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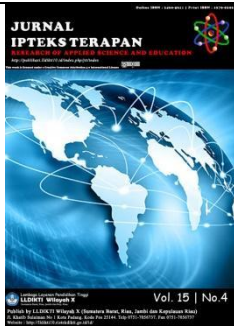
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# CHANGING THE PARADIGM OF SCIENTIFIC WRITING IS DIFFICULT WITH THE TPACK LEARNING FRAMEWORK

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## Abstract

In the era of digital society 5.0, it offers much technology to help students write. However, the available technology will not be used by students if it has not been introduced and taught to use technology that can be used in writing scientific papers. Lecturers can use the TPACK learning framework to teach and train students to write scientific papers. This research belongs to survey research. This study looked at the responses of 40 students taught using technology in applications or recommended websites to facilitate writing scientific papers. The research instrument is in the form of a questionnaire that includes the four components of TPACK based on the recommended technology. The findings showed that the TPACK learning framework could change students' mindsets in writing scientific papers to be easier and more enjoyable. After introducing and teaching techniques with the stages of the TPACK learning framework that can be utilized, students are interested and find it helpful in finding the latest research ideas/topics with many easily accessible references: Publish or Perish, paraphrasing citations from articles to avoid plagiarism: Smoodin, improving writing and grammar: google document and using the reference manager application to help create an automated bibliography: Mendeley.

**Keywords:** TPACK, scientific writing, survey, applications

## INTRODUCTION

Writing is a difficult skill to master for some learners (Fareed et al., 2016). That is the paradigm that is embedded in students' minds when faced with the task of writing scientific papers (Harris & Graham, 1994; Laidlaw, 2005). It is undeniable that writing scientific papers requires good basic skills so that the scientific works produced are in high quality (Husin & Nurbayani, 2017; O'leary, 2017). In addition, students must recognize the characteristics of scientific works by reading a lot. Reading scientific papers in journal articles is highly recommended to build students' critical thinking patterns (Fang, 2006; Schafersman, 1991). The practice of writing scientific papers also must be carried out continuously in order to improve the quality of the scientific papers produced.

In the digital era of Society 5.0, there are many technologies (Yamada, 2021) that can be used to assist students in writing scientific papers (Farikah & Al Firdaus, 2020; Parsons, 2020; Wafiroh et al., 2021). Unfortunately, the available technology is not yet known by students. Introducing technology that can help students is highly recommended in learning scientific papers. Teaching writing scientific papers by utilizing technology can be done with the Technological Pedagogical Content Knowledge (TPACK) learning framework (Ersanli, 2016). The TPACK learning framework is widely used as research material to teach science material (Guzey & Roehrig, 2009; Srisawasdi, 2014) or social (Ersanli, 2016; Tseng, 2016) by utilizing technology that supports the material being taught.

The development of modern technology creates new obstacles in many fields, including education (Rubens et al., 2017). Using new or creative technology in education is one of the difficulties for some educators regarding use, networking, and other things (Ertmer, 1999). However, adopting technology alone will not meet

the students' needs. The ability of lecturers to integrate technology into their teaching process can help students maximize their potential.

The TPACK technology integration model examines educators' knowledge of technology as a pedagogical instrument in the teaching and learning process. TPACK is all about effective teaching with technology. It includes knowing what makes learning easy or difficult, pedagogical strategies, and how technology can help students. According to TPACK's research findings, the frameworks can be considered as the part of effective teaching. The framework brings together three areas of knowledge — technology, pedagogy, and content — into a single unit. The TPACK learning framework used by lecturers in teaching writing material for scientific papers at Asahan University was conducted in this research. To assess the use of the TPACK learning framework, this study examines the all components in TPACK learning framework.

Having technological literacy recommended in finding the latest research ideas/topics with many easily accessible references: Publish or Perish, paraphrasing citations from articles to avoid plagiarism: smoodin and spinner id, improving writing and grammar: google document, and using the reference manager application to help create an automated bibliography such as Mendeley facilitate the creation of learning models using the TPACK model. In this study, technological knowledge (TK), content knowledge (CK), pedagogical knowledge (PK), and combined knowledge (TK) were assessed. Pedagogical, Content (TPACK) (Ammade et al., 2020).

Aiming to improve student learning outcomes, this study seeks to understand better the relationship and interaction between content knowledge (the subject matter to be taught), technology knowledge (computers, Internet, digital video), and pedagogical knowledge

(practices). The data were collected through administering questionnaire. Further research is required to determine whether the survey results support the TPACK frameworks in these seven aspects. By using survey data, this study evaluates the TPACK learning framework (Archambault & Barnett, 2010).

## RESEARCH METHODS

Descriptive research utilizing a closed questionnaire. We employed a questionnaire to assess 4 (seven) TPACK domains, 1) technological knowledge; 2) pedagogical knowledge; 3) content knowledge; 4) technological pedagogical knowledge; 5) technological content knowledge; 6) pedagogical content knowledge; and 7) technological pedagogical content knowledge. The study was conducted at Asahan University with 40 participants. Forty students in this descriptive study are trained to write scientific articles utilizing technology.

## RESULTS AND DISCUSSION

The TPACK (Technological Pedagogical Content Knowledge) learning framework integrates technology and specialized applications (content) in learning. This learning incorporates seven related knowledge domains, including:

First, Pedagogical Knowledge. It is a conceptual framework learning model that explains systematic procedures in organizing learning experiences to meet specified learning objectives (Tian & Arief, 2014). This pedagogical knowledge follows the Republic of Indonesia Law No. 14 of 2005 about Teachers and Lecturers. A teacher's pedagogical competency includes comprehending pupils, planning, implementing, evaluating, and realizing their potential, according to Government Regulation No. 19 of 2005.

Second, Content Knowledge. It is information about the subjects being

studied or taught. According to TPACK's research findings, the topic matter comprises concepts, theories, ideas, frameworks, scientific procedures, and everyday application. Content knowledge is knowledge about the subject matter. Material knowledge is a must-know lesson for (Mishra, P. & Koehler, 2006). (Shulman, 2006) Practices and ways to build content knowledge are included in adding content knowledge.

The third type of knowledge is technological pedagogy. It is about how various technologies can be used in education and how this might transform the way teachers teach (Schmidt et al., 2009).

Technology-inappropriate instructional practices and design are included in this expertise (Sahin, 2011).

Fifth, Technological Content Knowledge. It is about how to link technology and content reciprocally. Technological knowledge can be used as a representative model for specific content (Schmidt et al., 2009). TCK is knowledge about the interrelationship between technology and content (Koehler et al., 2014). Sixth, Pedagogical Content Knowledge as a parameter to determine what teaching approach is appropriate to the content and how content elements can be arranged for better teaching. This means pedagogical knowledge applies to teaching specific content. This knowledge is also to determine what teaching approaches are appropriate to the content and how content elements can be arranged for better teaching (Mishra, P. & Koehler, 2006).

Seventh, Technological Pedagogical Content Knowledge (TPCK) is a conceptual framework that shows the relationship between three pieces of knowledge that must be mastered by teachers, namely technology, pedagogy, and content. This TPCK needs to be mastered by lecturers so that learning activities can run effectively and efficiently. Lecturers are expected to have a reliable understanding of the complex

interactions between the three essential components of knowledge, namely PK, CK, and TK, by teaching certain materials using appropriate pedagogic methods and technology (Schmidt et al., 2009). TPACK has advantages over the previous concept, namely PCK. Among them are preparing instructional designs, learning models and strategies, assessment systems, and designing curriculums, all of which are integrated with information and communication technology.

Research has been conducted to obtain information about understanding the relationship and interaction between content knowledge (subject matter to be taught), technological knowledge (computers, Internet, digital video, etc.), and pedagogical knowledge (practices, processes, strategies, procedures, and teaching and learning methods), in order to improve the results of student writing. The results of the study are presented in the following description.

Table 1. Student Perception Interval

No	Category	Interval
1	Very high	89
2	High	72-88
3	Middle	55-71
4	Low	38-54
5	Very low	37

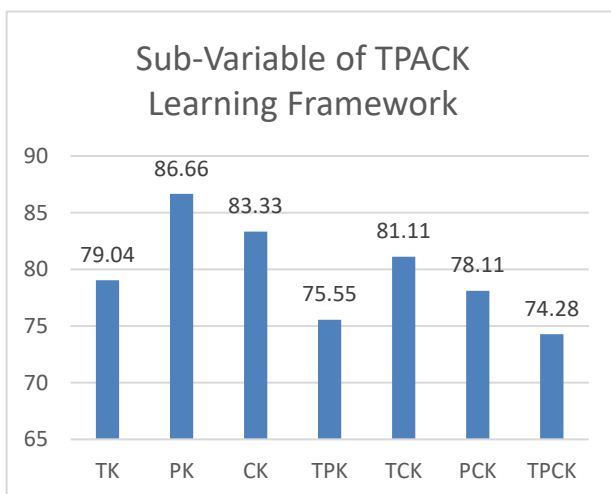


Figure 1. Learning Framework

Where:

- TK : Technological Knowledge
- PK : Pedagogical Knowledge

CK : Content Knowledge

TPK : Technological Pedagogical Knowledge

TCK : Technological Content Knowledge

PCK : Pedagogical Content Knowledge

TPCK : Technological Pedagogical Content Knowledge

Based on the graph above, it can be seen that students' perceptions can be categorized into high category with a percentage of 79.72%. It indicated that the TPACK learning framework as a whole can change the student paradigm that writing scientific papers can be easier and more enjoyable. This can be seen from the results of each related aspect in the components of the TPACK learning framework. In general, the results of the TPACK learning framework are in the high category; namely, the technological knowledge domain has a percentage of 79.04%, then the pedagogical knowledge domain has a percentage of 86.66%, content knowledge has a percentage of 83.33%, technological pedagogical knowledge has a percentage of 75.55%, technological content knowledge with the percentage of 81.11%, pedagogical content knowledge with the percentage of 78.11%, and technological pedagogical content knowledge has a percentage of 74.28%,

Based on the sub-variables of the TPACK learning framework, it can be concluded that the Pedagogical Knowledge domain has a higher percentage than the other sub-variables, which means that students can learn independently, can plan activities to support writing scientific papers more quickly, can find research topics from references with the help of technology, which is easily accessible (Publish or Perish), able to avoid plagiarism of other people's writings with the help of applications such as Smoodin or Spinner, able to improve written work with the help of Google Docs, and able to cite other people's writings effectively and



efficiently from reference applications manager such as the Mendeley application.

## CONCLUSION

The findings showed that the TPACK learning framework can change students' mindsets in writing scientific papers to be easier and more enjoyable. After introducing and teaching techniques with the stages of the TPACK learning framework that can be utilized, students are interested and find it helpful in finding the latest research ideas/topics with many easily accessible references: Publish or Perish, paraphrasing citations from articles to avoid plagiarism: smoodin and spinner id, improving writing and grammar: google document and using the reference manager application to help create an automated bibliography such as Mendeley.

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