

**OVERVIEW OF RESEARCH ON THE TPACK MODEL IN VIETNAM THROUGH BIBLIOMETRIC ANALYSIS; APPLICABILITY OF TPACK IN VIETNAMESE EDUCATION, CHALLENGES - OPPORTUNITIES – SOLUTIONS**

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**Abstract**

The TPACK (Technological Pedagogical Content Knowledge) model helps teachers better understand the relationship between technology, teaching methods, and subject content. Developed by Punya Mishra and Matthew J. Koehler in 2006, TPACK has expanded Shulman's PCK (Pedagogical Content Knowledge) model to include more technology, and TPACK has become an important theoretical framework in the context of digital transformation in education. This paper provides an overview of the research situation related to the TPACK model in Vietnam through bibliometric analysis. The article uses the Google Scholar academic database to search and collect published documents using the keyword "Mô hình TPACK" and "Khung TPACK", studies in Vietnamese and researched in Vietnam. To not miss any documents, the team of authors also used Harzing's Publish or Perish software to conduct a search from Google Scholar data sources according to the keyword "Khung TPACK" in the period from 2005 to 2024. Thereby, evaluating the development and impact of the TPACK model in the field of education in Vietnam. At the same time, the article also discusses the challenges faced by educators and educational institutions when applying TPACK in practice, as well as possible opportunities and solutions to overcome these difficulties, to improve the effectiveness of teaching and learning in the modern context.

**Keywords:** TPACK, education, bibliographic analysis.

## I. INTRODUCTION

### 1. TPACK model, overview of the research situation in the world and Vietnam

TPACK stands for Technological Pedagogical Content Knowledge. This model was created to assist teachers in comprehending the interplay between technology, teaching strategies, and subject matter. It was developed by Punya Mishra and Matthew J. Koehler in 2006, and it expands upon Shulman's PCK (Pedagogical Content Knowledge) model by incorporating technology, which has become a crucial component in contemporary education.

TPACK not only helps teachers integrate technology into teaching effectively, but also helps improve the quality of teaching and learning. The TPACK model helps teachers better understand the complexity and interaction between technology, content, and pedagogy. It emphasizes that in order to use technology effectively in teaching, teachers need to develop knowledge and skills in all three areas and understand how they interact with each other. The TPACK model also encourages innovation in teaching and facilitates the development of new and more effective teaching methods.

Since its introduction in 2006, the TPACK framework has been the subject of over 1,600 empirical studies. This framework has proven to be a valuable tool for teachers looking to effectively incorporate technology into their teaching by combining their knowledge of technology, pedagogy, and content. According to data from Scopus, the United States has made the largest contribution to TPACK research, followed by Turkey, Australia, Singapore, and Taiwan. This demonstrates a widespread interest and investment in enhancing the integration of technology in education globally.

In Vietnam, research and application of TPACK began in the early 2010s. Some key milestones include from 2010 to 2015, universities and research institutes introduced the TPACK concept through scientific conferences and papers. The initial studies focused on understanding and applying the TPACK theoretical framework in education. From 2015 to 2020, TPACK was more widely implemented, with pedagogical universities and educational institutions incorporating the framework into teacher training. The integration of technology into teaching became a topic of interest in the development of teacher training programs. From 2020 to the present, the development of technology and the demand for online learning due to the COVID-19 pandemic have greatly accelerated the application of TPACK and technology in teaching. Recent studies have focused on evaluating the effectiveness of technology in teaching and improving teachers' TPACK competencies. Despite some limitations, it can be said that TPACK research in Vietnam has been developing for over a decade, with increasing interest and investment from educational institutions and researchers.

In order to effectively research and apply the TPACK framework in education in Vietnam, there are several key steps that researchers should follow. Firstly, it is important to assess the current state of research on TPACK in education in Vietnam. This will help to identify any gaps or areas of need that should be addressed. Secondly, researchers should carefully design their studies, focusing on key aspects such as selecting appropriate research methods, choosing the target audience for the research, and developing effective measurement tools. It is also crucial to collect diverse and representative data from schools, education centres, and related organizations. Once the data has been collected, it should be analysed using appropriate methods to identify factors that affect TPACK and the relationships between its components. Based on the research findings, recommendations and strategies should be developed to improve TPACK capacity for teachers and education administrators in Vietnam. These recommendations and strategies can then be shared through workshops and training courses, as well as through publications in scientific journals and presentations to the educational community. It is also important to establish an ongoing monitoring and evaluation system to ensure that the strategies and recommendations are effectively implemented and continuously improved. By following these steps, research on TPACK in Vietnam can be comprehensive and have a significant impact on the education system.

### 2. Bibliographic research

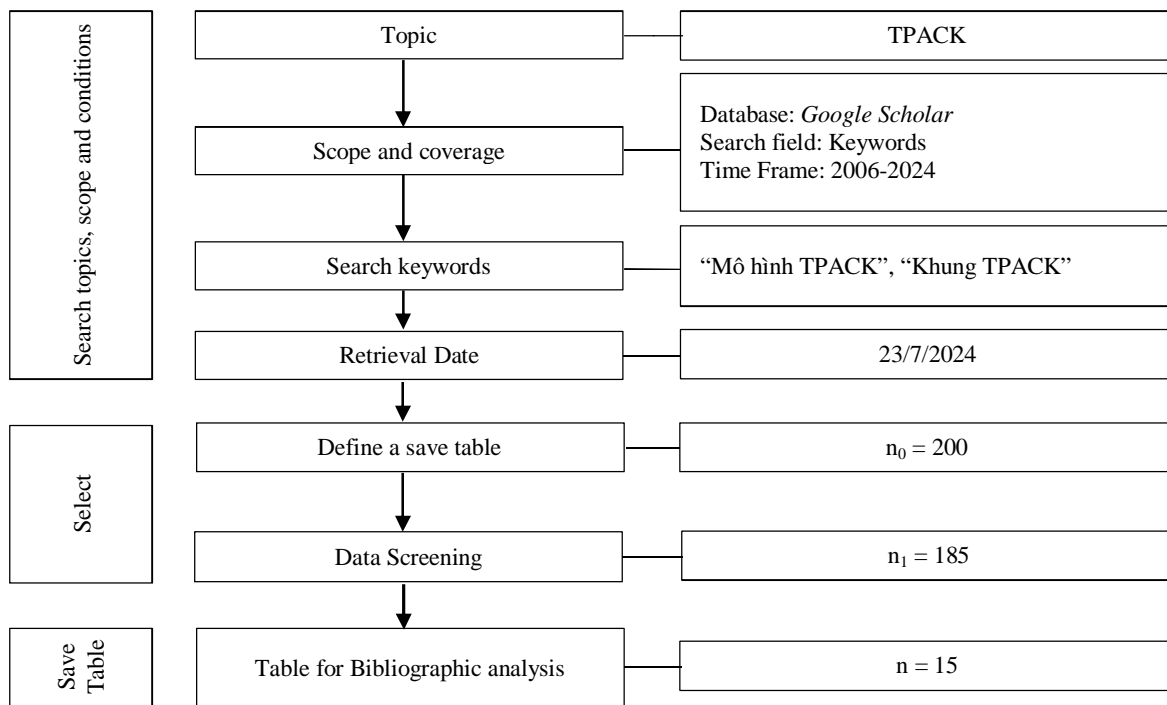
Bibliographic research is a crucial process in academic writing, involving the collection and analysis of various scholarly documents, including scientific papers, books, dissertations, seminars, and other relevant resources pertaining to a specific research topic. This method utilizes a range of tools and techniques, such as document management software, academic databases, and statistical methods, to effectively evaluate and synthesize information.

Bibliographic research is gaining popularity as a new approach in research (Ahmi, A., & Mohd Nasir, M. H., 2019). The main objectives of this type of study are to identify research trends, gain insight into current developments and directions in a specific field, detect knowledge gaps, propose new research directions, assess the impact of research through indicators such as citations and influence, and identify top researchers and institutions that contribute significantly to the field.

## II. BIBLIOGRAPHIC ANALYSIS OF TPACK RESEARCH IN VIETNAM

### 1. Analytical methods

Bibliographic analysis involves collecting, analysing, and visualizing data from scientific articles, journals, and research materials related to TPACK in Vietnam. In this article, the author utilizes the Google Scholar academic database to search and gather published documents related to the TPACK model in Vietnamese and originating from Vietnam. Specifically, the authors used Harzing's Publish or Perish software to search Google Scholar data sources using the keyword "mô hình TPACK", "khung TPACK" from 2006 to 2024. As a result, the authors identified and reviewed 15 articles in Vietnamese published in domestic journals that were relevant to the TPACK model. The data was then screened, author keywords were added, and Microsoft Excel was used for data processing and statistical analysis, including creating charts. The VOSviewer tool was also used for quantitative analysis, and the main topics of the studies were reviewed through the articles.



Source: Zakaria & Associates (2021)

Figure 1. Search Map

## **2. Findings and Discussion**

### ***2.1. Number of articles and research works***

The number of articles and research works on the TPACK model in Vietnam is currently limited. After conducting a search and screening process, only 15 studies related to the TPACK model were found. These publications were primarily published in educational and scientific journals from universities in Vietnam. Despite the fact that the TPACK model has been studied globally since 2006 (Mishra, P., & Koehler, M. J., 2006), the majority of the research was conducted after Vietnam implemented the Renovation General Education Programme 2018 (14 out of 15 articles). This indicates that technology in teaching is a topic of interest and plays a significant role in Vietnam's education renovation.

Table 1. Studies related to the TPACK model by Vietnamese in Vietnam

<b>ID</b>	<b>Author</b>	<b>Study Name</b>	<b>Year</b>	<b>Source</b>
1	Nguyen, N. H.	Applying technology and TPACK model in teaching (in Vietnamese)	2017	Vinh University Journal of Science
2	Nguyen, T. D.	Some initial research results about the TPACK framework in integrated technology teaching (in Vietnamese)	2019	Hue University Journal of Science
3	Nguyen, T. D.	A survey on the necessity and feasibility of the TPACK framework for integrating technology in teaching (in Vietnamese)	2019	Hue University Journal of Science: Social Sciences and Humanities
4	Pham, D. T.	Create Video Lectures with Microsoft Office 365 PowerPoint (in Vietnamese)	2019	Proceedings of the Scientific Conference of Hoa Lu University
5	Ngo, V. G.	Critical review on ICT models: Rethinking online teaching in higher education institutions (in Vietnamese)	2020	Hanoi University Journal of Foreign Language Studies
6	Doan, N. L.	Story map - An Effective Educational Tool in Teaching History in High School (in Vietnamese)	2020	Vietnam Journal of Education
7	Le, T. H., Nguyen, T. B. & Cao, T. S.	Developing a Standardized Elementary Teacher Teaching Competence Self-assessment Tool (in Vietnamese)	2020	VNU Journal of Science: Education Research
8	Bui, T. T. H.	New technologies for higher education - challenges and solutions in application (in Vietnamese)	2020	Vietnam Journal of Educational Sciences
9	Nguyen, V. L.	Technological pedagogical and content knowledge in foreign language teaching: A literature review (in Vietnamese)	2021	Can Tho University Journal of Science
10	Phan, T. T.	Developing information technology competence for students majored in primary education at pedagogical university to meet the requirements of educational innovation (in Vietnamese)	2021	Vietnam Journal of Educational Sciences
11	Nguyen, B. H. T. & Trinh, M. T.	Measures to manage the application of information technology in teaching at secondary schools in Tran Van Thoi	2022	UED Journal of Social Sciences, Humanities and Education

		district, Ca Mau province (in Vietnamese)		
12	Tang, M. D.	Training pre-service teachers to teach mathematics with information technology: a view from the TPACK framework (in Vietnamese)	2022	Ho Chi Minh City University of Education Journal of Science
13	Nguyen, T. D.	Proposal of a practice scale based on the TPACK framework for assessing the ability to integrate technology in teaching (in Vietnamese)	2023	Vietnam Journal of Education
14	Vu, P. L., & Dang, T. T. P.	Applying the TPACK model in teaching the content circuit "Substances and their transformations" (Natural Science 6) through e-book design (in Vietnamese)	2023	Vietnam Journal of Education
15	Truong, N. D. & Pham, T. T. H.	Primary teacher training in context of digital conversion - approach the TPACK frame (in Vietnamese)	2024	Vietnam Journal of Education

2.2. Keyword Network

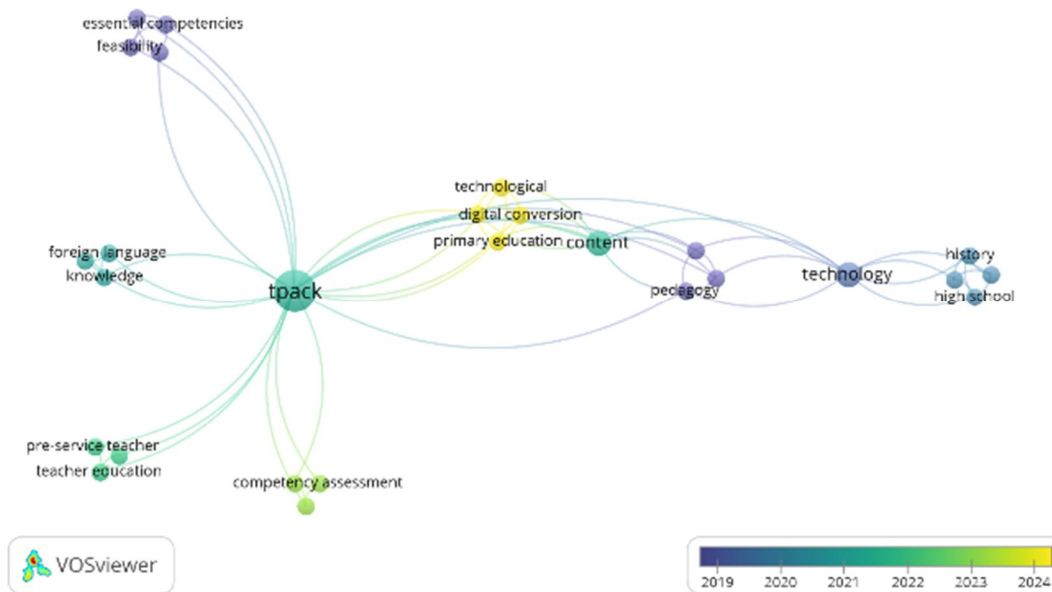


Figure 2. Keyword Network Diagram

After analysing the keyword network diagram, it is evident that the TPACK framework is a central focus of many research topics. These topics include technology, technology integration, capacity, knowledge, and pedagogy. Additionally, self-assessment and professional standards are also mentioned. Based on the research findings regarding the TPACK model, the following main research themes can be identified:

### **Explore the model**

The research focuses on understanding the TPACK model, including the components that make up the TPACK framework and its application in education. TPACK creates a basis for teachers to design effective teaching and learning activities in the classroom, "teaching and learning are most effective when teachers and students use the power of technology to explore knowledge in a learning environment that is closely linked to real life. TPACK also supports teachers to design and organize tests and assessments of learning activities effectively, quickly and accurately" (Truong, N. D., & Pham, T. T. H., 2024).

There are two key aspects to applying the TPACK model. Firstly, TPACK helps us create a more effective learning environment by enabling teachers to develop and apply their knowledge to enhance the quality of their teaching. Secondly, TPACK emphasizes the importance of integrating technology skills with other forms of knowledge, rather than teaching them in isolation. This approach supports the use of appropriate techniques for teaching with technology. TPACK also highlights the importance of creating a learning environment that encourages students and teachers to explore the use of technology in relation to specific teaching contexts. (Nguyen, N. H., 2017).

### **Application of TPACK in teacher training and in teaching some specific subjects**

There have been numerous studies conducted on the implementation of the TPACK framework in teacher training and in the teaching of specific subjects. In 2022, author Tang Minh Dung provided a perspective on the use of the TPACK framework in training math teachers. This study demonstrated the effectiveness of the TPACK framework as a research tool for evaluating the training of teachers in utilizing information technology in math instruction. By analysing training programs, modules, lectures, and learning materials through the lens of the TPACK framework and comparing them with TPACK training models developed from this theoretical framework, the study was able to identify key differences. These differences can serve as a basis for proposing adjustments and improvements to the Bachelor of Mathematics Pedagogy program, to better prepare teachers to incorporate information technology into the General Education Program in Mathematics 2018 (Tang, M. D., 2022). Nguyen, V. L. (2021) conducted a comprehensive study on TPACK in foreign language teaching. While this article provides a summary of several representative studies, it is important to note that due to limited access to reference resources in Vietnam, some other relevant studies were not included. Despite this limitation, the overview offers valuable insights into the concept of TPACK, as well as its assessment and survey tools, based on research conducted around the world. However, it is worth noting that there is a lack of research on TPACK in the context of Vietnam. Therefore, further studies are needed to expand our understanding of the TPACK model and its application in teaching English in Vietnam.

### **Application of technology in education**

Phan, T. T. (2021) conducted a study on the development of information technology skills for students in primary education at pedagogical schools. The purpose of this study was to meet the demands of educational innovation. The findings of this study demonstrate that it is highly feasible to enhance the information technology skills of primary education students in pedagogical schools. This is a crucial aspect in improving the quality of teacher training to meet the demands of educational innovation. Educational technologies can play a central role because they facilitate learners' active learning activities while teachers act as facilitators of the learning process. The growing adoption of constructive teaching philosophy along with smart teaching technologies offers new opportunities to address learners' individual differences. This is one of the highlights of modern educational methods (Bui, T. T. H., 2020). Doan, N.L. (2020) shown a study on the use of Story map in history teaching mentioned: In fact, students today are "surrounded" by technology, so history teachers must incorporate technology and digital resources into classrooms and lessons. As

digital innovations continue to increase in daily life, teachers need to embrace digital storytelling methods, online simulation of Story map into effective History teaching. With the interactivity of these technological resources, students will be more passionate and love the subject; from there, they can remember the lessons learned from the past and feel more motivated in the learning process.

### 2.3. Author Network

The author network diagram reveals that the researchers involved in studying the TPACK model and its application in education in Vietnam are all independent and lack coordination. Additionally, the number of works by these authors is limited. One standout author, Nguyen The Dung, has published three studies on the TPACK model, ranging from an initial understanding of the framework to the importance of its application and a proposed practice scale for assessing technology integration in teaching.

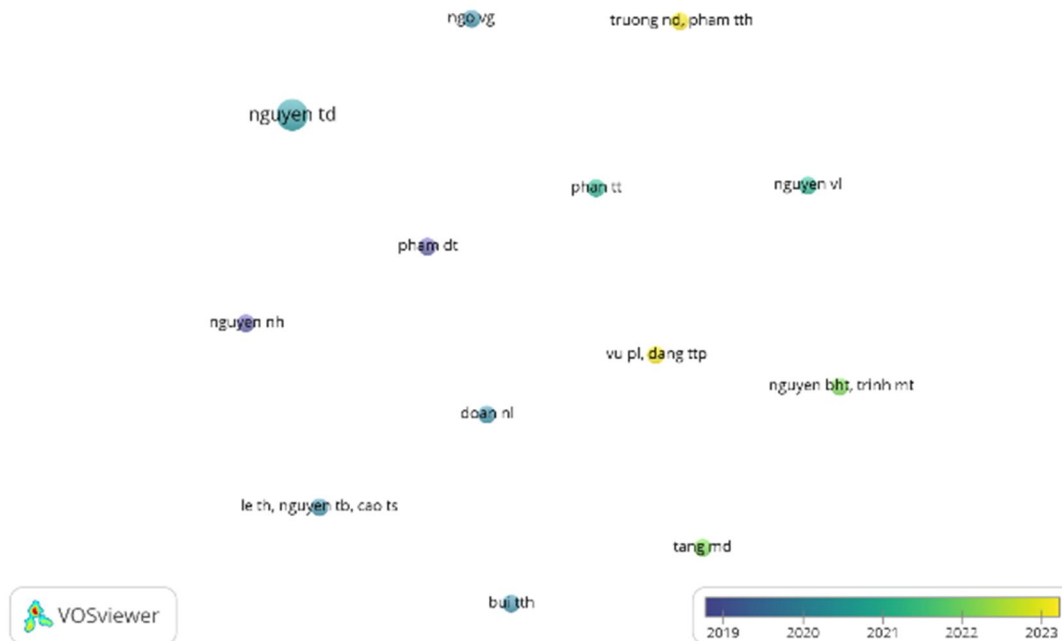


Figure 3. Author Network Diagram

### 2.4. Research gaps

After conducting a bibliometric analysis of studies and articles in Vietnam on the TPACK model, it is evident that the research and application of this model still faces numerous challenges and there are several research gaps that need to be addressed.

**Lack of quantitative data:** The majority of research in Vietnam on TPACK is based on qualitative methods, such as interviews and observations, rather than using quantitative methods to evaluate the effectiveness of the model in teaching. This leads to difficulties in generalizing the research results.

**Practical Applicability:** While many studies have explored the TPACK theory, few have established a direct link to teaching practices in Vietnam. There is a lack of in-depth research on how Vietnamese teachers can effectively incorporate this model into their daily teaching routines, particularly in rural or technology-deprived school settings.

**Development of TPACK assessment tools:** In Vietnam, there is still a lack of effective and appropriate assessment tools to measure teachers' TPACK knowledge. Existing assessment tools are often developed in Western countries and may not be fully adapted to the cultural and educational context in Vietnam.



no research on how to train and develop TPACK capacity for teachers in Vietnam. The lack of formal training programs or detailed instructional materials can lead to difficulty for teachers to access and effectively apply this model.

International comparative studies: Vietnam has not had many comparative studies comparing TPACK with other countries, especially countries in Southeast Asia. This limits the ability to learn from international experiences and adapt the model to the Vietnamese context.

Impact of education policy: The link between education policies in Vietnam and the integration of TPACK in teaching has not been extensively studied. Current policies can affect how and how well TPACK is integrated in schools, but there hasn't been much research exploring this issue.

The above gaps show that there is still a lot of potential to continue researching and developing the TPACK model in Vietnam, to improve the quality of education and the integration of technology in teaching to improve the quality and effectiveness of education.

### III. POSSIBILITY OF APPLYING TPACK TO THE REALITY OF EDUCATION IN VIETNAM

#### 1. Challenges

The TPACK model is a theoretical framework that assists teachers in effectively integrating technology into their teaching. While TPACK has demonstrated its value in education, its application in the Vietnamese education context presents several challenges. Based on studies conducted on the implementation of TPACK in Vietnam, the following key challenges have been identified:

*Uneven Technology Infrastructure:* In many rural or remote areas of Vietnam, the technology infrastructure, including the Internet, computers, and modern teaching equipment, is limited. This poses a challenge for teachers to effectively integrate technology into their teaching using the TPACK model. As one teacher stated, "Without a powerful computer and fast internet connection, it is not feasible to incorporate technology into our teaching." (Bui, T. T. H., 2020).

*Lack of training and professional support:* Many teachers in Vietnam are not adequately trained in the use of technology in teaching, especially in the integration of technology, pedagogy, and content knowledge (TPACK). They need to be provided with ongoing training and support to improve their skills in using technology. Because "technology is changing so fast that any method that tries to help teachers keep up to date with the latest software, hardware, and terminology is outdated a few years later" (Nguyen, N.H., 2017).

*Stereotypes and fear of change:* Some teachers are still conservative, unfamiliar with, or unconfident in using technology in teaching. This may be due to a lack of experience or concerns about changing traditional teaching methods. "Attitudes and beliefs about educational technology and pedagogy in general will influence how teachers implement technology." (Bui, T. T. H., 2020).

*Difficulties in adapting learning content:* Adapting learning content to fit new technologies is not always easy. Teachers need to have extensive knowledge of both subject content and technology to create meaningful and effective learning activities.

*Differences in proficiency between students:* In a classroom, a student's level of understanding and technology skills can vary widely. This creates a challenge in designing learning activities that use technology that all students can participate in and benefit from.

*Lack of appropriate learning resources:* Finding and developing technology-integrated teaching materials that are suitable for the curriculum in Vietnam is also a major challenge.

Overcoming these challenges requires close collaboration between stakeholders, including teachers, schools, policymakers, and communities, especially teacher training institutions. This will help create a more favourable educational environment for the effective application of the TPACK model.

The difficulties and challenges that arise in the teaching process are a good opportunity to motivate teachers to develop their professional skills better and better. Thinking about the classroom, students, and pedagogy will be a source of motivation for teachers to explore, research and create new approaches and pedagogical methods (Pham, D. T., 2019).

## 2. Opportunities

The application of the TPACK model to Vietnamese education not only brings many challenges but also opens many significant opportunities such as:

*Improving teaching quality:* Integrating technology into teaching according to the TPACK model helps teachers design lessons that are more lively, attractive and suitable for students' learning needs. Technology allows teachers to use a variety of teaching methods, thereby improving the quality and effectiveness of teaching. "Technology must be integrated into both content and pedagogy to bring about the highest educational effectiveness" (Truong, N. D., & Pham, T. T. H., 2024).

*Develop teachers' skills:* The adoption of TPACK requires teachers to continuously learn and develop their technology, pedagogy, and professional skills. This not only helps teachers improve their professional qualifications but also motivates them to become more well-rounded educators.

*Encourage creativity in teaching and learning:* The TPACK model encourages teachers to be creative in using technology to develop new teaching methods, thereby helping students access knowledge in a more creative and flexible way. This creativity can also inspire students to explore and learn.

*Enhance teacher-student interaction:* Technology helps create more opportunities for interaction between teachers and students, as well as between students. Tools such as online forums, learning apps, and online learning platforms allow students to participate in the learning process in a more active and active way.

*Preparing students with the skills they need for the 21st century:* When applying TPACK, students not only learn about professional knowledge but also develop soft skills such as critical thinking, problem-solving, teamwork, and the use of technology. These are important skills that prepare students to face the challenges of the 21st century.

*Bridging the digital divide:* The application of TPACK in teaching helps students in rural or remote areas access modern technology, thereby narrowing the digital gap between different regions in the country. This also creates opportunities for equality in education.

*Personalized learning support:* Technology allows teachers to design lessons and learning activities that are tailored to each student. This helps to meet the diverse learning needs of students, thereby optimizing learning outcomes.

In conclusion, the application of the TPACK model to Vietnamese education opens many opportunities to improve the quality of education, develop teachers and students, and create a more modern and effective learning environment.

## 3. Solutions

TPACK is a theoretical framework model that aims to identify the elements necessary for teachers to be able to integrate technology effectively into teaching. In order to develop and apply TPACK to Vietnamese education, it is necessary to consider some of the following solutions:

### Teacher training on TPACK:

*Developing training programs and training courses:* Developing intensive courses on TPACK in pedagogical schools and teacher training centres. This includes teachers understanding the components of TPACK (content knowledge, pedagogical knowledge, technology knowledge) and how to combine the components in the TPACK framework. "Technological capacity training for teachers through the TPACK model emphasizes the intersection of three components of technical knowledge, pedagogical knowledge and technological knowledge" (Bui, T. T. H., 2020). In particular, it is necessary to develop and improve teacher training programs according to the TPACK framework, so that

TPACK is not only encapsulated in a number of specific modules, but it must be throughout the teacher training process. "A good training program according to the TPACK model approach must ensure to provide students with adequate knowledge of content, pedagogical methods, and technology" (Truong, N. D., & Pham, T. T. H., 2024).

*Technology fostering:* It is necessary to organize training courses on educational technology, update new technologies and how to apply them in teaching. "... Active teaching with the application of information technology is not a form for teachers to project words, but it is the distillation of information such as images, writing, colours, sounds, forms, etc. combined with active teaching methods to make the lectures more lively, attractive, interested in learning and stimulating learners' thinking" (Nguyen, B. H. T. & Trinh, M. T., 2022).

*Continuous support:* Organize regular seminars and training sessions for teachers to update new knowledge and share experiences on technology integration and application of the TPACK model in teaching process design.

### **Developing Teaching Resources:**

*Digital resources:* Develop and provide digitized documents and learning materials in accordance with the content of the educational program. These resources need to be flexible and easy to apply to a variety of subjects.

*Digital libraries:* Create digital libraries with rich resources, supporting teachers in finding and using technology tools effectively.

### **Technology and Infrastructure Support**

*Equipped with technological equipment:* It is necessary to equip schools with necessary technological equipment such as computers, projectors, and interactive boards, especially in rural and remote areas.

*Internet Network:* Ensure that the Internet network is stable and available in schools to support the adoption of technology in teaching.

### **Innovating teaching methods**

*Positive teaching methods:* Encourage teachers to apply positive teaching methods, such as project-based teaching, problem-solving teaching, combined with technology to enhance student interaction and learning effectiveness.

*Flexibility and creativity:* Teachers should be encouraged to experiment and adapt teaching methods to suit the needs and abilities of their students.

### **Building a professional learning community**

*Online Community:* Build online forums and groups where teachers can discuss, share experiences, and learn from each other about how to apply TPACK in teaching.

*Collaboration with experts:* Encourage collaboration between teachers and technology experts and education researchers to develop TPACK application solutions suitable for the Vietnamese education context.

### **Support policies from education administrators**

*Incentive policies:* Education authorities should have policies that support and encourage teachers to adopt TPACK in teaching, such as rewarding teachers who have effective initiatives in integrating technology.

*Assessment and adjustment:* Develop a system to evaluate and monitor the application of TPACK to promptly adjust and improve it to suit the teaching reality.

### **Raising public awareness**

*Propaganda:* Increase awareness about the importance of using technology in education to raise awareness among parents, students, and the community.

*Social cooperation:* Strengthen cooperation with social organizations and businesses to provide financial support and resources for the development of educational technology.

The development and application of TPACK in Vietnamese education requires efforts not only from teachers but also from educational, community, and social management levels.

#### **IV. CONCLUSION**

The bibliographic analysis of studies on the TPACK model in Vietnam, the research and application of the TPACK model in Vietnam is starting to attract attention. In fact, the number of publications and research content is still limited, facing many challenges, it is necessary to have the cooperation of the community of researchers, especially educators to exploit, develop and apply the TPACK framework in the field of education in general and teacher training in particular. By taking advantage of the right opportunities and solutions, Vietnam can improve the quality of education through the effective integration of technology into teaching content and methods.

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