Vol. 10, No. 3, pp. 526-533, 2020 DOI: 10.23960/jpp.v10.i3.202014

Jurnal Pendidikan Progresif

e-ISSN: 2550-1313 | p-ISSN: 2087-9849

http://jurnal.fkip.unila.ac.id/index.php/jpp/

TPACK's Understanding Analysis of Physics Teachers in Using Learning Media

Diah Mulhayatiah[1,*], Herni Yuniarti Suhendi[1], Neneng Windayani[2]

[1]Department of Physics Education, Universitas Islam Negeri Sunan Gunung Djati, Indonesia.

[2]Department of Chemical Education, Universitas Islam Negeri Sunan Gunung Djati, Indonesia.

*Corresponding email: diahmulhayatiah@uinsgd.ac.id

Received: 27 October 2019 *Accepted: 20 July 2020* *Published: 22 December 2020*

Abstract: Analysis of TPACK's understanding physics teachers in using learning media. This study aims to determine the use of learning media used by physics teachers in the learning process. This research method is qualitative with research instruments in the form of questionnaires, document analysis and interviews. The study sample consisted of 60 physics teachers in West Java. The results of the study show that the majority of physics teachers still use Power Point media as the main media, then use electronic references, and interactive multimedia. Based on the media compilation process, almost most of them directly use existing media. The main reason is the lack of training gained by teachers in developing learning media. The conclusion of this study is that physics teachers still need technology and pedagogic knowledge in learning.

Keywords: content knowledge, ICT, pedagogical knowledge.

Abstrak: Analisis pemahaman TPACK guru fisika dalam menggunakan media pembelajaran. *Penelitian ini bertujuan untuk penggunaan media pembelajaran yang digunakan oleh guru dalam pembelajaran. Metode penelitian ini menggunakan metode kualitatif dengan instrument penelitian berupa kuisioner, analisis dokumen, dan wawancara. Sampel penelitian terdiri dari 60 guru fisika di Jawa Barat. Hasil penelitian memperlihatkan mayoritas penggunaan teknologi untuk media pembelajaran adalah menggunakan power point sebagai media utama, dilanjutkan penggunaan referensi yang bersifat elektronik, dan multimedia interaktif. Alasan utama guru belum maksimal dalam mengembangkan media berbasis teknologi adalah kurangnya pelatihan yang diikuti guru dalam mengembangkan media terintegrasi yang dihubungkan dengan kompetensi pedagogik. Kesimpulan penelitian ini adalah bahwa guru fisika sangat memerlukan teknologi dan pengetahuan pedagogic dalam proses pembelajaran.*

Kata kunci: *pengetahuan konten, TIK, pengetahuan pedagogik.*

To cite this article:

Mulhayatiah, D., Suhendi, H. Y., & Windayani, N. (2020). TPACK's Understanding Analysis of Physics Teachers in Using Learning Media. *Jurnal Pendidikan Progresif*, *10*(3), 526-533. doi: 10.23960/jpp.v10.i1.202014.

INTRODUCTION

Teacher quality will affect the achievement of achievement that will be owned by students (Byers, 2018; Feng & Sass, 2017).This is in line with what was stated by Chan that a good quality teacher competency can equip students with diverse knowledge and abilities in accordance with the concepts and context of learning. The teacher's competence is certainly inseparable from the pedagogic and professional competence of the teacher (Yang et al., 2019; Chan, 2018; Jääskelä, Häkkinen, & Rasku-Puttonen, 2017). The role of the teacher is implied in the Law of the Republic of Indonesia Number 14 of 2005 concerning Teachers and Lecturers (Indonesia, 2005). This law mandates the development and development of the teaching profession as an actualization of the teaching profession.

The Ministry of Education and Culture (Kemendikbud) has realized this through a competency improvement program for all teachers, both certified and uncertified. The program is realized by competency mapping carried out through the Teacher Competency Test (UKG), the aim is, of course, to find out the teacher's current objective conditions along with an analysis of the need to improve their competence. The follow up of the UKG implementation was realized in the form of post-UKG teacher training in 2016 and will be continued in 2017 with the Continuing Professional Development Program (PKB) for Teachers. One of the objectives of this program is to improve teacher pedagogical competence that is integrated with technology. Mazibe et al (2018) said that the reported PCK refers to the knowledge that teachers portray in a written and spoken format, including declarative and procedural PCK. Enacted PCK refers to the knowledge that the teachers reveal during teaching, similar to dynamic PCK.

The industrial revolution 4.0 has brought changes in the learning process that utilizes technology. The development of information and communication technology (ICT) is needed to support the development of learning media. ICT is also what can support the teacher's pedagogical abilities. Govender (2014) in his research stated that the integration of ICT in learning can improve the quality of education. The pedagogic content knowledge technology framework (TPACK) was developed by the government in order to realize quality and technological learning. Urban et al. (2018) also states that the implementation of the development of the TPACK program results in improved learning quality and improved teacher competency.

METHODS

This research method is a qualitative method using surveys and then analyzing the results of questionnaires and interviews as a survey instrument for physics teachers in Madrasah Aliyah and high schools in West Java. The research sample involved 60 teachers who were willing to be involved in the study. The questionnaire was used to find out the abilities and habits of teachers in integrating ICT into their pedagogical competencies. The questionnaire was given to physics teachers consisting of 23 questions based on 5 TPACK indicators adoption from indicator WPCK Tsai and Chang (2008) in Gorgum and Hunzorum (2012), namely ICT knowledge in general, ICT communicative abilities, pedagogical ICT, pedagogical ICT integrated content knowledge, and attitudes towards ICT-based education. Interviews were conducted with the principal as a direct supervisor and training provider in improving teacher competency.

RESULTS AND DISCUSSION

Questionnaire results from 60 teachers are presented in the following graphs below. The first question regarding ICT features that have been utilized in making teaching materials / learning media is (the teacher can choose more than one).

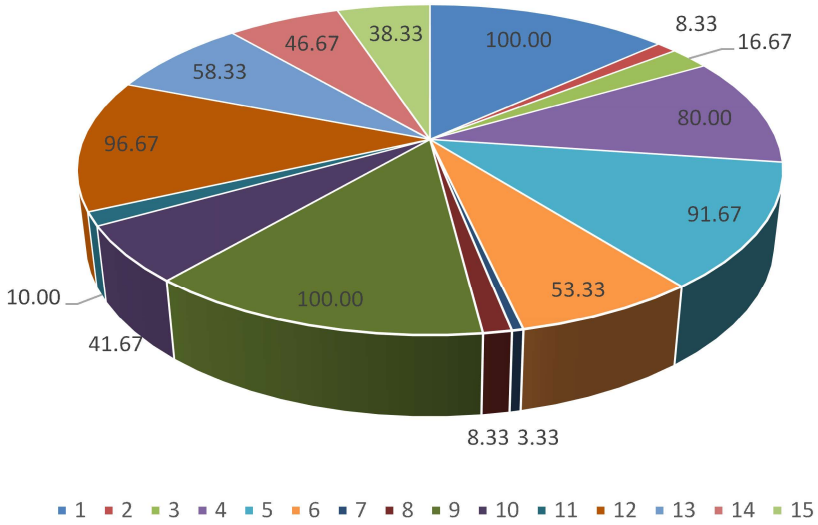

Figure 1. Pictures of ICT features that have been utilized in making teaching materials / learning media
1. Computer
2. Digital cameras
3. Scanner
4. Projector data
5. Specific software (ispring, phet, flash etc.)
6. Worksheets (for example: Excel)
7. Databases
8. Graphics program
9. PowerPoint
10. Word processing
11. Website
12. Electronic reference sources (e-books, mobile learning)
13. Discussion groups (WA, Facebook, Twitter etc.)
14. Email
15. Search Engine (Google scholar)

Figure 1 shows that the teacher is basically accustomed to using ICT features, only the features used are still limited to those that are easier to make, teachers still rarely use databases, software, websites, electronic references, and e-mail. This is shown from the percentage of teachers who use this feature is still small, whereas based on the results of Lye and Koh (2014) research that as for the instructional implication, it is proposed that a constructionism-based problem-solving learning environment, with information processing, scaffolding and reflection activities, could be designed to foster computational practices and computational perspectives. The second question is the ICT Feature which plans will be utilized in making teaching materials / learning media when learning is (can choose more than one).

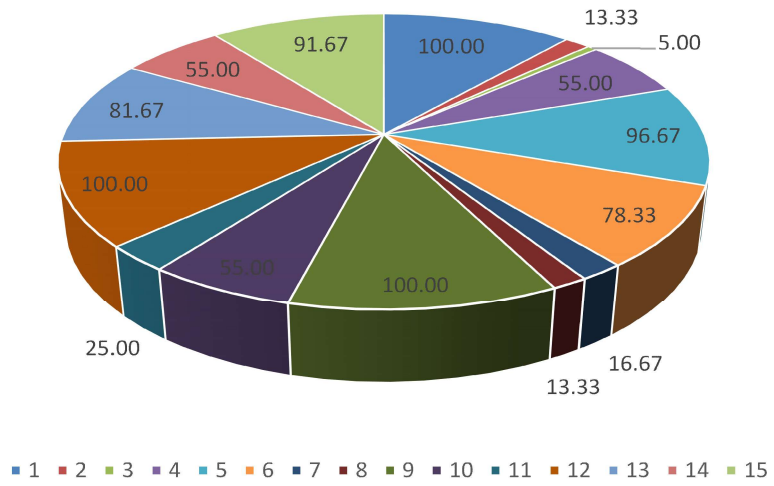

Figure 2. Pictures of ICT features that will be utilized in making teaching materials / learning media
Computer
2. Digital cameras
3. Scanner
4. Projector data
5. Specific software (ispring, phet, flash etc.)
6. Worksheets (for example: Excel)
7. Databases
8. Graphics program
9. PowerPoint
10. Word processing
11. Website
12. Electronic reference sources (e-books, mobile learning)
13. Discussion groups (WA, Facebook, Twitter etc.)
14. Email
15. Search Engine (Google scholar)

Figure 2 shows that the plan the teacher chooses to use various types of ICT that will be integrated with student learning. After the teacher understands the importance of pedagogic integration with technology through TPACK enhancement training, the teacher is increasingly aware that the development of technology integration with ICT learning is absolutely necessary. Lee (2012) states that with the advent of digital technologies, video as part of ICT has often been used as a learning tool for teacher education, where it is used to present models for teachers to analyze and emulate. As one example, teachers in a training session watch brief clips of classroom instruction featuring specific instructional strategies to be modeled, with follow-up discussions for analysis. Larkin (2012) also reinforces that While ICT is essential in delivering courses to those students who are studying online, it additionally has the potential to improve learning of all students require scaffolded learning opportunities to integrate ICT effectively.

The percentage of answers from the third question to the twenty-fifth question is presented in table 1. This question explains the indicators of integration competence between teacher pedagogics and the use of technology.

Table 1. Percentage of teacher answers to the importance of TPACK implementation in learning.

Queston (Indicator of TPACK)		Answer	
		Yes	No
1.	Have you ever used an argumentation activity between students and students in the learning process?	91,67%	8,33%
2.	Have you ever used an argumentation activity between students and teachers in the learning process?	55,50%	45,50%
3.	Are scientific strategies / models / approaches commonly used to build documentary activities growing within students?	91,67%	8,33%
4.	Have you ever known the background of your students (parents' work)?	35%	65%
5.	Does the student's background affect the ability of students to show their arguments?	35%	65%
6.	Does the implementation of argumentation activities exist in the curriculum in Indonesia?	100%	0
7.	Does the argumentation activity assess student performance?	80%	20%
8.	Does the argumentation activity facilitate students to gain more knowledge?	95%	5%
9.	Does the preparation of ICT-based teaching materials / media involve many things that must be done?	100%	0
10.	Do you arrange teaching materials by involving graphics?	93,33%	6,67%
11.	Do you compile teaching materials using words (text)?	100%	0
12.	Do you compile teaching materials by involving simulation games?	18,33%	81,67%
13.	Did you prepare teaching materials by involving PPT ?	100%	0
14.	Do you arrange teaching materials by involving posters?	8,33%	91,67%
15.	Do you compile teaching materials by involving learning objectives?	100%	0
16.	Do you structure teaching materials that involve hypothesizing activities?	93,33%	6,67%
17.	Do you compile teaching materials by involving experimental activities?	45%	55%
18.	Do you compile teaching materials by involving observing activities?	93,33%	6,67%
19.	Do you compile teaching materials by involving data collection activities?	55%	45%
20.	Do you compile teaching materials by involving data processing activities?	45%	55%
21.	Do you structure teaching materials by making conclusions?	91,67%	8,33%

22.	Do you compile teaching materials by involving the design of various possible solutions to problems?	71,33%	18,67%
23.	Do you compile teaching materials by making different types of assessments?	41,67%	58,33%

Table 1 shows the results of the percentage of teacher answers to indicators of the importance of TPACK implementation in learning. Indicators of the importance of PCK as part of learning are represented by indicators 1 through 8, which show that PCK is closely related to argumentation. Wang and Buck (2016) states that the synthesize the teacher's performed PCK from his argumentation practices and narrated PCK from his reflection on the argumentation practices, from which we summarize his PCK of argumentation from the perspectives of orientation, instructional strategies, students, curriculum, and assessment. The integration of PCK with technology which we refer to as TPACK is represented by indicators 9 through 14. In this indicator the teacher's perception of the use of media in learning integrates technology is known. This is done to facilitate the teacher in preparing learning and facilitate students in accessing various information needed in learning. Nugultham (2018) states that professional teachers are those who can integrate technology into learning so students can build their own knowledge through scientific activities based on the integration of ICT knowledge with pedagogic content of good teacher knowledge. Deng (2018) also said developing teachers' knowledge of content for teaching within the context of the institutional curriculum, with a central concern for developing human powers, would not be effective without being informed by technology.

Items 15 to 23 show the teacher's scientific pedagogic indicators in learning. Science learning, although using ICT media certainly cannot be separated from the scientific stage, this is done to improve students' cognitive skills and motivation to learn. Mishra et al. (2019) said that practical work in science education is a unique resource to the learning of scientific knowledge and processes, to the development of important tools and cognitive skills and to enhance students' motivation. Ferreira (2018) reinforces that the social context of the school on science teachers' practices, in terms of the structural and interactional characteristics of the practices and of the level of complexity of knowledge and skills they promote, specifically in the case of practical work contexts. In general, the average percentage of statements above teachers use and apply the TPACK indicator. Good learning certainly requires pedagogic competence and teacher content as the main thing, with the good competence integrated with ICT will further increase teacher competence in this era of digital literacy. Chowdhary (2014) understands this by stating that consideration teachers 'needs, attitudes, and beliefs toward their students when expecting changes in teachers' cognition and behavior to teach inquiry-rich challenging science.

■ CONCLUSIONS

The results of the study show that the majority of physics teachers still use Power Point media as the main media, then use electronic source, and interactive multimedia. Based on the media compilation process, almost most of them directly use existing media. The main reason is the lack of training gained by teachers in developing learning media. The conclusion of this study is that physics teachers still need technology and pedagogic knowledge in learning. The main cause is the lack of teacher competence developed when teachers return to school after

training and the lack of training activities to improve pedagogical competencies integrated with technology organized by the government.

REFERENCES

Byers, J. (2018). The Impact of Teacher Trust on the Achievement Gap Among African American Male Students (Doctoral dissertation, Northcentral University).

Chan, K. K. H., & Yung, B. H. W. (2018). Developing pedagogical content knowledge for teaching a new topic: more than teaching experience and subject matter knowledge. Research in Science Education, 48(2), 233-265.

Chowdhary, B., Liu, X., Yerrick, R., Smith, E., & Grant, B. (2014). Examining science teachers' development of interdisciplinary science inquiry pedagogical knowledge and practices. Journal of Science Teacher Education, 25(8), 865-884.Cartwright, T.

Deng, Z. (2018). Pedagogical content knowledge reconceived: Bringing curriculum thinking into the conversation on teachers' content knowledge. Teaching and Teacher Education, 72, 155-164.

Feng, L., & Sass, T. R. (2017). Teacher quality and teacher mobility. Education Finance and Policy, 12(3), 396-418.

Ferreira, S., & Morais, A. M. (2018). Practical Work in Science Education: Study of Different Contexts of Pedagogic Practice. Research in Science Education, 1-28.

Govender, N., & Govender, D. (2014). Change of science teachers' use of Information and Communication Technology (ICT) media resources and its pedagogical use in science classrooms in a developing country. Journal of Communication, 5(2), 155-167.

Horzum, M. B., & Gungoren, O. C. (2012). A model for beliefs, tool acceptance levels and web pedagogical content knowledge of science and technology preservice teachers towards web based instruction. Turkish Online Journal of Distance Education, 13(3), 50-69.

Indonesia, P. R. (2005). Peraturan Pemerintah Republik Indonesia nomor 19 tahun 2005 tentang standar nasional pendidikan. Departemen Pendidikan Nasional Republik Indonesia.

J., & Hallar, B. (2018). Taking risks with a growth mindset: long-term influence of an elementary pre-service after school science practicum. *International Journal of Science Education*, *40*(3), 348-370.

Jääskelä, P., Häkkinen, P., & Rasku-Puttonen, H. (2017). Teacher beliefs regarding learning, pedagogy, and the use of technology in higher education. Journal of Research on Technology in Education, 49(3-4), 198-211.

Larkin, K., Jamieson-Proctor, R., & Finger, G. (2012). TPACK and pre-service teacher mathematics education: Defining a signature pedagogy for mathematics education using ICT and based on the metaphor "mathematics is a language". Computers in the Schools, 29(1-2), 207-226.

Lee, Y., Kinzie, M. B., & Whittaker, J. V. (2012). Impact of online support for teachers' open-ended questioning in pre-k science activities. Teaching and teacher education, 28(4), 568-577.

Lye, S. Y., & Koh, J. H. L. (2014). Review on teaching and learning of computational thinking through programming: What is next for K-12?. Computers in Human Behavior, 41, 51-61.

Mazibe, E. N., Coetzee, C., & Gaigher, E. (2018). A comparison between reported and enacted pedagogical content knowledge (PCK) about graphs of motion. Research in Science Education, 1-24.

Mishra, C., Ha, S. J., Parker, L. C., & L. Clase, K. (2019). Describing teacher conceptions of technology in authentic science inquiry using technological pedagogical content knowledge as a lens. Biochemistry and Molecular Biology Education.

Nugultham, K. (2018, September). The advantages of Information and Communications and Technology (ICT) in Science Education. In International Conference on Science and Education and Technology 2018 (ISET 2018). Atlantis Press.

Urban, E. R., Navarro, M., & Borron, A. (2018). TPACK to GPACK? The examination of the technological pedagogical content knowledge framework as a model for global integration into college of agriculture classrooms. Teaching and Teacher Education, 73, 81-89.

Yang, X., Kaiser, G., König, J., & Blömeke, S. (2019). Professional Noticing of Mathematics Teachers: a Comparative Study Between Germany and China. International Journal of Science and Mathematics Education, 17(5), 943-963.

Wang, J., & Buck, G. A. (2016). Understanding a high school physics teacher's pedagogical content knowledge of argumentation. Journal of Science Teacher Education, 27(5), 577-604.