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Research Article

Perception Profile of Content Knowledge and Technological Pedagogy of Chemistry Teachers and the Quality of Their Implementation in the Development of RPP and Chemistry Learning

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Abstract: Content knowledge and technological pedagogy (TPACK) can be seen as the skills and abilities of teachers in selecting and using technology effectively. However, information about the Perception Profile of Chemistry Teachers' TPACK and the quality of its implementation in the development of lesson plans and chemistry learning is still limited. On the other hand, today's learners have grown and developed surrounded by technology, making it an integral part of their daily lives. Students are already using smart phones that can be used as a means of communication, making pictures, videos, transferring data by everyday learners, showing the ability to think and process information that is different from the previous generation. In connection with these developments, it is necessary to have teacher competencies that are able to combine material knowledge, pedagogy and technology that interact with each other and intersect to form Technological Pedagogical Content Knowledge (TPACK). In connection with this background, the purpose of this study is to analyze (1) how is the perception profile of the TPACK chemistry teacher at MGMP Malang in terms of length of teaching and certification status, (2) how is the correlation between teachers' perceptions of TPACK and implementation in RPP development, (3) how is the correlation? perceptions of TPACK with the implementation of Chemistry learning in the classroom, (4) what is the cause of the gap between teachers' TPACK perceptions and TPACK implementation in RPP and TPACK implementation in learning. The research design used is descriptive design, because this research requires quantitative and qualitative data, mixed methods are used in this study. The data analysis in this research is descriptive analysis. In this study, data were obtained in the form of chemical teacher TPACK perceptions, TPACK implementation in RPP development, TPACK implementation in chemistry learning, and interviews with teachers and students. The results showed that: (1) The perception profile of chemistry teachers' TPACK is that most of the chemistry teachers (85%) have TPACK perceptions in the medium category, the rest are in the high and low categories. From the results of the Importance-performance Analysis (IPA) analysis, the teacher was able to apply TPACK perceptions to the implementation of RPP making on the PK, PCK, and TK (volunteer) components with high categories, while the TPK component had low applicability and the low category level was the CK component. From the results of the IPA analysis, the applicability of teachers' perceptions of TPACK in classroom learning was the highest in the CK, PK, and PCK components, while the TPACK components had low TCK and TPACK applicability. The gap in the perception of TPACK teachers with implementation in lesson plans and learning is due to (a) an understanding of the concept of learning as just a knowledge transfer process so that teachers emphasize more on conveying chemical concepts (b) teacher learning experiences while taking teacher education have not got the skills to use technology for learning. (c) the process of preparing lesson plans is carried out jointly, with the target of immediate completion of the real lesson plans, the discussion process for compiling lesson plans that challenges students, encourages students to find concepts, and the use of various media and IT-based does not get an adequate portion (d) availability of facilities and regulations which supports the use of technology in schools is not sufficient.

1. Introduction

Technology integration is a complex process involving many interconnected factors, such as environment, technology, individuals, organizations, and pedagogy (Niederhauser & Lindstrom, 2018; Sánchez, Marcos, González, & GuanLin, 2012). The success of technology integration cannot be seen only from the availability of technology. However, it must be seen from the skills and abilities of teachers in choosing and using technology effectively in accordance with learning content and pedagogy (Bilici, Guzey, & Yamak, 2016). The appropriate technology integration model to describe these skills or abilities is Pedagogical Technology and Knowledge Content (TPACK) (Chai, Koh, Tsai, & Tan, 2011; Joo, Park, & Lim, 2018).

The TPACK framework consists of major components and integration components (a combination of the main components). The main components consist of Content Knowledge (CK), Pedagogical Knowledge (PK), and Knowledge Technology (TK). Furthermore, the integration component consists of Pedagogical Content Knowledge (PCK), Technology Content Knowledge (TCK), Pedagogical Technology Knowledge (TPK), and Pedagogical Technology and Content Knowledge (TPACK) (Koehler, Mishra, & Kain, 2013; Valtonen, Kukkonen, Kontkanen, Mäkitalo-Siegl, & Sointu, 2018; Valtonen et al., 2017). These seven components are interrelated and cannot stand alone. Therefore, to have a good TPACK, a teacher must have the ability to develop cognitive fluency and flexibility in each of the main components and the relationships between TPACK components. Finally, they can develop solutions that are effective in technology integration (Kimmons, 2015; Koehler et al., 2013).

The TPACK model is suitable to be used to describe and study the technology integration abilities of teachers, especially teachers in Indonesia. The reason is that several TPACK components are part of the competence of Indonesian professional teachers listed in the Academic Qualification Standards and Teacher Competencies in Indonesia. These components are pedagogical knowledge (related to pedagogical competence) and content

knowledge (related to professional competence) (Nofrion, Wijayanto, Wilis, & Novio, 2018). In addition, the TPACK model also consists of PCK, which is the knowledge, experience, and skills that teachers acquire through teaching experience in the classroom, which is a potential indicator for teachers to implement quality learning activities (Anwar, Rustaman, Widodo, & Redjeki, 2014; Widodo, 2017).

2. Method

The research method used is a survey method. According to Sugiyono (2013) a survey method where data collection is carried out using a questionnaire as a research instrument carried out on large and small populations, but the data studied is data from samples taken from that population, so that relative incidence, distribution, and relationships between variables are found. , sociological and psychological ". This study aims, firstly, to attempt to assess and measure the perceptions of chemistry teachers of Malang chemistry MGMP members about their understanding of the TPACK framework and its related constructs. Thus, the basic data on the level of TPACK for chemistry teachers in Malang is obtained. Research on this matter has never been carried out in Malang. From the data collected, it will be possible to know the TPACK profile of the chemistry teacher and the interaction relationship between the components that make up TPACK. The second objective of this research is to find out whether the perception chemistry teacher of the TPACK framework is used in compiling the lesson plans, and the third objective is to find out whether the perception of the TPACK framework is used in implementing real classroom learning. The fourth objective is to find out the reasons for the gap between perceptions of TPACK and implementation in RPP development and learning. The first objective requires a quantitative approach, while the other requires a qualitative approach, in the form of in-depth observations and interviews about the actual practice of what chemistry teachers do with technology in the classroom. The research subjects to measure the perceptual beliefs of teachers towards the TPACK framework for chemistry teachers who were active in the MGMP Kimia Malang activities were 41 people. While the number of subjects measured by RPP scores were 18 chemistry teachers out of 41 MGMP chemistry teachers. The number of subjects as volunteers to observe their learning, and to conduct interviews as many as 6 chemistry teachers

3. Result

Almost all secondary schools in Malang have internet service via Wifi, apart from having already had a multi media laboratory. This is to support the PPDB process as well as the existence of a computer-based national exam. Teachers and students can access the internet with wifi even though the bandwidth is still inadequate for all academicians at the school. Most schools prohibit their students from activating Android cellphones while in class, and some schools even prepare cell phones before students enter class, so that Android phones cannot be used in the learning process in class. There are very few schools that regulate the use of cellphones in class during learning so that in these schools learning by accessing IT-based learning resources can be implemented.

The challenge is that the use of technology is still not high, both at the time of designing lesson plans and during learning, apart from being influenced by the school environment as mentioned earlier, it is also driven by the skills of the teachers in mastering the technology. Interviews with teachers as in Table 4.38 can be summarized as follows:

a. Educational background.

Teachers who have been teaching for a long time, which means they graduated from college in the 1980s, feel that they do not get the skills to use technology in learning. In contrast to teachers who graduated from the 2000s and above, they have already acquired knowledge in the use of IT for learning even at the basic level. Likewise, teachers who continue their S-2 education, who are a class over 2000, feel more equipped about the use of IT technology for chemistry learning.

The results of this study are in accordance with the findings of Archambault and Crippen (2009) who found that traditional science teachers in America who have been educated are more focused on CK and PK. In New Zealand, the same thing was found (Owusu, 2014). Owusu's research results show that science teachers whose kindergarten scores are low is caused when most teachers learn when technology is not as advanced as it is now and technology is not explicitly part of the teacher education program.

b. Understanding the Concept of Learning Chemistry.

From table 5.9, almost all volunteer teachers understand chemistry learning is a process of student-teacher contact where knowledge transfer occurs. The teacher as a learning resource who has sole authority in conveying the truth of chemistry. The view that the teacher is the only source of chemistry in the classroom makes the learning process monolithic from teacher to student, unthinkable or even provides learning resources outside the teacher, both accessible in the classroom and through IT technology outside the classroom. . The tendency to make learning as merely a transfer of knowledge encourages learning to stick to a very tight curriculum schedule and consider the task of transferring all of the chemistry that is in the curriculum especially to the final class which is going to the national exam, to be the teacher's credo in carrying out their assignments. The desire to encourage students to interact with friends, learning resources outside the classroom, in the laboratory and experience challenging and meaningful learning has become somewhat forgotten.

The results of this study are also confirmed by the research of Pamuk (2012) and Owusu (2014) that science teachers in Turkey and New Zealand who reduce the use of technology in high-class classes that are prepared for final exams are due to demands for final examination assessments.

c. Preparation of RPP

In preparing the lesson plan, the teacher has followed the steps suggested by the ministry of education and culture. In real practice in schools, lesson plans are usually done together by the teacher in the Chemistry Subject Teacher Conference at the school. Conducted at the beginning of the school year. This is done as easily as the real RPP product which must be signed by the principal, education supervisor for the completeness of learning tools that must be available and owned by teachers and schools. In the process of preparing the RPP what is important is the form of the real RPP. With the target of completing the real lesson plans, the discussion process to compile lesson plans that challenges students, encourages students to find concepts, and the use of various media and IT-based does not receive a large portion. So it becomes sufficient reason when there is a parallelity relationship between the perceptual scores of TPACK and TPACK in RPP and TPACK in Learning, even though the scores are still not high, they even tend to be below enough. Especially for teachers with zero TPACK scores, since the beginning of compiling lesson plans they believed that their students would prefer to be guided by a question-answer model, so that from starting to compile lesson plans and implementing learning, they did not use technology. The two teachers really liked the students because they were able to guide them with the question-answer learning model

The results showed that there was a parallelity relationship between the perceptual score of TPACK and TPACK in lesson plans and learning TPACK although the scores were still not high, even tended to be below sufficient. This result is due to the close relationship between the perceptions of TPACK possessed by a prospective teacher which can affect the way the teacher teaches a material and the teaching method is reflected in the learning tools (RPP) (Srisawasdi, 2012).

4. Conclusion

The perception profile of chemistry teacher TPACK in Malang is as follows; Most (85%) chemistry teachers have the perception of TPACK in the medium category, the rest are in the high and low categories. The perception of TPACK for chemistry teachers was not related to length of teaching and certification status, even descriptively, the perception of TPACK of teachers who were not certified was higher than those who were already certified. The lowest mean score was 3.34 on the TCK component or knowledge of technology content, while the highest average score was in the CK component or content knowledge of 4.13. For the other components, namely TK, PK, PCK, TPK and TPACK respectively, 3.70; 3,97; 3,85; 3,36; 3,63. With the highest score of 5, the chemistry teacher has a more than moderate perception of the knowledge of technology content and has a high score on the perception of content knowledge. By using the linear line model and PLS SEM in real terms, the TPACK of chemistry teachers is positively influenced by TPK, PK, TCK and negative influence by PCK, TK. These results indicate that the 6 constituent components of TPACK are the main predictors of TPACK perceptions of chemistry teachers in Malang. The TPACK component score implemented in the lesson plan has the lowest average score in the pedagogical knowledge technology (TPK) sub-component of 2.61 which means the meaning between disagree and doubt, while the highest average score is in the pedagogical knowledge component of 3.82 , although the highest is still close to agreeing on a scale between doubt and agreeing to implement the TPACK perception in the RPP. From the results of the science analysis, the teacher was able to apply TPACK perceptions to the implementation of RPP making on the PK, PCK, and TK (volunteer) components with the high category, while the TPK component had low applicability and the low category level was the CK component. From the results of the IPA analysis, the application of TPACK perceptions of teachers to classroom learning was the highest in the CK, PK, and PCK components, while the TPACK components with low applicability were TCK and TPACK. The results of the science analysis show that the application of TPACKrpp in learning has the highest PK and PCK components. There is a relationship between the TPACK perception score of volunteer teachers and the TPACK score implemented in the RPP and in learning on 4 volunteer teachers, while the 2 volunteer teachers showed no parallels between the TPACK perception score, TPACK rpp and the TPACK score in learning. The gap between teacher perceptions of TPACK and implementation in lesson plans and learning is due to (a) an understanding of the concept of learning as just a knowledge transfer process so that teachers emphasize more on conveying chemical concepts (b) teachers' learning experiences while taking teacher education have not got the skills to use technology to learning. (c) the process of preparing RPPs is carried out jointly, with the target of completing the RPP immediately, then the discussion process for preparing RPPs that challenges students, encourages students to find concepts, and the use of various media and IT-based does not get an adequate portion (d) the availability of facilities and regulations inadequate support for the use of technology in schools.

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