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Influences of Technological Pedagogical Content Knowledge and Self-Efficacy on Technology Integration Practices of Economics Teachers

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Abstract

This study aimed to examine the influences of Technological Pedagogical Content Knowledge (TPACK) and Teacher Self Efficacy (TSE) on the technology integration practices of economics teachers. This study applied a quantitative method approach with primary data retrieved from questionnaire results distributed to respondents. The results demonstrated that TPACK significantly affected the technology integration practices of economics teachers with a significance value of 0.000 < 0.05. Besides, TSE also positively affected the economics teacher's technology integration practices with a significance value of 0.000 < 0.05. Furthermore, the F-test results confirmed that TPACK and TSE simultaneously impacted the technology integration practices of economics teachers, with $F_{count} > F_{table}$ (12.842 > 3.14) and a significance value of 0.000 <0.05.

Keywords: *Technological Pedagogical Content Knowledge (TPACK); Teacher Self Efficacy (TSE); Technology Integration Practices; Economic Teachers*

Introduction

Technology continues to experience rapid growth, and demands for using technology continue to escalate. This technological growth encourages rapid changes in various social aspects of humans (Yan, 2021). Further, the changes prominently affect life fields, one of which is education. Technology provides innovation opportunities. At the same time, the use of technology in education is also a challenge, especially in learning (Kurniawan et al., 2021).

The Covid-19 pandemic has made many changes in the teaching and learning process. Learning that should be conducted at school is forced to be run from home or distance learning. Facing these conditions, technology in education plays a large enough role in supporting the teaching and learning process (Starkey et al., 2021). Changes that occurred rapidly during the Covid-19 pandemic complicated teachers to adjust. It became a challenge for teachers because they were still not used to integrating technology into learning (Tafano & Saputra, 2021).

The problem of technology integration is one of the crucial issues to be discussed. Teachers are often unprepared and limited to using technology in technology-integrated learning practices (Barbour et

al., 2013). Based on observations of economics teachers in high schools (Senior High Schools or SMA/ Islamic Senior High Schools or MA) in Surakarta, it was found that only 49.17% of teachers had technology integration in their teaching process. This condition exhibited that there were differences in teacher technology integration practices. It was because only several teachers could integrate technology into teaching practices.

The success of technology integration practices in learning is vital because technology integration has been shown to improve student achievement and involvement in learning (Ghavifekr & Rosdy, 2015). In practice, several factors influence the successful integration of teacher technology. The realization of teacher technology integration in the teaching-learning process in the classroom emphasizes teachers' knowledge, skills, and attitudes toward using technology (Roussinos & Jimoyiannis, 2019). Meanwhile, teachers' beliefs about instructional choices in teaching also need to be considered when they design teaching experiences with technology (Abbitt, 2011).

The TPACK framework introduced by Mishra & Koehler (2006) is widely used in educational research and teacher professional development, especially teacher technology integration practices. The TPACK concept consists of three elements of knowledge; technology, pedagogy, and content. Hofer et al. (2015) stated that ICT in learning is not a skill that must be mastered separately but in an integrated form with an understanding of pedagogy and content areas. Further, Roussinos & Jimoyiannis (2019) mentioned that TPACK describes a teacher's integrated framework for teaching effectively with digital technology.

In particular, self-efficacy is a factor that needs to be considered for the integration of teacher technology (Barton & Dexter, 2020). Teacher Self Efficacy (TSE) is often interpreted as teacher beliefs that are most correlated with instructional choices of teaching (Poulou et al., 2019). TSE in teachers' technology integration practices is defined as teachers' confidence in their ability to use technology as an instructional option in the teaching and learning process (Bukar et al., 2018). Furthermore, TSE refers to three dimensions of teacher ability: classroom management, instructional strategies, and increasing student engagement (Tschannen-Moran & Hoy, 2001).

This study was conducted to determine how the technology integration practices of economics teachers in high schools (SMA/ MA) in Surakarta city are practiced. This study's analysis included TPACK and TSE's influences on the technology integration practices of the teachers.

Study of literature

Technological Pedagogical Content Knowledge (TPACK)

TPACK is a framework designed by Mishra & Koehler (2006) consisting of three main components of knowledge: technology, pedagogy, and content. The three components interact, forming the seven components teachers need to teach using technology (Koehler et al., 2013). The seven components include Technological knowledge (TK), Pedagogical knowledge (PK), Content knowledge (CK), Technological pedagogical knowledge (TPK), Technological content knowledge (TCK), Pedagogical content knowledge (PCK), and Technological pedagogical content knowledge (TPACK). TK is the knowledge to operate technology in starting learning. PK is the teacher's knowledge of learning procedures and strategies. CK is knowledge of the content of the subjects to be taught. TPK is knowledge of using technology in pedagogical activities. TCK is the knowledge of presenting content through technology. PCK is knowledge to deliver effective content instructions. TPACK will then highlight the teacher's sensitivity to the relations between the three knowledge components: technology, pedagogy, and content.

Voogt et al. (2013) defined TPACK as the knowledge teachers must have about combining content knowledge with pedagogical knowledge by including modern technology to facilitate learning. Then, Raygan & Moradkhani (2020) explained that when technology, pedagogy, and content are correctly combined, then teachers can be said to have succeeded in achieving technology-based learning.

Technology integration practices are influenced by teachers' TPACK. Santika et al. (2022) found that TPACK significantly affected teachers' ICT integration in learning. Another study by Koh et al. (2017) reported similar results where there were positive and significant correlations between the teacher's TPACK to the development of teacher professionalism for designing ICT-based learning.

Teacher Self-efficacy (TSE)

TSE is a factor that needs to be considered in teacher technology integration practices (Barton & Dexter, 2020). According to Tschannen-Moran & Hoy (2001), TSE is defined as teachers' beliefs about the ability to teach and to achieve the desired results while increasing student involvement in the teaching and learning process. Curtis (2017) stated that TSE was one of the self-beliefs that most predicted a teacher's professional behavior.

According to Poulou et al. (2019), teachers with strong levels of self-efficacy will invest more time in teaching plans that are more organized and open to new ideas that support learning. A study by Lailiyah & Cahyono (2017) found that TSE positively correlated with teachers' technology integration practices. Further, Buric & Kim (2020) also revealed that TSE positively and significantly influenced teachers' instructional choices.

Technology Integration

The use of technology in learning can be defined according to the aspects of its usage. According to Summak et al. (2010), the integration of technology in learning was a series of activities performed by teachers using technology to develop students' thinking skills. Monga (2015) mentioned that technology integration was the well-coordinated use of technological tools or digital and computational devices.

Teachers must be skilled and well-prepared regarding technical, pedagogical, and content knowledge (Farjon et al., 2018) to integrate technology successfully into learning. Meanwhile, Barton & Dexter (2020) identified that beliefs about technology and readiness to integrate technology had the most significant effect on teachers' technology integration practices.

Hence, based on the background and literature, the hypotheses of this study are as follows.

H1: TPACK has a positive and significant influence on teachers' technology integration practices

H2: TSE has a positive and significant impact on teachers' technology integration practices

H3: TACK and TSE simultaneously have a positive and significant effect on teacher technology integration practices

Based on theoretical explanations, prior research findings, and hypotheses development regarding TPACK and TSE on teacher technology integration practices. The research framework can be presented in Figure 1.

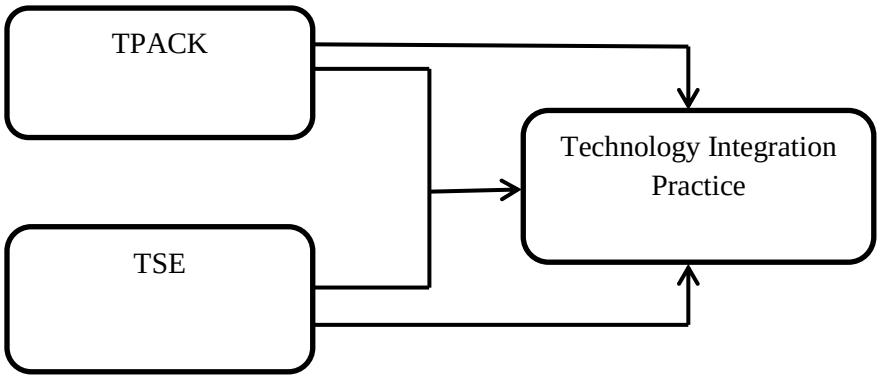

Figure 1. Research framework

Method

This study applied a quantitative approach. Data collection employed quantitative or statistical research instruments. The quantitative research method was aimed to test the hypotheses that have been set. Besides, quantitative research was used to test the independent variables on dependent variables through numbers. Then, research indicators are described in Table 1.

Table 1. Variable indicators

Variable	**Indicator**
TPACK (Cheng, 2017; and Raygan & Moradkhani, 2020)	1) TK (Technological Knowledge); 2) TPK (Technological Pedagogical Knowledge); 3) TCK (Technological Content Knowledge); 4) TPACK (Technological Pedagogical Content Knowledge)
TSE (Maulana et al., 2020)	1) Student engagement; 2) instructional strategies; and 3) classroom management
Technology Integration (Vannata & Banister, 2009; and Raygan & Moradkhani, 2020)	1) Risk-taking behavior and comfort with technology; 2) the perceived benefits of using technology in class; 3) beliefs and behavior regarding the use of technology in class; 4) use of teacher technology (administrative and instructional); 5) facilitating the use of technology by students; 6) teacher support for using technology and access to technology

This research was conducted in high schools (SMA/ MA) in Surakarta, Indonesia. The population or sample in this study was 67 economics teachers. The sampling technique employed was a saturated sample meaning that the entire population was the research sample.

Data collection techniques employed questionnaires. This study used primary data from questionnaire results distributed to respondents via Google forms consisting of TPACK, TSE, and teachers' technology integration practices.

Results and Discussion

The instruments used in this study were tested for validity and reliability using the SPSS application program. The results revealed that the TPACK, TSE, and teacher technology integration questionnaires comprised 37 items. All question items were declared valid because they had a significance level of loading factor above 0.60.

The normality test resulted in Asymp data with a Value of Sig. (2-tailed) of 0.200 > 0.05, indicating that the TPACK, TSE, and technology integration data were normally distributed. Furthermore, the multicollinearity test showed that the tolerance values for X1 and X2 were 0.458 and 0.456, respectively, while the VIF values for X1 and X2 were 1.184 and 1.182, respectively. Accordingly, it was known that the tolerance values for X1 and X2 were greater than 0.10, and the VIF values for X1 and X2 were less than 10. Thus, it could be concluded that there was no multicollinearity in the regression model in this study. For the heteroscedasticity test, it was known that the significance for X1 was 0.936, and the value for X2 was 0.431. Then, the significance probability value was greater than 0.05. Hence, it could be concluded that the regression model was free from heteroscedasticity.

Table 2. t-test results

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	std. Error	Betas		
1	(Constant)	79.366	3.399		33.238	003
	TPACK	.814	.070	.772	11.562	.000
	TSE	.303	099	.204	3.051	.000

a. Dependent Variable: Technology Integration

Influence of TPACK on the Technology Integration Practice of Economics Teachers

Based on Table 2, the significance value (Sig.) of X1 (TPACK) is 0.000 <0.05. Consequently, it could be concluded that variable X1 (TPACK) had a positive and significant effect on variable Y (technology integration practices) of economics teachers. Based on the statistical results, the t-test value for TPACK was the t-count > t-table (11.562 > 1.668) with a significant contribution of 0.000 < 0.05. Thus, TPACK had a positive and significant effect on the technology integration practices of economics teachers. These results indicated that the first hypothesis (H1) could be accepted.

Raygan & Moradkhani (2020) found that teachers with high TPACK levels contributed significantly to good technology integration practices. Besides, Santika et al. (2021) also showed that teachers with high TPACK, especially TK, TPK, and TCK, would have a positive influence on the use of technology in the teaching and learning process.

Many studies related to TPACK have been conducted. The results were various regarding the correlation between TPACK and teacher technology integration practices. However, most research results reported a positive influence between the two aspects. Nevertheless, some also found that TPACk had no impact on teachers' technology integration practices.

Influence of TSE on the Technology Integration Practices of Economics Teachers

Based on Table 2, the significance value of variable X2 (TSE) was 0.000 <0.05, and the t-count value was 3.051 > 1.688. Accordingly, it could be stated that there was a positive and significant influence between variable X2 (TSE) on variable Y (teacher technology integration). The results of the t-test analysis also demonstrated that TSE had a partial effect on the technology integration practices of economics teachers. Hence, the second hypothesis (H2) could be accepted.

Research by Lailiyah & Cahyono (2017) exposed that the level of TSE influenced the teacher's technology integration ability. TSE is the belief that teachers can carry out and manage learning activities, including using technology as a teaching instructional option. Teachers with a high TSE level will be confident to organize, manage classes, and choose appropriate instructional strategies to increase student participation and involvement in learning.

Table 3. F-test results

ANOVA[a]						
Model		Sum of Squares	df	MeanSquare	F	Sig.
1	Regression	582.060	2	591.030	12.842	.000b
	Residual	779.104	64	12.173		
	Total	1361.164	66			

a. Dependent Variable: Technology Integration
b. Predictors: (Constant), TSE, TPACK

Influence of TPACK and TSE on Teachers' Technology Integration Practices

The results of the F-statistic test exhibited that the F_{count} was greater than F_{table} (12.842 > 3.14) with a significance value of 0.000 < 0.05. Thus, it was stated that TPACK and TSE simultaneously had a positive and significant effect on the teacher's technology integration practice variable. Therefore, the third hypothesis (H3) could be accepted

According to research by Dalal et al. (2017), it revealed that the development of teacher professionalism could be done through the teacher's choice to use technology in teaching combined with the teacher's knowledge of the technology and subject matter that are adapted to the learning approach (pedagogy). Teacher knowledge and confidence are essential to realizing the integration of technology in learning to improve student achievement and engagement.

Research by Bakar et al. (2018) demonstrated that teacher technology integration practices were influenced by the combination of TPACK and TSE. Teachers with high TSE would perform high persistence toward organized planning and be open to new ideas for teaching. It included the teacher's ability to learn and have the knowledge to teach with technology.

Table 4. Determinant Coefficient Test Results

Summary models				
Model	R	R Square	Adjusted R Square	std. Error of the Estimate
1	.832a	.669	.665	3.489

a. Predictors: (Constant), TSE, TPACK

Based on Table 4, the R Square value was 0.669, meaning that the TPACK and TSE variables contributed 66.9% to teacher technology integration practices. In contrast, 33.1% was influenced by other variables not discussed in this study. Based on the data analysis, it was found that teachers with TPACK knowledge and self-confidence would have effective technology integration practices. Conversely, teachers with low TPACK knowledge and self-confidence obtained ineffective or low technology integration practices.

Based on the research findings, it was found that TPACK and TSE had a stimulating effect on the technology integration practices of economics teachers in high schools in Surakarta. Then, this study's results are expected to add to scientific studies of relevant research. The limitation of this study was that it only examined two factors influencing teachers' technology integration practices, including TPACK and TSE.

Conclusion

This study aimed to investigate the effect of TPACK and TSE on the technology integration practices of economics teachers in high schools in Surakarta. The results discovered that TPACK and TSE were selected as factors that positively and significantly impacted teachers' technology integration practices.

Further, teachers must be familiar with technological advances. Therefore, teachers must constantly update their technological knowledge. Teachers must also firmly believe that using technology in the learning process will improve the quality of their teaching.

Future research is expected to be able to investigate other variables that can predict the success of teacher technology integration, which is not only limited to economics teachers. Then it can lead to a deeper understanding of the factors that influence technology integration by teachers in learning.

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