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Profile of Technological Pedagogical Content Knowledge (TPACK) on Pre-Service Teachers in Higher Education

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Abstrak:

This research aims to determine the Technological Pedagogical Content Knowledge (TPACK) profile of pre-service teachers at the Economics Education Study Program at Jenderal Soedirman University. The research approach used is quantitative with a survey research design type. The population is 3rd, 5th, and 7th-semester students and the sample is 111. To measure TPACK, 50 statements have been prepared based on the indicators of each TPACK component and are declared valid and reliable. Data were analyzed using descriptive statistics. The research results show that the seven components of TPACK are classified as good, two components are more prominent, namely TK and TCK, while the lowest component is CK. These results provide input that in the lecture process there needs to be emphasis on mastering the material and integrating technology into learning.

Keywords: TPACK; Pre-service Teacher; Higher Education

INTRODUCTION

In order to secure a country's existence and progress, education is the most crucial source of quality human resources (HR). The better the education, the more reliable the human resources' abilities will be. Higher education is expected to produce skilled workers to meet society's demand for skilled workers. Apart from that, higher education is expected to produce professional graduates as pillars of the nation's future in carrying out educational development. One of the professional workers produced by higher education is professional workers in the field of education. Producing professional teachers must adapt to the demands and dynamics of social, economic, cultural life and advances in science and technology of the 21st century.

To be able to educate students who meet the demands of 21st century skills in the era of society 5.0, teachers must have good skills in terms of using technology, mastering concepts and delivering material. The ability of teachers in the use of technology has a positive impact on the use of learning media. Learning media is useful for attracting students' interest in the learning material presented, thus increasing students' understanding of the material presented, thus increasing students' enthusiasm for learning (Ainiyah, 2023). The combination of these abilities is known as Technological Pedagogical Content Knowledge or often abbreviated as TPACK. TPACK development began with Pedagogical Content Knowledge (PCK) which was first introduced by Shulman (1986) in the mid-1980s with relatively limited reach and resources. Based on Shulman's ideas regarding PCK, Mishra, P., & Koehler, M. J. (2006) added technology items to PCK, and described TPACK as an integration of content knowledge, pedagogy, and technology. TPACK is a connection and intersection of content, pedagogy and technology.

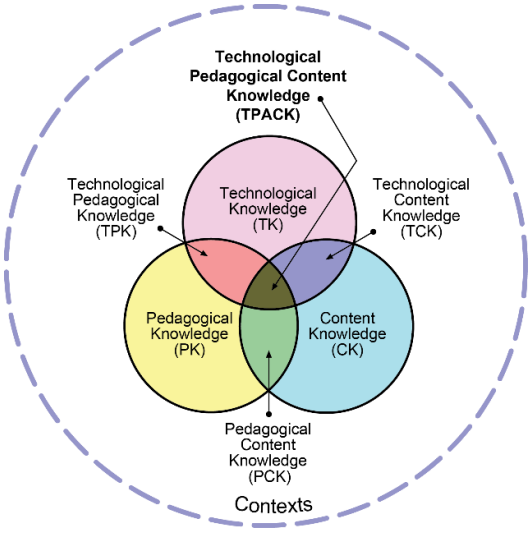

Figure 1. Pedagogical Content Knowledge technological framework (Koehler, 2011)

TPACK is the basis of good teaching with technology and requires an understanding of concept representation using technology; pedagogical techniques that use technology in constructive ways to teach content; knowledge about what makes concepts difficult or easy to learn and how technology can help fix some of the problems students face; knowledge of students' previous knowledge and epistemological theories; and knowledge about how technology can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones. Mishler and Koehler (2006) developed a TPACK model as an epistemic framework to describe teachers' knowledge of technology integration across disciplines.

The three fundamental knowledge sources that make up TPACK are technological knowledge, pedagogical knowledge, and content knowledge. However, how teachers connect these to create the intermediary knowledge forms of technological content knowledge (TCK), technological pedagogical knowledge (TPK), and pedagogical content knowledge also has an impact on TPACK (Abad-Segura et al., 2020). Technology advancement and instruction should go hand in hand (Lisa et al., 2021), and teachers must be able to integrate knowledge of technology with pedagogical and content knowledge (Tan et al., 2023). Prior research has highlighted the significance of digital competences in motivating and preparing educators from the outset to become proficient in maximizing the use of technology in the classroom (Brevik et al., 2019; Ulayyah & Rosy, 2022).

The first step to forming a teacher's TPACK is to start at an institution that has a program to produce teacher candidates because teacher educators' technology competencies maybe related to their academic disciplines and their experience levels (Carpenter et al., 2020). Jenderal Soedirman University is one of the Higher Education Institutions that produces teacher who is committed to producing quality graduates. So far, information about Economic Education students' TPACK has not been well identified. Information is only obtained through related courses and does not measure the integration process as a whole. Because of the importance of TPACK for prospective economics teacher students, it is necessary to carry out a study for it. On this basis, researchers want to conduct a study to identify the TPACK profile of prospective pre service teacher in higher education.

METHODS

This research uses descriptive research methods and survey research. According to Sugiyono (2018) the descriptive method is research used to study the value of independent variables, either one or more variables (independent), without making comparisons/

relationships with other variables. This study was conducted amongst pre-service economic education teachers enrolled in Economic Study Program at Jenderal Soedirman University, Indonesia. The population in this study was 142 students for the classes of 2020, 2021 and 2022. The sample size was determined using the G*Power application version 3.1.9.7 and the results were 111 students as samples in this study.

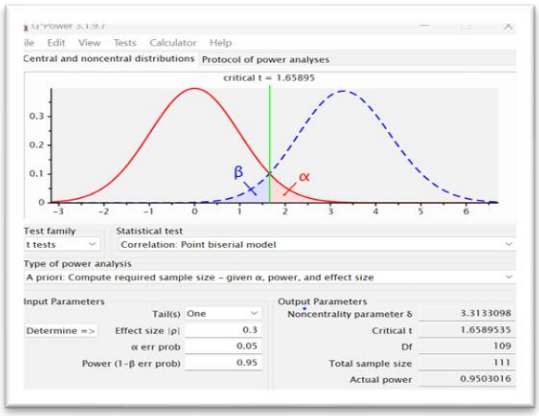

Figure 2. Total sample measurement results using G*Power

Standardized self-report rating scales, open-ended surveys, interviews, and performance assessments—which might be in the form of assessments of actual instruction, lesson plans, or assessments of standardized tests—are some of the methods used to measure TPACK (Su & Foulger, 2019; Willermark, 2018). This research uses the self-report method and is currently one of the most frequently used approaches because it appears to be an easy and cost-effective way to collect quantitative data (Miguel-Revilla et al., 2020; Schmid et al., 2020; Valtonen et al., 2017). The questionnaire was adopted from a questionnaire developed by Schmid et al (2020). This questionnaire measures all seven dimensions validity and reliability (see Table 1).

Table 1 Descriptive statistics of TPACK.xs items and subscale validity

Item		M	SD	Pearson Correlation
TK1	I know how to solve technical problems that occur on my own computer/laptop	3.405	.9083	.608
TK2	I can learn various technologies easily	3.874	.7022	.665
TK3	I keep up to date with new technologies that are important to me	4.171	.6449	.658
TK4	I often tinker with technological devices to find out more	3.486	.9132	.517
TK5	I know many different types of computer/laptop technology	3.180	.8862	.625
TK6	I know various computer/laptop hardware (example: mother-board, RAM) and their functions	3.243	.9650	.599
TK7	I know various computer/laptop software (example: Windows, Media Player) and their functions	3.793	.8646	.765

TK8	I know how to use word processing programs (example: Microsoft Word)	4.243	.7163	.781
TK9	I know how to use column processing programs (example: Microsoft Excel)	4.054	.8403	.701
TK10	I know how to use presentation presentation programs (example: Microsoft PowerPoint)	4.297	.7335	.815
TK11	I know how to use image processing programs (example: Adobe Photoshop)	3.063	1.0382	.510
TK12	I know how to use communication applications on the internet (example: Email)	4.423	.6113	.714
TK13	I know how to use social media applications on the internet (example: Facebook, Instagram)	4.604	.5095	.540
TK14	I can store data in digital form (example: CD, DVD, Flash Disk)	4.252	.7320	.765
TK15	I can save and change data in various formats (example: convert MS.Word files to PDF)	4.586	.5636	.616
TK16	I can use printers, projectors, scanners and digital cameras.	4.225	.7590	.760
	TK subscale	**3.931**	**.7743**	
PK1	I know how to plan learning in class	3.748	.7801	.871
PK2	I know the general procedures for implementing learning in class	3.838	.7925	.835
PK3	I know how to organize and manage a class	3.739	.7712	.898
PK4	I can adapt my teaching style to students who have different characters	3.631	.7854	.801
PK5	I can adjust my learning process based on what students already understand and don't understand	3.739	.7712	.784
PK6	I can use various models, approaches, strategies, methods, media, techniques and learning tactics in class	3.550	.8283	.845
PK7	can find out students' misconceptions about a concept or material	3.423	.8040	.774
PK8	I can assess student learning using various types of assessments	3.649	.7937	.756
	PK subscale	**3.664**	**0.791**	
CK1	I have good knowledge of economic material	3.640	.6149	.752
CK2	I have various ways and strategies to develop my understanding of Economics material	3.721	.6898	.804
CK3	I can use social science thinking	3.820	.7769	.754
CK4	I follow scientific developments and the latest issues in the economic field	3.577	.7574	.745
CK5	I know prominent economic scientists in Indonesia	3.279	.8546	.775
CK6	I follow the development of the latest books on Economics material	3.171	.8515	.879
CK7	I take part in seminars or similar activities with an economic theme	3.622	.7634	.572
	CK subscale	**3.547**	**0.758**	
TCK1	I know various technologies that I can use to study Economics material	3.586	.9092	.845
TCK2	I can use certain computer/laptop applications to make it easier for me to understand economic material	3.631	.8194	.839

TCK3	I can use a computer/laptop well to develop (compose papers and make presentation slides) Economics material	3.505	.8076	.861
TCK4	I use technology in the form of the internet as a learning resource to search for Economics material	3.577	.8372	.914
TCK5	I use communication technology such as WhatsApp, BBM, Line, and others to discuss Economics material with colleagues	3.532	.8182	.844
TCK6	use social media such as Facebook, Instagram, Twitter, blogs, and others to post and express my understanding of Economics material	3.865	.8032	.835
TCK7	I use social media such as Facebook, Twitter, Linked-in, and others to connect with leading economic scientists in Indonesia	3.739	.8709	.808
	TCK subscale	**3.633**	**0.838**	
TPK1	I can choose technology that can improve learning strategies in the classroom	3.748	.7683	.856
TPK2	I think more deeply about how technology can impact the learning strategies I use in the classroom	4.063	.6912	.801
TPK3	I can choose technology that can increase student interest during the learning process in class	4.216	.6929	.769
TPK4	I think critically about how to use technology in classroom learning	4.270	.6459	.760
TPK5	I can adapt the use of technology to various learning activities in class	4.297	.6687	.812
TPK6	I can choose technology that can be used to improve learning outcomes in the classroom	3.847	.8655	.836
TPK7	I can help other teachers to use technology in classroom learning	3.505	.9618	.748
	TPK subscale	**3.992**	**0.756**	
TPACK1	can use the right technology in appropriate learning strategies to deliver economic material effectively in the classroom	3.820	.7032	.799
TPACK2	I can choose the right technology to improve students' understanding of the economic material that I teach using certain learning strategies in the classroom	3.739	.7225	.899
TPACK3	I can choose the right technology to assess student learning outcomes in the economics subjects that I teach using certain learning strategies in the classroom	3.811	.6254	.874
TPACK4	I can carry out good learning by combining the use of appropriate technology and appropriate learning strategies in economics subjects in the classroom	3.667	.7548	.830
TPACK5	I can help other teachers to use the right technology in learning strategies that suit certain economic material in classroom learning	3.820	.6902	.811
	TPACK subscale	**3.766**	**.7001**	

In the validation test, the total correlation value (pearson correlation) of the modified items is also called r count, and the decisions in the validation test are based on the following decision criteria: 1) If r count > r table, the questionnaire is valid, 2) If r count < r table, then

the questionnaire is in-valid, 3) r table for one-way test with a sample of 111 respondents = 0.1555.

Based on table 1, r count > r table. So, it can be concluded that of the 50 statement items that were developed/compiled, all statement items were declared valid. The validation validity test using IBM SPSS Statistics Version 22.0. The reliability is calculated using the Cronbach Alpha coefficient with the help of SPSS. The reliability results for the entire TPACK measurement instrument obtained were more than 0.60. The weight scale for the competency questionnaire is presented in Table 2.

Table 2. The weight scale for the competency questionnaire

Category	Score
Strongly agree	5
Agree	4
Undecided	3
Disagree	2
Strongly disagree	1

(Morrisan, 2015)

Data processing and analysis uses descriptive statistics, namely determining the percentage of student responses for each question. Apart from that, the average and standard deviation of each variable from TPACK were also calculated. Next, data analysis was also carried out by categorizing student scores for each TPACK variable into low, medium and high levels.

Table 3. TPACK Score Grouping Criteria

No.	Value Interval (mean value)	Criteria
1.	> 4,20 – 5,00	very good
2.	> 3,40 – 4,20	good
3.	> 2,60 – 3,40	enough
4.	> 1,80 – 2,60	not enough
5.	1,00 – 1,80	very less

RESULTS AND DISCUSSION

The TPACK instrument was distributed to 111 pre-service teachers in Jenderal Soedirman University in the 3rd, 5th and 7th semester of the Economics Education Study Program. The data from the filling in is then analyzed to see the profile of prospective economics teachers in each TPACK component. Table 4 reveals that there were 12 male respondents (10.8% of the total), and 99 female respondents (89.2% of the total). This indicates that women made up the majority of responders. Of the 58 respondents, or 52.3% of the total, the majority were between the ages of 20 and 21. The majority of respondents had never taken IT training, according to IT training data.

Table 4. Respondent Characteristics

Characteristics	Criteria	Number (respondent)	Percentage (%)
Gender	Male	12	10.8
	Female	99	89.2
Age (years)	< 20	49	44.1
	20 – 21	58	52.3
	22 - 23	4	3.6
IT Training	Yes	9	8.1
	No	102	91.9

The statistical measurement of the research outcome data was commonly described using descriptive statistics analysis. The results of the descriptive statistics analysis on the TPACK pre-service teachers' profile are summarized in Table 5.

Table 5. The results of the descriptive statistics analysis on the TPACK pre-service teachers'

No	Indikator	Mean	SD	Kriteria
1	Technological Knowledge (TK)	3.931	.7743	Good
2	Pedagogical Knowledge (PK)	3.664	.791	Good
3	Content Knowledge (CK)	3.547	.758	Good
4	Pedagogical Content Knowledge (PCK)	3.633	.838	Good
5	Technological Content Knowledge (TCK)	3.992	.756	Good
6	Technological Pedagogical Knowledge (TPK)	3.777	.709	Good
7	Technological Pedagogical and Content Knowledge (TPACK)	3.733	.724	Good

The research results as presented in table 5 show that in general their abilities are in the components of Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical and Content Knowledge (TPACK) are good. This indicates that mastery of technology, content, technology-content, and technology-pedagogy, as well as technology-pedagogy-content is good. Of the total seven components that make up TPACK, there are two components that have the highest average value, namely technological knowledge and Technological Content Knowledge (TCK). The component with the lowest average value is Content knowledge (CK).

These results show the relationship between components, where when TK is high it will influence TCK and TPK which are also high. If these abilities cannot be mastered, then integrating them into learning will also be difficult. The effect of this lack of CK mastery is that the material received by students is not optimal and, furthermore, it can have the effect of creating misconceptions or wrong concepts. A conceptual error is a very fatal mistake. Research results show that errors or lack of understanding of concepts will result in students failing to solve problems or students will make mistakes in answering questions (Alqurashi et al., 2017).

However, on the other hand, the average score for TCK includes the 2 highest components even though the CK score is among the lowest. This indicates that prospective

teachers are able to integrate technology with various economic materials even though their content abilities are still relatively lower than other abilities.

CONCLUSION

TPACK is an important skill for prospective teachers as future teachers, especially in the era of society 5.0 and also as a requirement for 21st century learning. The TPACK profile of prospective economics teacher students in the economics education study program, Jenderal Soedirman University is at a good level. In detail, of the seven TPACK components, there are two components that are more prominent, namely Technological Knowledge (TK) and Technological Content Knowledge (TCK). Meanwhile, the lowest component is Content Knowledge (CK).

It is hoped that these results will be a consideration for study programs and lecturers to be able to design learning processes in several courses to support TPACK which is oriented towards learning in the era of society 5.0 and 21st century skills. For future research, research can be carried out not only limited to the (theoretical) knowledge of prospective pre-service teacher regarding TPACK but also examine their ability to apply TPACK in learning, for example in microteaching courses or in implementing Field Experience Practices (PPL)/Educational Internships. Future research can also develop self-assessment instruments for economics pre-service teachers so that the assessments carried out can more precisely measure the TPACK of prospective economics teachers.

REFFERENCES

Abad-Segura, E., González-Zamar, M. D., Luque-de la Rosa, A., & Cevallos, M. B. M. (2020). Sustainability of educational technologies: An approach to augmented reality research. *Sustainability (Switzerland)*, *12*(10). https://doi.org/10.3390/su12104091

Ainiyah, N. (2023). *The Use of Quizizz: Classroom Action Research on Financial Transaction Materials*. https://ejournal.unesa.ac.id/index.php/joa

Alqurashi, E., Gokbel, E. N., & Carbonara, D. (2017). Teachers' knowledge in content, pedagogy and technology integration: A comparative analysis between teachers in Saudi Arabia and United States. *British Journal of Educational Technology*, *48*(6), 1414–1426. https://doi.org/10.1111/bjet.12514

Brevik, L. M., Gudmundsdottir, G. B., Lund, A., & Strømme, T. A. (2019). Transformative agency in teacher education: Fostering professional digital competence. *Teaching and Teacher Education*, *86*. https://doi.org/10.1016/j.tate.2019.07.005

Carpenter, J. P., Rosenberg, J. M., Dousay, T. A., Romero-Hall, E., Trust, T., Kessler, A., Phillips, M., Morrison, S. A., Fischer, C., & Krutka, D. G. (2020). What should teacher

educators know about technology? Perspectives and self-assessments. *Teaching and Teacher Education*, *95*, 103124. https://doi.org/10.1016/j.tate.2020.103124

Koehler. (2011, May 11). *http://tpack.org/*.

Lisa, A., Faridi, A., Bharati, D. A. L., & Saleh, M. (2021). A TPACK-in Practice Model for Enhancing EFL Students' Readiness to Teach with Ed-Tech Apps. In *International Journal of Interactive Mobile Technologies* (Vol. 15, Issue 17, pp. 156–176). researchgate.net. https://doi.org/10.3991/ijim.v15i17.23465

Miguel-Revilla, D., Martínez-Ferreira, J. M., & Sánchez-Agustí, M. (2020). Assessing the digital competence of educators in social studies: An analysis in initial teacher training using the TPACK-21 model. *Australasian Journal of Educational Technology*, *36*(2), 1–12. https://doi.org/10.14742/ajet.5281

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record*, *108*(6), 1017–1054.

Morrisan. (2015). *Metode Penelitian Survei*. Prenada Media Group.

Schmid, M., Brianza, E., & Petko, D. (2020). Developing a short assessment instrument for Technological Pedagogical Content Knowledge (TPACK.xs) and comparing the factor structure of an integrative and a transformative model. *Computers and Education*, *157*. https://doi.org/10.1016/j.compedu.2020.103967

Shulman, L. S. (1986). Definición de cómputo - Qué es, Significado y Concepto. *American Educational Research Association Is Collaborating with JSTOR to Digitize, Preserve and Extend Access to Educational Researcher.*, *15*(2), 1. https://definicion.de/computo/

Su, M., & Foulger, T. (2019, March). We aren't there yet: A progression of literature on TPACK measures to assess technology integration. *Society for Information Technology & Teacher Education International Conference (2019) 2534-2542*.

Sugiyono. (2018). *Metode Penelitian Kuantitatif, Kualitatig, dan R&D*. Alfabeta.

Tan, L., Thomson, R., Koh, J. H. L., & Chik, A. (2023). Teaching multimodal literacies with digital technologies and augmented reality: a cluster analysis of Australian teachers' TPACK. In *Sustainability*. mdpi.com. https://www.mdpi.com/2071-1050/15/13/10190

Ulayyah, & Rosy, B. (2022). *Pengaruh Penggunaan Media Pembelajaran E-Learning terhadap Motivasi Belajar Mahasiswa Pendidikan Administrasi Perkantoran Universitas Negeri Surabaya Ulayyah*. https://ejournal.unesa.ac.id/index.php/joa

Valtonen, T., Sointu, E., Kukkonen, J., Kontkanen, S., Lambert, M. C., & Mäkitalo-Siegl, K. (2017). TPACK updated to measure pre-service teachers' twenty-first century skills. In *Australasian Journal of Educational Technology* (Issue 3).

Willermark, S. (2018). Technological pedagogical and content knowledge: A review of empirical studies published from 2011 to 2016. *Journal of Educational Computing Research*. https://doi.org/10.1177/0735633117713114