Teacher’s TPACK Profile: The Affect of Teacher Qualification and Teaching Experience

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Abstract. The 21st century is the era of technology and digital. The 21st century affects all aspects of life, regardless education. This is clearly the teacher must improve their ability to master ICT in learning. The aim of this study was to determine the affect of teacher qualifications and teaching experience on biology teacher’s TPACK in the Magelang City. This was a survey research. The data collection technique uses TPACK test instruments from Paidi & Subali (2018). This research was conducted in all public secondary schools in the Magelang City, Central Java. Population in this study was hypothetico population. The sample in this study were 14 high school biology teachers in Magelang City. The analysis of data was two-way ANOVA, with provisions p <0.05, which means that there is a significant variable influence on TPACK implementation. This finding reveals that teacher qualifications and teacher teaching experience have Sig. score p <0.05. In conclusion, there was a significant affect of teacher qualifications and teaching experience on biology teacher’ TPACK.

1. Introduction

The 21st century is a technological era. Technology has penetrated almost all segments of life, including education. The learning the era of globalization aims to prepare a generation that is ready for the advancement of ICT that develops so quickly and has an impact on various aspects of life, including in the teaching and learning process [14]. Technology has become an integral part of educators and students' lives, it changed interaction of teachers and students how to learn in technology-rich environments [6][26]. The conclusion from [17], the use of technology in the classroom is described as a great support tool for access to information, student academic support, and for individualization and personalization.

According to [20], along with digital technology, technical competencies have also emerged. This requires knowledge and skills in using technology to provide comprehensive learning. This confirms that the task of the teacher as an educator will increase. According to Shulman (1987), there is a teacher's ability to manage classes, namely mastery of Content Knowledge (CK) [15], and the importance of mastering Paedagogical Knowledge (PK) [10][25] which was integrated into PCK. Koehler & Mishra integrated TK in the Shulman PCK concept (1987) so as to form new types of knowledge, TCK, TPK, and TPACK. The related literature review shows that school-based determinants that was important to support education teacher quality [1] [11] because the teacher
determines Adeyemi students' academic performance (2010). Therefore, there was a need to assess secondary school teachers’ characteristics in terms of qualifications and teaching experience to ensure the quality of education. Teacher qualification is described that skill or type of experience or certain knowledge that a person has to make or is suitable for teaching. Accordingly, teacher qualifications can mean all the skills teachers need to teach effectively. In this study, teaching qualifications focused on academic degrees that a teacher must have to fulfill his teaching requirements. In Nigeria, this includes Bachelor, Master, Doctor, other certificates, and inclusive diplomas. However, only degree holders are eligible to teach in high school. Some scholars believe that higher degree shows a positive correlation with student academic achievement [9][29]. The teachers who have more training produce students who have better achievements. Years of teacher experience is one indicator of teacher qualifications which is believed to be a significant determinant of student academic performance [8]. A greater teaching experience will result in students with higher achievement [6]. Research has shown that inexperienced teachers are usually less efficient than experienced teachers [7]. Studies have found a positive relationship between teacher effectiveness and their experience over the years and efficient teachers positively influence student academic achievement of [2].

2. Research Methods

This was survey research. The study was conducted in all Senior High Schools in Magelang City, Central Java, which amounted to 5 Public High Schools. Population in this studied was hypothetico population with konvenien sample, that is 24 biology teachers in Magelang City. The instrument in this research is the TPACK biology teacher test instrument by Paidi & Subali (2018). Empirical validity of test instruments obtained MNSQ infit value of 1.00 with a standard deviation of 0.16. In this case, it shows that all test items that have been prepared fit the Rasch model because the MNSQ infit score obtained is at the acceptance limit of ≥ 0.77 to ≤1.30. The instrument contains 40 multiple choice questions, each TPACK component consists of types of conceptual, factual, and procedural questions. The study was conducted from January to February 2019. The independent variables measured in this study were teacher qualifications and teaching experience. Qualifications teachers in this studied were teachers with master's degrees (S2 teachers) and bachelor degree graduates (S1 teachers). Teaching experience were teachers had taught more than 15 years (senior teachers) and teachers had taught less than 15 years (junior teachers). The dependent variable (y) was the teacher’s knowledge about seven components of TPACK. The data analysis used the multivariat analysis of variance with the Sig. provisions <0.05, which means that there is a significant effect on teacher qualifications and teaching experience on teacher’s TPACK.

3. Findings and Discussion

| No | TPACK’s components | Teaching Experience | Teacher Qualification | Means | Probability |
|----|--------------------|---------------------|-----------------------|-------|-------------|
| 1  | CK                 | Senior              | S1                    | 7.5000| 0.016*      |
|    |                    |                     | S2                    | 8.7500|             |
|    |                    | Junior              | S1                    | 6.6667|             |
|    |                    |                     | S2                    | 8.3333|             |
| 2  | PK                 | Senior              | S1                    | 4.2500| 0.033*      |
|    |                    |                     | S2                    | 5.3333|             |
|    |                    | Junior              | S1                    | 3.6667|             |
|    |                    |                     | S2                    | 5.0000|             |
| 3  | TK                 | Senior              | S1                    | 1.0000| 0.012*      |
|    |                    |                     | S2                    | 2.3333|             |
|    |                    | Junior              | S1                    | 2.6667|             |
|    |                    |                     | S2                    | 2.7500|             |
Based on the results of the study, 100% were certified teachers with 21.4% of men and 78.6% of women. Table 1 showed that the TPACK by postgraduate graduate (S2) teachers were much higher than those of Diploma / Bachelor graduates (S1). This study revealed that 42.8% of participants served more than fifteen years as teachers and 57.2% of teachers had taught less than 15 years. Table 3 shows that there are significant differences of seven TPACK components between S2 teachers and S1 teachers who have more than 15 years of teaching experience and those who are less than 15 years old in Magelang City, Central Java, \( p < 0.05 \). This means that teacher qualifications and teaching experience contributed significant to the teacher’s TPACK in the Magelang City.

4. Discussion

The purpose of this study was to see the extent to which teacher qualifications and teacher teaching experience were related to the ability of seven components of the teacher's TPACK on biology subjects. The findings of this study indicated that 42.8% were teachers with master's degrees (S2 teachers) while 57.2% have Bachelor degree graduates (S1 teachers). Further research revealed that the teachers taught Biology subjects where they were trained. This implies that the teachers meet the requirements so that they are expected to be able to integrate TPACK's abilities in the learning process. These findings agreed with the views of Rivkin et al. (2005) who found no convincing evidence that master's degrees increased the effectiveness of teachers at the secondary school level. Further findings agreed with [13] which stated that additional professional qualifications outside the first level did not always lead to increased teaching competencies at the secondary school level. However, the findings of this study contradict the findings of research conducted by other scholars who found that teacher qualifications and experience played an important role in improving teacher abilities [3][4][16][18] (Yala and Wanjohi, 2011; [19]. The research findings showed that a low percentage (42.8%) of biology teachers who have had many years of experience in the field, these findings revealed that there was no significant influence from teaching experience. This confirmed that the teacher experience did not significantly influence the ability to implement 4 components of TPACK (Table 1). Regarding the development of the teacher's career over the years, this study determined that the majority of teachers (42.8%) had taught for more than fifteen years, 57.2% of the participants had taught less than fifteen years.

Finding showed that teacher qualification, S1 and S2 teachers have significant differences in the mastery of the seven components of TPACK principle. This is possible because of seven components of TPACK are competency in the form of knowledge about science disciplines that must be possessed
by teachers, therefore both senior and junior teachers have taken education to obtain this knowledge, but teachers with S2 graduates have better knowledge than teachers with S1 graduates. In line with Musou and Migasi (2015), the average knowledge of students taught by S2 graduates is higher than students taught by S1 graduates, because the mastery ability of master graduates is better than S1 graduates. This finding showed that senior teachers have PK, CK, and PCK better than junior teachers. This is because more teaching experience causes flexibility in teaching. According to [22] reveals that learning is a long-term change in behavior or inability to behave in a certain way, resulting from practice or other forms of experience. This is in line with the opinion of [12] "definitions of organizational effectiveness are constantly changing because they are influenced by context preferences, which in turn reflect social change." Learning occurs when experience (including exercise) results in a change in behavior and a person's knowledge that is stable. This emphasizes that the more an experienced teacher, the better the way to teach. The contrast finding that, junior teachers have TK, TCK, TPK, and TPACK better than senior teachers. The same thing was also proven based on [17] that as teachers age, senior factors are challenges to the application of technology. Thus, teacher qualification and teaching experience have significant affect to teacher’s TPACK. and [16] suggest that teacher qualification and teaching experience have an important role in the self-development of a teacher to master the competencies that demand the development of the times.

5. Conclusion
The results of the study showed that teacher qualifications and teaching experience have a significant affect on biology teachers’ TPACK in Magelang City, the significance value of the two way annova test on seven TPACK components were p <0.05.

Acknowledgement
The results of this study will provide information regarding mastery of teacher TPACK so that it can be used to improve the quality of learning. In addition, the results of the study also provide consideration in determining education policies, related to the number of basic competencies that must be mastered by students, learning experiences or abilities that need to be developed in the curriculum, as well as educational or learning methods or technologies that need to be accommodated. The researcher gratitude the senior high school headmaster, biology teacher, head of MGMP in Magelang City, and all those who had helped in this research.

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