

# The Effect of Self-Efficacy Mediation to the Influence between Teacher Experience and Teacher Training Towards Technological Pedagogy and Content Knowledge

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**Abstract.** This research was inspired by the rapid development of information and communication technology. It obligates teachers to apply technology and information in learning for enriching their professionalism. This research aims to determine the significance of the effect on teacher experience, training, and self-efficacy on TPACK, as well as determining the significance of teacher experience and training on self-efficacy. The used method in this research was descriptive method with data collection techniques through distributing questionnaires to economics teachers. Path analysis technique is used to analyze the data. Based on the results of the analysis, it was found that teacher experience, training, and self-efficacy had a significant positive effect on TPACK. Teacher experience and training have a significant positive effect on self-efficacy. Yet, self-efficacy is not able to mediate the effect of teacher experience on TPACK, and the effect of training on TPACK.

**Keyword.** self efficacy; teacher experience; teacher tpack; training

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## INTRODUCTION

The Partnership for 21st Century Learning develops the framework of 21st century learning, which requires students to have skills, knowledge and information regarding media and technology skills, learning and innovation skills, as well as life and career skills (Triling and Fadel 2009; P21 2015). Therefore, in order for students to acquire those skills, the establishment should start from teacher side as a very important role in teaching and learning process.

Teachers role strategically regarding the efforts in improving the quality, relevancy, and efficiency of education. Thus, the improvement and development of teacher's Technological Pedagogy and Content Knowledge (TPACK) is necessary for the learning in 21st century. Numbers of previous studies have shown that the TPACK of teachers is an important component to assist teachers in creating effective learning and increasing teacher professionalism. The notion is supported Graham, R. C. 2009; Allan, W. C. 2010; Puspitarini, S. S., & Erma, S. 2013; Rosyid, A. 2016; and Sukaesih, S. et al 2017.

TPACK defines as a learning framework, which emphasizes the relationship between subject-matter, technology, and pedagogy. The component of TPCK are; 1) Content Knowledge (CK); 2) Technological Knowledge (TK); 3) Pedagogical Knowledge (PK); 4) Content Knowledge (CK); 5) Technological Pedagogy Knowledge (TPK); 6) Technological

Content Knowledge (TCK), and 7) Pedagogical Content Knowledge (PCK) (Shulman 1986; Koehler & Mishra 2006; Rosyid, 2016).

Differently, the competence of teachers in Indonesia is still relatively low. Teacher competency test results in 2015 showed that the teacher competency test value was below the standard, which has been set by the government. The value only reached 53.02, while the value set by the government as minimum standard was 55 with an average of 51.12 (Ministry of Education and Culture 2015; Rian Gunawan 2018).

In addition, the survey from the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2016, Global Education Monitoring (GEM) reported the quality of education in developing countries of Asia Pacific which stated that Indonesia ranks 10th out of 14 countries. As for the quality of educators, the quality was at level 14th of 14 developing countries (Al-Jawi, M. S. 2006; Putriani, E. D 2014; Laoli, Y. 2017).

The issues which have been exposed previously show that the TPACK possessed by teachers in Indonesia needs to be improved. The challenge to improve the exact sector becomes a huge chance for teachers to improve and develop the competencies of TPACK. The goal is fostering the understanding the essence which says that teacher must have comprehensive and holistic knowledge as well as skills in terms of content, pedagogy, and technology (Koehler & Mishra 2006; Nofrion et al. 2018).

Following the issues which have been stated before, efforts should be made to improve and develop the TPACK of teachers in Indonesia. The factors, which affects teachers' TPACK includes teacher experience, training, technology, self-efficacy, and motivation (Shulman 1986).

Several previous studies have examined the factors, which influence TPACK. Those factors are teachers' self-efficacy (Ariani, D. N. 2015), teaching experience and teachers' business (Lestari, S. 2016), teachers' pedagogical knowledge, learning effectiveness, familiarity with the use of technology, conformity of integration with the content of material (Putri, A. R. A., Hidayat, T., & Purwianingsih, W. 2019), and teacher experience, training, technology, self-efficacy and motivation (Shulman 1986).

Based on the background description and description from previous studies regarding the effect of mediating self-efficacy on the influence of teacher experience and training on the TPACK, research question could be formulated. The research questions are: 1) Does the teacher experience significant influence towards the TPACK; 2) Does the training have a significant effect on the TPACK; 3) Does self-efficacy have a significant effect on teacher's Technological Pedagogy and Content Knowledge (TPACK); 4) Does the Teacher's experiences have a significant effect on self-efficacy; 5) Does training have a significant effect on self-efficacy.

Based on the formulation of research questions, the objectives of this research could be determined, as follows: 1) Determine the significant influence of teacher's experience on the TPACK; 2) Find out the significant effect of training on teacher's TPACK; 3) Find out the significant effect of self-efficacy on the TPACK; 4) Determine the significant effect of teacher's experience on self-efficacy; 5) Find out the significant effect of training on self-efficacy.

Based on the research objectives, this research is expected to be able to provide benefits both theoretically and practically, as follows:

1) Theoretical Benefit

The results of this study are expected to be able to provide empirical evidence to be used as a reference in subsequent studies which still use relevant variable.

2) **Practical Benefit**

The results of this study are expected to be able to contribute ideas to teachers for further enhancement and development in the competencies of TPACK in economic learning for 21st Century.

**Teacher Experience**

Teacher experience defines as the teacher's working period (including guidance and counseling) in conducting the responsibility as an educator in particular education notion, which align with the assignment letter from the authorized institution such as government or any community groups of education (Muchlish, 2007). Physical evidence from the condition may be in the form of a decree/legal statement from the authorized institution (Suyatno Z.A, 2008).

Teacher experience of an individual is one of the factors, which determines the succession of education. Teacher who has teaching experience and a long teaching period will have the ability as a high quality teacher. There are notions in measuring the level of work experience; 1) work period, 2) level of knowledge and skills possessed, and 3) mastery of work and equipment (Foster, 2001).

**Training**

Training exposes an activity in the development and elevation the competencies in conducting the responsibility as educators in various level such as the level of sub-district, district/city, provincial, national or international. The physical evidence of this component may be in the form of different types of certificates from training institutions (Suyatno Z.A, 2008). Moreover, Training also defines as one type of learning process to acquire and improve skills, which excluded the HR development system that applies in a short time with methods that prioritize practice than theory (Komaruddin Sastradipoera 2006).

Training benefits teacher in assisting their development and abilities (Armstrong, 2006). Training has a very significant influence on the effectiveness of a school. Training gives teachers the opportunity to gain new knowledge, skills, and attitudes that change their behavior. The changing of behavior may enhance students' learning achievement. Training must be aligned with the needs of teacher regarding the teaching-learning process. Training's organizers must plan every training carefully. It starts from the selection of material, time, place, method, and the quality of instructors (Musfah 2012).

**Self-efficacy**

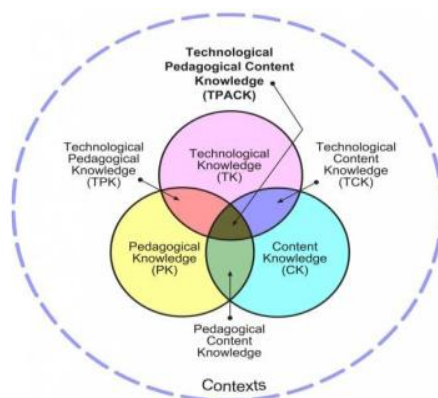
Self efficacy defines as the belief in the ability to possess some form of control over one's own functions and events in the environment. Self-efficacy is also determined on how people feel, think, motivate, and behave (Bandura 1994; Jess Feist & Feist 2010). Self - efficacy as self-perception sees how well the individual could function in certain situations. Self-efficacy relates to the belief the expectation in conducting the activity. Self-efficacy could be obtained, modified, enhanced, or reduced (Alwilsol 2007).

Influencing factors regarding self-efficacy are the experience of mastering some sort of knowledge, social modeling, social persuasion, and physical and emotional conditions. In addition, aspects of self-efficacy are levels, strengths, and generalizations. Individual needs to understand the strategy to be able to improve their own self-efficacy in facilitating the reception of improvement (Bandura 1997).

**Technological Pedagogical and Content Knowledge (TPACK)**

Koehler & Mishra (2009: 62) establish a TPACK framework on the concept of Pedagogical Content Knowledge (PCK) which was first introduced by Shulman through the

inclusion of additional items in the form of Technological Knowledge (TK). Shulman in his article entitled "Those Who Understand: Knowledge Growth in Teaching" explains that the combination of Pedagogical Knowledge (PK) and Content Knowledge (CK) is obligatory to teach, as it is very important to create useful learning for students. Teacher's PCK is formed from two major parts, namely CK which includes knowledge of concepts, theories, ideas, thinking frameworks, and proofing methods and evidence. While, PK is related to teaching methods and processes including knowledge about classroom management, assignments, learning planning, and student learning (Shulman 1986: 9-10; Rosyid, 2016: 448). TPACK has an interrelated slice scheme as what the image below is shown.



**Technological Knowledge (TK)** includes the understanding on how to use computer software and hardware, presentation equipment such as presentation documents, and other form of technologies in the educational context. TK also describes the ability to adapt and learn new technologies and retrieving deeper understanding of the mastery of information technology for information processing, communicating, and problem solving. The existence of the ability needs to be acquired to meet the objective of technology continuous development and changes. For example, the development of computers, which changes constantly from the establishment of Personal Computers (PCs) to notebooks. However, the computer could be used for various pedagogical responsibility such as research, communication, etc. (Koehler & Mishra, 2009: 64; Rosyid, 2016: 450).

**Pedagogical Knowledge (PK)** defines as the teacher's knowledge on methods of the teaching-learning processes and practices. This knowledge includes the understanding on learning process of students, classroom management activities, the role of student motivation, learning plans, and learning assessment. Those are the notions which must be developed by teacher for managing and organizing teaching-learning activities in achieving the expected learning goals (Koehler & Mishra, 2009: 64; Rosyid, 2016: 451).

**Content Knowledge (CK)** is very crucial for teachers. CK refers to the teacher's knowledge about the subject-matter which is expected to be learned or taught. Teacher must recognize and understand the characteristics of the material in the form of concepts, theories, ideas, frameworks, methods that are equipped with scientific methods and their application in the process. CK is different in each level, as an example, the CK in elementary school and junior high school should be different. (Koehler & Mishra, 2009: 63; Rosyid, 2016: 450).

**Technological Content Knowledge (TCK)** defines as the knowledge of reciprocal relationship between technology and content (material). Technology has an impact on what we know and the introduction of new things on how we can describe the content (material) in a different way, which was previously impossible. For example, nowadays, students are able to learn the relationship between geometric shapes and angles by touching and playing

the concept on the monitor screen with their hands on their portable equipment. The similar experience also happens with visual programming software, which allows students to design and create program in their digital games. Technology enables the discovery of new content or a description of content (Rosyid, 2016: 451).

Shulman (1986: 9 – 10) explains the Pedagogical Content Knowledge as effective teaching as it requires more than the separation of content understanding and pedagogy. PCK also recognizes the fact that different content will suit different teaching methods. For example, learning English speaking skills fits more appropriate with a student-centered approach for supporting the meaningful learning. However, the approach may be different for seminar of appreciating art, which is accepted to be delivered by teacher-centered approach. PCK means more than content experts or knowing general pedagogical guidelines, but it also concerns on the mutual influence of content and pedagogy (Koehler & Mishra, 2009: 64; Rosyid, 2016: 451).

**Technological Pedagogical Knowledge (TPK)** identifies the relation between technology and pedagogy. The knowledge makes it possible to understand the use of appropriate technology to achieve pedagogical objectives, as well as enable teachers to choose the most appropriate equipment based on their preference for a particular pedagogical approach. Technology may also provide new methods for teaching that make it easy to be applied in the classroom. For example, the emergence of online learning, which requires teachers to develop appropriate new pedagogical approaches (Rosyid, 2016: 451).

**Technological Pedagogical Content Knowledge (TPCK)** defines as an understanding, which arises from the interaction between content knowledge (material), pedagogy, and technology. It focuses on how technology could be made specifically to be faced with pedagogical needs to teach content (material) that should be appropriate in a particular context. TPACK depicts the basis of effective teaching using technology, understanding the representation of concepts using technology; the application of pedagogical techniques with the use of technology in a constructive way to teach content; knowledge of what makes concepts difficult or easy to learn and how technology may help the improvement of some problems which is faced by students, understand how technology can be used to build the existing knowledge to develop new epistemologies or strengthen old ones (Koehler & Mishra, 2009: 66; Rosyid, 2016: 451).

## **METHOD**

The used method in this research was associative, which used 2 (two) independent variables, 1 (one) dependent variable and 1 (one) mediating variable. This research is an associative study to determine the effect of teacher experience and teacher training towards Technological Pedagogy and Content Knowledge (TPACK) of economics teachers with self-efficacy of Lampung Province year 2019. The population in this study is the economics teachers in Lampung Province. The subjects of this study were 30 teachers, which was chosen randomly.

The variables in this study include the Teacher's Experience and teacher' training variables as independent variables. TPACK roles as the dependent variable. The mediating variables is the self-efficacy. The used data analysis technique in this research is the Path Analysis. Path analysis defines as an extension of multiple linear analysis in estimating the causality of a relationship between variables (Main 2012). Path Analysis investigates the influence of exogenous variables on endogenous variables simultaneously or partially. The process of testing the suitability regarding the model was based on research data and theory. Defining the correlation between variables was conducted through investigating the direct effect, indirect effect, total effect, and the influence of other factors.

## RESULTS AND DISCUSSION

Table 1. Descriptive Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
Teacher Experience	30	3	35	5	13,18
Training	30	77	154	5,13	9,20
Self Efficacy	30	80	125	4,16	10,21
TPACK	30	110	212	5,54	0,31
Valid N (listwise)	30				

Source: Analyzed Data, 2019

Table 1 shows the results of descriptive data analysis of the research sample, which was 30 economics teachers in Lampung Province year 2019. Based on calculations, it could be depicted that the lowest teacher experience period, which was three months acquired by Ms. Laras Nuraini, an economics teacher at SMAS Persada Bandar Lampung. Meanwhile, the highest period of teacher experience was Mrs. Lia Safitri, an economics teacher at SMA Negeri 2 Bandar Lampung, who experienced teaching for 35 years. The results of Table 1 also show that the average teacher experience among economics teacher is 5 years with standard deviation of 13.18.

The lowest number of training is 77 from Muhammad Muhammad Alimi, an economics teacher at SMA Bina Mulya Gading Rejo. On the other hand, the highest number of training ia 154 from Andalas Mulyawan, economics teacher at SMA Negeri 2 Kotabumi. Table 1 also shows the average number of training among economics teachers in Lampung Province is 5.13 with standard deviation of 9.20.

The lowest rate of self-efficacy is 80, which is retrieved by Daniel, an economics teacher at SMA 4 Bandar Lampung. Meanwhile, the highest rate if self-efficacy is 125 by Lia Safitri, an economics teacher at SMA Negeri 2 Bandar Lampung. Table 1 also shows the average of self-efficacy of economic teachers in Lampung Province is 4.16 with standard deviation of 10.21.

The lowest number Technological Pendagogical and Content Knowledge (TPACK) data is 110 by Fairuz Sulthanah, an economics teacher at SMA Negeri 2 Bandar Lampung. On the other hand, the highest number of TPACK is 212 by Faszina Sayyidina, economics teacher at S Persada Badar High School, Lampung. Table 1 also shows the average number of TPACK among economics teachers in Lampung Province is 5.54 with standard deviation of 0.31.

Table 2. The Regression Coefficient. Substructure 1

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1701,711	2	740,350	15,180	,000 <sup>b</sup>
	Residual	1283,004	27	34,223		
	Total	2984,715	29			

Source: Analyzed Data, 2019

The obtained F Test results show the F value of 15,180 with a significance of  $0,000 < 0.05$  (used significance level). The result shows that the experience and training have a simultaneous and significant effect on self-efficacy.

Tabel 3. The Regression Coefficient. Substructure 1

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-136,003	47,067		-3,125	,000
	Teacher experience	51,733	15,204	,460	4,207	,000
	Training	1,044	,744	,215	1,302	,012

Source: Analyzed Data, 2019

1. The Influence of Teacher Experience ( $X_1$ ) towards Self-Efficacy ( $Y_1$ ) for Economics Teacher in Lampung Province Year 2019

Based on Table 3, it could be seen that the significance value is  $0,000 < 0.05$ , then  $H_0$  is rejected. This result shows significant influence between the teacher experience on self-efficacy in economics teachers in Lampung Province year 2019. Beta value of 51,733 shows a positive direction. This value carries meaning that the teacher experience has a positive effect on self-efficacy. If teacher experience of economics teacher in Lampung Province year 2019 is getting longer, self-efficacy will increase too, and vice versa.

2. The Influence of Training ( $X_2$ ) towards Self-efficacy ( $Y_1$ ) for Economics Teacher in Lampung Province Year 2019

Based on table 3, it could be seen that the significance value of training is  $0.012 < 0.05$ , then  $H_0$  is rejected. This result shows that there is a significant influence between training and self-efficacy of economics teachers in Lampung Province year 2019. Beta value of 1.044 shows a positive direction. This value has a meaning that training has a positive effect on self-efficacy. If teachers take more training, the better self-efficacy, and vice versa.

Table 4. The Regression Coefficient. Substructure 2

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	332,043	3	136,574	18,824	,000 <sup>b</sup>
	Residual	181,508	26	6,307		
	Total	524,562	29			

Source: Analyzed Data, 2015

The obtained of F test results shows an F value of 18,824 with a significance of  $0,000 < 0.05$  (used the significance level). It shows that teacher experience, training, and self-efficacy have simultaneous and significant effects on Technological Pedagogical and Content Knowledge (TPACK).

Table 5. The Regression Coefficient. Substructure 2

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-44,387	26,306		-2,013	,042

SIZE	16,060	7,041	,208	2,083	,035
DER	,887	,234	,255	2,782	,007
ROA	,136	,069	,239	2,080	,035

Source: Analyzed Data, 2015

### **The Effect of Teacher Experience (X<sub>1</sub>) towards Technological Pedagogical and Content Knowledge (TPACK) for Economics Teachers in Lampung Province**

Table 5 shows significant value of  $0.035 < 0.05$ . It means that the  $H_0$  is rejected. The result indicates a significant difference between teachers experience with Technology Pedagogical and Content Content (TPACK) of economics teachers in Lampung Province. The beta value of 16,060 indicates a positive interpretation. The value means that the teachers experience shows positive effect towards the Economic Education and Knowledge Pedagogical (TPACK). If the teacher experience shows long period, the Technology Pedagogical and Content Knowledge (TPACK) of economics teachers get better, and vice versa.

### **The Effect of Training (X<sub>2</sub>) towards Technological Pedagogical and Content Knowledge (TPACK) for Economics Teachers in Lampung Province**

Based on the table, it could be interfered if the significance value states  $0.007 < 0.05$ , then  $H_0$  is rejected. The result indicates a significant influence between training and Technological Pedagogical and Content Knowledge (TPACK) of economics teachers in Lampung Province. Beta value of 0.877 shows a positive direction. It means that training has a positive effect on the Technological Pedagogical and Content Knowledge (TPACK) of economics teachers. If there is more training for economics teachers, then Technological Pedagogical and Content Knowledge (TPACK) will increase, and vice versa.

### **The Effect of Self-efficacy (Y<sub>1</sub>) towards Technological Pedagogical and Content Knowledge (TPACK) (Y<sub>2</sub>) for Economics Teachers in Lampung Province**

Based on Table 5, the data shows the significance value of  $0.035 < 0.05$ . It means that the  $H_0$  is rejected. The result means a significant influence between self-efficacy and Technological Pedagogical and Content Knowledge (TPACK) of economic teachers in Lampung Province. Beta value of 0.136 shows a positive direction. It means that self-efficacy has a positive effect on the Technological Pedagogical and Content Knowledge (TPACK) of economics teachers. If self-efficacy of economics teachers is increasing, the Technological Pedagogical and Content Knowledge (TPACK) will increase eventually, and vice versa.

The results of this study indicate that teacher experience has a positive effect on Technological Pedagogical and Content Knowledge (TPACK) based on economics teachers in Lampung Province year 2019. The results of this research support the first hypothesis that teacher experience has a positive effect on Technological Pedagogical and Content Knowledge (TPACK) for economics teachers in Lampung Province year 2019. The positive direction shows that the longer the teacher experience is, the better the Technological Pedagogical and Content Knowledge (TPACK) of the economics teacher, and vice versa. The results of this research align with the results of research, which was conducted by Abell et al 2011.

The results of this study indicate that training has positive effect on Technological Pedagogical and Content Knowledge (TPACK) of economics teachers in Lampung Province



year 2019. The results of this study support the second hypothesis that training has positive effect on Technological Pedagogical and Content Knowledge (TPACK) of economics teachers in Lampung Province year 2019. The positive direction shows that the longer the training takes place, the better the Technological Pedagogical and Content Knowledge (TPACK) of economics teachers, and vice versa. The results of this research are in line with the results of research from Elnaga, A., & Imran, A. 2013.

The results of this study indicate that self-efficacy has a positive effect on Technological Pedagogical and Content Knowledge (TPACK) of economics teachers in Lampung Province year 2019. The results of this study support the third hypothesis, which state that self-efficacy has a positive effect on Technological Pedagogical and Content Knowledge (TPACK) of economics teachers in Lampung Province year 2019. The positive result shows that if self-efficacy is higher, the better the Technological Pedagogical and Content Knowledge (TPACK) of economics teachers, and vice versa. The results of this study are accordance with the results of research from Ariani, D. N. 2015.

The results of this study indicate that teacher experience has a positive and significant effect on self-efficacy of economics teachers in Lampung Province year 2019. The results of this study support the fourth hypothesis, the teacher experience has a positive and significant effect on self-efficacy. The positive result means that the longer teacher experience, the better teacher's self-efficacy, and vice versa.

The results of this study indicate that training has a positive and significant effect on self-efficacy of economics teachers in Lampung Province year 2019. The results of this study support the fifth hypothesis that training has a positive and significant effect on self-efficacy. The positive result means that the more teacher gets training, the better self-efficacy that will be acquired, and vice versa.

The Sobel test results show that self-efficacy could not mediate the effect of the teacher experience on Technological Pedagogical and Content Knowledge (TPACK) on economics teachers in Lampung Province year 2019. The direct effect between teacher experience and Technological Pedagogical and Content Knowledge (TPACK) was greater (0.309) compared to the indirect effect through mediating the influence of self-efficacy towards teacher experince and Technological Pendagogical and Content Knowledge (TPACK). The results from previous tests show significant positive effect between teacher experience and Technological Pedagogical and Content Knowledge (TPACK) of economics teachers, significant positive effect between teacher experience and self-efficacy, and significant positive effect between self-efficacy and Technological Pendagogical and Content Knowledge (TPACK) of economics teachers.

The Sobel test results show that self-efficacy could not mediate the effect of training on Technological Pedagogical and Content Knowledge (TPACK) of economics teachers in Lampung Province year 2019. The direct effect of training on Technological Pedagogical and Content Knowledge (TPACK) of economics teachers was greater (0.309) compared to the indirect effect through mediating self-efficacy of the influence between training and teacher's Technological Pedagogical and Content Knowledge (TPACK). The results of previous tests show significant positive effect between training and Technological Pedagogical and Content Knowledge (TPACK) of economics teachers, significant positive effect between training and self-efficacy, and significant positive effect between self-efficacy and Technological Pedagogical and Content Knowledge (TPACK) of economics teachers.

## CONCLUSION

Based on discussion which has been delivered previously, it could be concluded, as follows Teachers' partial experience has a significant positive effect on Technological Pedagogy and Content Knowledge (TPACK) of economic teachers in Lampung Province. The longer the teacher teaches promotes the better TPACK of the teacher, Training has a partial significant positive effect on TPACK of economics teachers in Lampung Province. The more frequent the training supports the better TPACK of the teacher, Self-efficacy has a partial significant positive effect on TPACK of economics teachers in Lampung Province. The better self-efficacy produces the better TPACK of the teacher, Teacher's Experience has a partial significant positive effect on self-efficacy. The longer the teaching experience makes the better teacher's self efficacy, Training has a partial significant positive effect on self-efficacy. The more often the training, the better the teacher's self-efficacy will be established, Self-efficacy was not able to mediate the influence of teacher experience on TPACK of teachers in Lampung Province and Self-efficacy was not able to mediate the effect of training on TPACK of teachers in Lampung Province in 2019.

Suggestions which may be able to be delivered based on the research results, as follows Teacher and The Educational Department of Lampung. Economics teachers in Lampung Province and The Educational Department of Lampung Province are advised to pay more attention to the teacher's experience, training, and self-efficacy. those three concerns need to be promoted in improving TPACK. And future Researchers. This research is limited to the examination of variables to the teacher's experience, training, self-efficacy and TPACK. It is expected that further researches are able to examine other variables, which affect the TPACK of teachers.

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