learning. The situation is supported by Fajriana and Satriana (2021), who underlined that it seems teachers are ready to do online learning, although they need to improve their ability to integrate their technology into the learning process. The study is aimed at knowing the effectiveness of online learning on students' ability to write TPACK learning instruments during the pandemic.

Method

This research was carried out to the 15 pre-service students at the Teacher Professional Education Program, Faculty of Teacher Training and Education, Pakuan University, the academic year 2020-2021, and it is done from 10th February 2021 to 24th December 2021.

The research method used is descriptive research method with a quantitative approach. Sugiyono (2012: 13) explains that descriptive research is a research conducted to determine the value of independent variables, either one or more (independent) variables without making comparisons, or connecting with other variables. Meanwhile, according to Sudjana and Ibrahim (2004:64) descriptive research is "research that seeks to describe a symptom, event, event that is happening at the present time".

In line with Sugiyono, and Sudjana, Arikunto (2013:12) emphasizes that the approach uses quantitative because it uses numbers, starting from data collection, interpretation of the data, and the appearance of the results. Based on this understanding, it can be concluded that descriptive research is done by seeking information related to symptoms. existing ones, clearly explain the objectives to be achieved, plan how to approach them, and collect various kinds of data as material for making reports.

In this study, the researchers want to know an overview of learning activities that arise during learning activities using the Learning Management System (LMS) learning media at Pakuan University. This research approach uses a quantitative approach because it uses numbers, starting from data collection, interpretation of the data, and the appearance of the results. It is also associated with research variables that focus on current problems and phenomena that are happening at the present time in the form of research results in the form of numbers that have meaning. The sample was 15 students were chosen purposively, and the instrument were an observation sheet. For validity and reliability, the researcher uses expert judgment techniques.

The teaching instrument covers the teaching material, media, students' worksheets, and evaluation the preservice teachers should provide before executing their job in the class. They have to construct the teaching plan components based on the curriculum carried out at school. The teaching instrument is the backbone of the teaching and learning process. It defines learning goals that students must achieve, materials and activities to support them in achieving the goals, and assessment to measure to what extent they have achieved the goals

The instrument used in this study was a questionnaire sheet. The data collection technique used in this research is a questionnaire. The approach used a Likert scale with five answer options, namely: Very Often (SSR), Always (S), Often (SR), Rarely (J), and Never (TP). The questionnaire was stated with two statements, namely a positive statement and a negative statement. Scores of positive statements answered 5 Very Often (SSR), 4 Always (S), 3 Often (SR), 2 Rarely (J), and 1 Never (TP). Scores of negative statements answered 1 Very Often (SSR), 2 Always (S), 3 Often (SR), 4 Rarely (J), and 5 Never (TP). The data analysis technique used in this research is quantitative analysis which consists of descriptive statistical analysis.

Results and Discussion

Technological Pedagogical Content Knowledge (TPACK)

In welcoming the era of the industrial revolution 4.0, a teacher is required to use technological advances in the learning system (Oktaviani, 2018). Learning which used to be carried out in elementary schools conventionally has to be changed into learning-based technology. To realize all these dimensions, it is necessary to have teacher's further competency by increasing the skills and knowledge (Destiana & Utami 2017).

TPACK framework which was initialized by Koehler dan Matthew (2016) focuses on three types of knowledge, namely: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) depict how content and technology are integrated to assist students to internalize their learning experiences. TK elaborates on technological devices and specific pedagogical practices relation; PCK emphasizes pedagogical practices and learning objectives specifically, while TCK highlights the relation between technology and learning goals. These three categories are then combined to form TPACK, which takes into account the connections between them and recognizes educators' role in this complex environment.

In addition, Kohler and Matthew (2016: 1028) underlined that those teachers need to recognize not just the subject matter they teach, but also the manner in which the subject depends can be modified with the aid of the utility of technology.

Meanwhile, according to Niess (in Angeli & Valanides, 2015), stated TPACK as knowledge describes the knowledge of teachers to teach technology. He refers to the four components of teacher TPACK, namely a) the overall concept of teaching content with technology; b) knowledge of students' understanding, thinking, and learning with technology; c) knowledge of curriculum and curriculum materials, and d) instructor knowledge and instructional representation

Previously, Hume & Berry (2013) mentioned that the development of beginner teachers' PCK through collaboration can be started by observing beginner teachers the actions taken by their mentors within a certain time-frequency so that novice teachers are able to know the things needed in the classroom. Collaborative mentors have an important role in teaching novice teachers to carry out the profession and provide motivation or support so that novice teachers are able to apply conceptual and pedagogical knowledge when teaching in the classroom, as well as identify and access PCK components that can be developed to become professional teachers (Fazio et al. in Hume & Berry, 2013).

Questionnaires

The result of the questionnaires from seven components of TPACK depicts that there are three components with the fair percentage namely: Technological Knowledge (TK) with

61.00%, Technological Pedagogical Knowledge (TPK) with 66.55%, and TPACK with 68.72% as shown below.

Table 1. Result of the questionnaire

	Variable	Mastery	Category
1	TK	61.00%	Fair
2	CK	77.22%	Good
3	PK	73.57%	Good
4	PCK	72.22%	Good
5	TCK	73.59%	Good
6	TPK	66.55%	Fair
7	TPACK	68.72%	Fair

The explanation of each category from the preservice students is as follows:

1. Technological Knowledge:
   The result shows that TK has 61.00 respondents, and 13 know about the technology, however, two of them still have difficulty submitting assignments through LMS;
2. Content Knowledge:
   The student's understanding of the material being taught is good as it shows that 77.22 of them could answer the question of pedagogical knowledge:
3. Pedagogical Knowledge:
   Learning planning, material delivery, student conditioning, and delivery of material to students are well controlled as it shows from the result that it gets 73.57%.
4. Pedagogical Content Knowledge:
   The percentage of the answer is 72.22% since the respondents prepared the presentation or the appearance of teaching materials well;
5. Technological Content Knowledge:
   Students' mastery of technology is good where they can use computer simulations in certain materials, and it shows by the percentage of 73.59%;
6. Technological Pedagogical Knowledge:
   Their mastery of technology is quite good as is shown by 66.55%, although there are four of them still find it difficult to apply computer simulations in certain materials;
7. Technological Pedagogical Content Knowledge:
   Four respondents face difficulty in integrating it with a percentage of 68.72%, meanwhile, (Schmidt, 2009) emphasizes that knowledge is needed by teachers in integrating technology using a pedagogical approach to facilitate learning.

Document Analysis

Readiness in carrying out online learning is certainly inseparable from the TPACK framework which integrates pedagogical abilities/skills, mastery of teaching materials and the use of technology in learning. Evaluation of online learning is based on the TPACK perspective adapted from Schmidt et al., (2009) and the TPACK-21 questionnaire (Valtonen et al.,2017) to measure teacher readiness. assessment based on learning conducted on 15 teacher-respondents participating in teaching activities, and the result of the assessment is presented below.
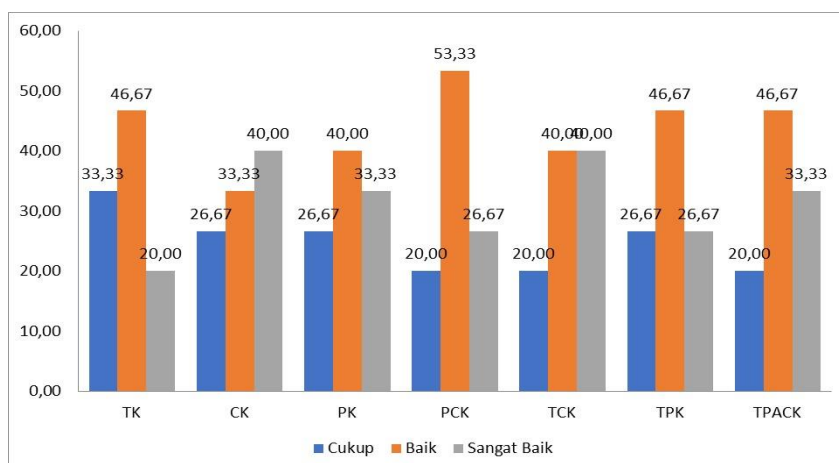
Figure 1. The result of lesson plan analysis

From the result of lesson plan analysis, it could be elaborated that each component has different percentage. The following are the elaboration of the percentage starting from the good mark (brown): PCK (53.33), TK, TPK, and TPACK (46.67), PK & TCK (40.00%), CK (33.33%). The fair rank (blue) belongs to: TK (33.33%), CK, PK, and TPK (26.67%), and very good rank (grey) are: CK & TCK (40.00%), PK & TPACK (33.33%), PCK & TPK have 26.67%, and the last TK has (20%). The result shows that the highest score is the component of Pedagogical Content Knowledge, and lowest is from Technological Knowledge and TPACK itself. Looking at the different components mastered by the respondents, it seems that the lack is quite contradict with what Cai, et al (2011) emphasized that the teacher is the instrument for successful learning, and it is also in line with what Schmidt (2009) who emphasized that knowledge is needed by teachers in integrating technology using a pedagogical approach to facilitate learning. However, the respondents have tried to do their best.

Conclusion

From the data above, the writers conclude that the implementation of online learning is quite effective and increases students' ability to write TPACK teaching instruments, although it still needs to be deepened in implementing more complete and targeted materials in accordance with the demands of the required material, since there is compatibility with 21st century learning including how to integrate materials using digital applications and mix them in interesting teaching materials and media. The teacher of the 21st century should be able to integrate the technology to the teaching process by considering the knowledge, pedagogic, and the content of the material to be able to enrich their students to face the future better.

References

Angeli, C., & Valanides, N. (2015). Preface. In Technological Pedagogical Content Knowledge: Exploring, Developing, and Assessing TPACK. https://doi.org/10.1007/978-1-4899-8080-9

Destiana, B., & Utami, P. (2017). Urgensi Kompetensi Pedagogik Guru Vokasional Pada Pembelajaran Abad 21. Elinvo (Electronics, Informatics, and Vocational Education), 2(2), 211–222. https://doi.org/10.21831/elinvo.v2i2.17368

Fajriana, & Safriana, S. (2021). Analisis Kesiapan Guru Fisika dan Matematika dalam Pembelajaran Daring. Jurnal Pendidikan Sains Indonesia, 9(2), 293–304. https://doi.org/10.24815/jpsi.v9i2.19162

Hofer, M., & Grandgenett, N. (2012). Research on Technology in Education | 83 TPACK Development in Teacher Education: A Longitudinal Study of Preservice Teachers in a Secondary. 45(1), 83–106.

Hume, A. & Berry, A. (2013). Enhancing the practicum experience for pre-service chemistry chemistry teachers through collaborative CoRe design with mentor teachers. Research Education, 43, 2107–2136.

Koehler, Matthew J, Punya Mishra, Kristen Kereluik, Tae Seob Shin, and C. R. G. (2014). The Technological Pedagogical Content Knowledge Framework. Handbook of Research on Educational Communications and Technology: Fourth Edition, 1–1005. https://doi.org/10.1007/978-1-4614-3185-5.

Schmidt, D. A. et al. (2009). Technological Pedagogical Content Knowledge (TPACK). Journal of Research on Technology in Education, 42:2, 123–149.

Schmidt, D. A., Thompson, A. D., Koehler, M. J., & Shin, T. S. (2014). The Social Impacts of Developments in Informat. CIE 2014 - 44th International Conference on Computers and Industrial Engineering and IMSS 2014 - 9th International Symposium on Intelligent Manufacturing and Service Systems, Joint International Symposium on "The Social Impacts of Developments in Informat, 42(2), 2531p.

Sofyana, L., & Rozaq, A. (2019). Pembelajaran Daring Kombinasi Berbasis Whatsapp Pada Kelas Karyawan Prodi Teknik Informatika Universitas Pgri Madiun. Jurnal Nasional Pendidikan Teknik Informatika (JANAPATI), 8(1), 81. https://doi.org/10.23887/janapati.v8i1.17204

Sugiyono, D. (2013). Metode penelitian pendidikan pendekatan kuantitatif, kualitatif dan R&D. https://digilib.unigres.ac.id/index.php?p=show_detail&id=43

Valtonen, T., Sointu, E., Kukkonen, J., Kontkanen, S., Lambert, M. C., & Mäkitalo-Siegl, K. (2017). TPACK updated to measure pre-service teachers' twenty-first century skills. Australasian Journal of Educational Technology, 33(3), 15–31. https://doi.org/10.14742/ajet.3518