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Exploring the Relationship Between School Support and Technology Use among Mongolian Teachers: The Mediating Role of TPACK*

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Under the context of the recent curriculum reform in Mongolia emphasizing technology integration in schools, the main purpose of this study was to examine external and internal factors that influence teachers' use of technology. This study aimed to investigate structural relationships between school support, technology use, and TPACK (Technological Pedagogical and Content Knowledge) among Mongolian secondary school teachers. This study was conducted with 208 secondary school teachers in Ulaanbaatar, Mongolia. Data were collected through an instrument that measures three factors: teachers' use of technology, TPACK, and school support. The results indicate that TPACK has a partial mediation effect on the relationship between school support and the use of technology. The contribution of this study lies that it examines the complex relationships between internal and external factors affecting teachers' technology integration, especially among Mongolian teachers who are less researched in the existing literature.

Keywords : School support, TPACK, Technology Use, Mongolian teachers, Developing Countries

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Introduction

Entering the 21st knowledge-based society, all nations around the world are promoting education reform initiatives through information communication technologies (ICTs). The United Nations (UN) announced the Sustainable Development Goals (SDGs) by 2030, which is a shared blueprint for all nations to achieve to improve health, education, climates, and other urgent issues through a global partnership. According to the SDGs agenda, education is viewed as the powerful strategy for addressing poverty and inequality in developing countries, calling for global attention and efforts to strengthen access to quality education (UNDP: United Nations Development Programm, 2016). Moreover, the Education 2030 agenda emphasizes that teachers should be able to facilitate student learning by integrating technology with appropriate teaching methods and curriculum content.

Many developing countries, however, are struggling to improve educational systems, particularly in educational reform initiatives related to technology-mediated learning (Malik, 2018). Like most developing countries, Mongolia is concerned about whether the nation's educational system meets the demand of globalization and knowledge-driven economy. In 2014, the Mongolian government announced its third curriculum reform that emphasized a wide integration of technology in teaching and learning environments. The new curriculum reform put a high emphasis on teachers' competency to integrate technology for effective teaching and to design learning activities with the integration of appropriate technological tools (Ministry of Education, Culture and Science of Mongolia, 2015). More recently, due to the COVID-19 pandemic in 2020, all schools in Mongolia had to stop the operation of physical schools, and switched to the distance education mode through television and online platforms. Since students are learning from home, all teachers had to manage their classes through online platforms, which further highlights the importance of teacher's competency to

integrate technology for instructional purposes (TERI: Mongolian Teacher Education Research Institute, 2020).

Considering such macro changes in the educational policy in Mongolia, this study aims to examine the complexity of Mongolian teachers' competency in technology integration. The existing literature collectively indicates that teachers' technology integration is a complex process affected by a myriad of internal and external factors (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). It has been suggested that imposing top-down and centralized policy initiatives is less likely to lead to deeper changes in actual teaching practices when policy imperatives do not adequately reflect the reality and perspectives of teachers and students (Tondeur, Keer, Braak, & Valcke, 2008).

In particular, developing countries, including Mongolia, suffer from a lack of technical infrastructure and teachers' knowledge and confidence in the use of technology (Karunaratne, Peiris, & Hansson, 2018). This means that for teachers to successfully use technology in the classroom, there should be efforts for teachers' professional development as well as cultural and financial support to cope with change. Recently, while developing countries have initiated educational reform to support teachers' technology integration, the focus has been mainly on solving environmental constraints such as technological infrastructure. There is a lack of policy initiatives to promote technology integration focusing on teachers who are the main actors of education reform (Karunaratne et al., 2018; Kihoza, Zlotnikova, Bada, & Kalegele, 2016). In addition, teachers should have diverse abilities, from simple technology application skills related to the production of instructional materials to complex technology application skills related to cultivating high-level thinking. However, the existing literature tends to examine the teacher's ability to use technology as a single factor (Karunaratne et al., 2018). Therefore, this study views teachers' technology integration skills as multiple components, namely 'basic technology skills', 'technology as an information tool', and 'technology as a learning tool', and attempts to identify the factors influencing these components.

In this study, Technological Pedagogical and Content Knowledge (TPACK) was selected as a critical factor for measuring teacher's ability to integrate technology in schools. TPACK refers to the knowledge base of teachers to understand the complex interactions between content, pedagogy, and technology (Mishra & Koehler, 2006). This study positions TPACK as a mediating factor between technology use and school support, based on the previous studies that suggested TPACK as an important factor in teachers' use of technology (Dalal, Archambault, & Shelton, 2021; Koh, Chai, & Natarajan, 2018).

In addition to the knowledge (internal) factor, it is important to provide systematic support at the school level to promote the effective use of technology. This study, hence, selected school support as an environmental (external) factor influencing teachers' use of technology in schools. The notion of 'school support' also includes cultural support, which refers to support for students, and perceptions of fellow teachers and principals (Lam, Cheng, & Choy, 2010; Özgür, 2020; Tondeur, Devos, Van Houtte, Braak, & Valcke, 2009).

Under this backdrop, the purposes of this study were two folds: (a) to examine how Mongolian secondary school teachers integrate technology for instructional purposes; (b) to identify internal (personal) and external (environmental) factors that influence their use of technology. To examine the complexity of Mongolian teachers' technology integration, we selected TPACK as an internal factor and school support as an external factor affecting teachers' technology integration. The research questions of this study are as follows:

Research Question 1. Are there significant structural relationships between school support, TPACK, and technology use among Mongolian secondary school teachers?

Research Question 2. Are there direct and indirect effects between school support, TPACK, and technology use among Mongolian secondary school teachers?

Literature Review

ICT in Education Policy in Developing Countries

In developing countries, reform changes through ICT policy in education can be divided into two categories. The first category is 'systemic change' (OECD: Organization for Economic Co-operation and Development, 2009). This is a change that takes place within the educational system as attempts to disseminate technology in the educational environment, but does not necessarily change the system itself. The second category is 'transformational change'. It aims to change the education system itself beyond superficial and piecemeal changes and ICT policy actions are committed to bringing profound changes in school structures and classroom practices that are aligned with a social and economic shift of paradigm (Kozma & Vota, 2014).

The contrast of systemic and transformational changes can explain the lack of effective and meaningful technology integrations in education. It has been reported that while many Asian countries have provided schools with technological resources (hardware and software) to increase access to ICT, the utilization of ICT in schools is still low (Ventayen, 2019). A study about technology use in developing countries found that teachers still have difficulty using technological resources provided in the classroom, and need more training for the effective use of technology (Saddhono, Mulyaningsih, Sudarsana, & Manurung, 2019). These findings show the limitation of education policy that aimed at systemic change but did not bring in fundamental changes in teaching and learning practices. Superficial and piecemeal changes tend to focus only on the quantitative growth for physical support such as school infrastructure and technical tools and to overlook deeper changes in the quality of teaching and learning. Hence, it has been suggested that educational policies in developing countries that attempt to reform education through ICTs should be developed toward the direction of bringing in transformational changes (Hardman, Abd-Kadir, & Tibuhinda, 2012; Kozma et al., 2014).

Teachers' ICT Training in Mongolia

In this section, we present the policy and system concerning how Mongolian teachers are educated and receive professional development training on the use of ICTs. The Mongolian Ministry of Education, Culture, and Science (2017) revised the 'Education Regulations for Teachers of Mongolian Elementary and Secondary Schools' and established the 'Mongolian Teacher Education Research Institute (TERI)' that is responsible for providing various training programs to teachers and staff across the country. The purpose of establishing TERI was to review the implementation of educational policies, to enhance teachers' ability to use technology, and to enhance the professionalism of individual teachers. Through various portal sites operated by TERI, teachers can access information and courses related to their professional development. Table 1 presents various online and offline training courses provided by TERI.

Table 1. Teacher training courses provided by the Teacher Education Research Institute

Training classification	Training content	Target	Training mode
Education policy training	▫ Education policy & Institutional Strategies	Pre-service teachers / Year 1 teachers	offline
Qualification training	▫ Teacher ethics education	Year 5 & Year 10 teachers	offline
General education	▫ Class operation plan ▫ Use of class instruction plan ▫ Use of online sites	Pre-service teachers / Year 1 teachers	online offline
Professional education	▫ Content knowledge	Pre-service teachers / Year 1 teachers	online offline
	▫ Pedagogical knowledge	Year 5 & Year 10 teachers	offline
	▫ Education evaluation	Year 5 & Year 10 T teachers	online offline
	▫ Learner-centered instruction	Year 5 teachers	online offline
	▫ Method of using ICT	Year 10 teachers	online offline

In accordance with the education reform policy, TERI has conducted various online training programs related to technology utilization. The range of online training courses offered for the past three years (2018-2020) indicates that many training courses focus on learning about technological platforms and tools (Mongolian TERI, 2020).

Teachers' Use of Technology

The use of technology for teaching and learning can be an effective way to overcome and solve challenges in Mongolian education. First, learning with technology can be an effective solution to lower time and space barriers (Miangah & Nezarat, 2012). Concerning the status of ICT penetration, Mongolia has 133.2 mobile phone subscribers per 100 people and 23.7% of Internet users (ICIPA: Information and Communication Industry Promotion Agency, 2020).

Mobile devices can be a useful teaching tool, especially in developing countries where technology infrastructure is not well established (Kaliisa, Palmer, & Miller, 2019). Similarly, the educational use of mobile technology in Mongolia can be a way to solve the problems with the shortage of computers and inequality of educational opportunities.

Second, the educational use of technology can be a way to move away from teacher-centered pedagogy in Mongolian education. Mongolian teachers often prepare lesson content and activities autonomously rather than based on the national curricula, which leads to a limited range of teaching and learning activities and teacher-centered pedagogical practices. It is expected that the use of technology can help Mongolian teachers to adopt various approaches in learner-centered pedagogy such as problem-based learning, project-based learning, and cooperative learning (Kim, Woo, & Kim, 2001; Sanchez et al., 2019).

Teachers use technology in the various spectrum, ranging from superficial use to deep integration. For instance, Tondeur, Braak, and Valcke (2007) proposed a

three-factor typology of computer use in schools: (a) basic computer skills, (b) computers as an information tool, and (c) computers as a learning tool. The first type 'basic computer skills' refers to the use of computers as a subject to teach such as teaching technical computer skills (e.g., how to use a computer and auxiliary programs). The second type 'computers as an information tool' means using technology as a means of mainly conveying and searching for information. The third type 'computers as a learning tool' refers to the use of computers for constructive learning activities such as knowledge construction tools. Tondeur et al. (2007) suggest that this typology is useful to examine different patterns of computer use by teachers in practices.

School Support

Much research has been done on the importance of school support that encourages teachers to use technology (Chen, 2008; O'Dwyer, Russell, & Bebell, 2005). Teachers' technology integration is affected by external structural conditions in schools such as the existence of systematic planning on technology adoption and the provision of teacher professional development opportunities as well as technical support for hardware and software (Dawson & Rakes, 2003; Özgür, 2020). Tondeur and his colleagues (2009) viewed school support as divided into structural and cultural dimensions. The structural dimension includes infrastructure, technical support, and plans to utilize technology at the school level. The cultural dimension includes the innovation of school members, the leadership of supervisors including the principal, and goal orientation for the use of technology among school members. Lam et al. (2010) emphasized that school support is not limited to technical support for whether teachers have the necessary hardware and software to use technology. They emphasized that school support is a concept encompassing both physical and environmental support, the perception of fellow teachers and principals, and support at the cultural level.

TPACK

The level of teachers' knowledge about technology is critical for the effective use of technology in school environments (Joo, Lim, & Kim, 2016; Malik, Rohendi, & Widiaty, 2019). TPACK refers to the knowledge base of teachers to understand the complex interactions between content, pedagogy, and technology (Mishra et al., 2006). For successful technology integration, teachers need to consider all aspects of teaching and learning in complex ways, beyond simply using technology for content delivery. Previous studies on TPACK indicate that there is a significant relationship between the frequency of technology use and TPACK (Lee et al., 2016). TPACK determines the level of the teacher's use of technology in class (Koh, Chai, & Tsai, 2013 & 2014). Teachers who lack technological knowledge tend to use technology less in class and are reluctant to change (Kim, So, & Ryoo, 2021). Teachers who have difficulty using technology tend to change when they receive support from fellow teachers or teachers with excellent competence and support at the school level (Koehler et al., 2013).

Research Related to Factors Affecting Teachers' Technology Use

This section discusses prior studies examining the relationship between school support, TPACK, and technology use that informed the construction of the research model in this study. First, School support is known as a factor that influences teachers' use of technology. Lack of classroom environment and lack of technical support for using technology have been pointed out as factors that hinder teachers' use of technology (Becker, 1994; Gil-Flore, Rodriguez-Santero, & Torres-Gordillo, 2017). For example, Blackwell, Lauricella, and Wartella (2014) explored factors that influence the use of digital technology in 1234 early childhood educators. The results indicate that school support and technology policy, along with students' SES and teaching experience, influenced teachers' technology use.

Among them, school support was found to be a major factor directly and indirectly affecting teachers' technology use. In a study by Jun(2004), which examined the relationship between school support and the use of technology with 266 public school teachers in the United States, there was a difference in the use of technology by the teacher according to the technical support, and the support of fellow teachers. In addition, Bebell, Russell, and O'Dwyer (2004) found that schools' organizational characteristics influenced teachers' use of technology in class. In particular, schools' leadership practices improved the frequency and amount of technology use by empowering teachers to develop technology-related expertise with more confidence. Through this, it can be inferred that the degree of technology use by teachers varies depending on school support (technological and cultural).

Second, TPACK is related to teachers' technology use. The higher the TPACK level, the more active teachers use technology (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010). Teachers need not only to understand the characteristics of technology, but also to know how to effectively present the content using technology (Kastberg & Leatham, 2005). Previous studies have shown that there is a statistically significant positive correlation between TPACK and technology use. For example, Joo, Park, and Lim (2018) analyzed the factors that influence intention to use technology among 296 pre-service teachers based on the Technology Acceptance Model (TAM). They found that TPACK influenced intention to use technology through the perceived usefulness and perceived ease of use. In addition, So, Park, and Kim (2020) analyzed TPACK, technology integration competency, and frequency of technology use among 162 special education teachers. They found that while the correlation between their TPACK and technology integration competency was generally high, the frequency of technology use related to class time was correlated only with certain types of knowledge such as TK, TPK, and PK. This means that teachers need to develop TPACK from their initial teacher training (Voogt & McKenney, 2017).

Third, TPACK is related to school support and technology use. For example, Dong, Xu, Chai, and Zhai (2019) examined the relationship between factors affecting technostress among 375 teachers in China. Teacher's TPACK was a major factor influencing technostress, and collegial support affected TPACK. Technostress is a negative emotion felt in the use of technology (Sahin & Coklar, 2009) and is related to the use of technology in the classroom (Pamuk & Peker, 2009). If the teacher's technostress is low, it reduces the burden of using technology in class, and influences teachers' positive attitude toward using technology (Dong et al., 2019). Joo et al. (2016) examined how 312 secondary school teachers' TPACK and school support affect their technology stress. It was found that TPACK had a significant effect on school support and technostress. This finding suggests that the higher the school support and teacher's TPACK, the more flexible teachers can cope with the problems caused by technology use. In addition, TPACK and school support were found to have a significant indirect effect on the intention to use technology through technostress. This in turn implies that for successful technology integration in class, it is necessary to provide teachers with opportunities to develop TPACK, and to consider how to foster school support for meaningful technology integration.

Methods

Research Model of the Present Study

Based on the review of the existing literature, it is clear that teachers' use of technology is a complex process influenced by both internal and external factors. This study, hence, examines teacher's technology integration under the school system where top-down policy initiatives require teachers to use technology in class. To examine the complexity of Mongolian teachers' technology integration, we selected TPACK as an internal factor and school support as an external factor

affecting teachers' technology integration.

First, regarding internal factors, we examine the TPACK framework that explains a complex interaction among three bodies of knowledge: content, pedagogy, and technology. The interaction of this knowledge, both theoretically and in practices, affects teachers' willingness and competency to integrate technology for teaching and learning (Malik et al., 2019; Mishra et al., 2006). TPACK can function as a factor mediating the relationship between school support and teachers' technology use, given the interaction between internal and external factors.

Second, this study examines a two-factor structure of school support as the external factor influencing the use of technology: (a) environmental support such as technical support and physical support for using technology, and (b) peer support such as school culture promoting teacher learning.

Third, since technology can be used in various ways in class, we used the typology of technology use proposed by Tondeur et al. (2007) to measure how Mongolian teachers use technological tools in class for teaching and learning activities. As mentioned earlier, this typology includes three types of technology use: (a) basic computer skills, (b) computers as an information tool, and (c) computers as a learning tool.

Figure 1 presents the hypothesized research model empirically examined in this study. The hypotheses examined in this research model are:

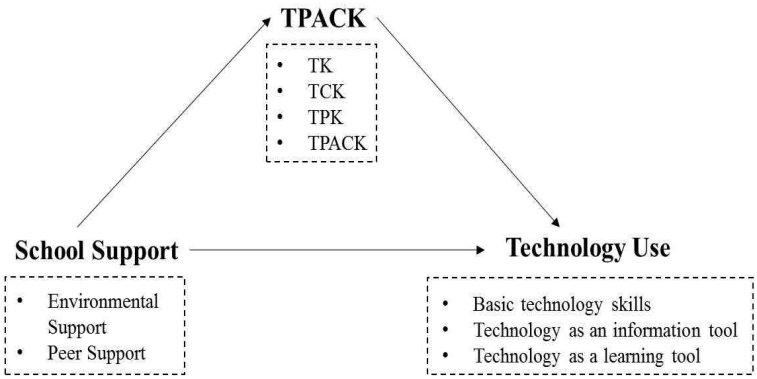


Figure 1. Hypothesized research model

Hypothesis 1. School support will have a direct effect on teachers' technology use and TPACK.

Hypothesis 2. TPACK will have a direct effect on teachers' technology use.

Hypothesis 3. TPACK will have a mediating effect between school support and teachers' technology use.

Participants

This study recruited participants using convenience sampling, one of the

Table 2. General characteristics of the research participants (*n = 208*)

	Division	Frequency (No. of teachers)	Percentage (%)
School level	Middle school	120	57.7
	High school	88	42.3
School type	Public school	179	86.1
	Private school	29	13.9
Teaching subject	Mongolian	34	16.3
	Second foreign language	47	22.6
	Mathematics	36	17.3
	Science	37	17.8
	Society	28	13.5
	Technical engineering	11	5.3
	Arts and Physical education	15	7.2
Teacher career	1-5 years	93	44.7
	6-9 years	32	15.4
	10-14 years	36	17.3
	15-19 years	18	8.7
	More than 20 years	29	13.9
Gender	Man	32	15.4
	Female	176	84.6
Age	20's	89	42.8
	30's	62	29.8
	40's	41	19.7
	Over 50's	16	7.7

non-probability sampling methods. The researcher personally visited 17 middle and high schools located in Ulaanbaatar, Mongolia, distributed the questionnaire to 230 teachers, and collected their questionnaires over four days. Among the collected data, the responses from 208 teachers (female n = 176, male n = 32) were used for the final analysis, excluding 22 incomplete responses. Table 2 shows the demographic characteristics of teachers who participated in this study.

Instrument

We defined the core variables as shown in Table 3 and adapted the existing instruments to develop items relevant to the purpose and context of the current study.

First, we used 10 items for the school support instrument proposed by Lam et al.

Table 3. Definition of variables in this study

Variable	Definition
Environmental Support	Teachers' perception of their schools as providing sound structure and making appropriate arrangements to facilitate their success in teaching with technology
Peer Support	Teachers' perceptions of the level of collegial support they had received for teaching with technology
TK	Knowledge about various technology tools
TCK	Knowledge of subject matter representation with technology
TPK	Knowledge of using technology to implement different teaching methods
TPACK	Knowledge of using technology to implement teaching methods for different types of subject matter content
Basic technology skills	The use of technology to teach students technical computer skills
Technology as an information tool	The use of technology to select and retrieve information
Technology as a learning tool	The use of technology to help understand the content of learning, or to help students construct knowledge and skills

(2010) that include 5 items measuring environmental support (e.g., Our school allows teachers to freely make changes in the timetables for teaching with technology) and 5 items measuring peer support (e.g., I have a fellow teacher helping me with problems when I use technology in the class). The two factors accounted for 47.84% of the total variance explained. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA) was .83, and the Bartlett sphericity test was 799.500 ($df = 45$, $p < .001$). Overall, the Cronbach's α value of the construct 'school support' was .85, demonstrating good internal consistency. The Cronbach's α values of the sub-factors were .78 for environmental support and .84 for peer support. The C.R was .92 and the AVE was .80.

Second, we adopted the TPACK instrument by Koh et al. (2014) to measure teachers' knowledge related to technology integration. We only selected four knowledge types related to technology, including 6 items on TK (Technical Knowledge), 3 items on TCK (Technological Content Knowledge), 5 items on TPK (Technological Pedagogical Knowledge), and 4 items on TPACK. The four factors accounted for 55.40% of the total variance explained. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA) was .88, and the Bartlett sphericity test was 1093.019 ($df = 66$, $p < .001$). Overall, the Cronbach's α value of the construct 'TPACK' was .88, demonstrating good internal consistency. The Cronbach's α values of the sub-factors were .89 for TK (e.g., I can easily learn technical skills), .95 for TPK (e.g., I help students find more information using technology), .92 for TCK (e.g., I can use software specially designed for teaching), and .94 for TPACK (e.g., I can play a leading role in helping other teachers adjust the content, technology and teaching methods in the school district). The C.R was .85 and the AVE was .74.

Third, we adopted items from Tondeur et al. (2007) to measure the types of teachers' technology use for teaching and learning. This construct includes 4 items on using technology as an information tool, 3 items on using technology as a learning tool, and 3 items on teaching basic technology skills. The three factors accounted for 60.11% of the total variance explained. The Kaiser-Meyer-Olkin

Measure of Sampling Adequacy (MSA) was .86 and the Bartlett sphericity test was 879.921 (df = 36, p < .001). Overall, the Cronbach's α value of the construct 'technology use' was .85, demonstrating good internal consistency. The Cronbach's α values of the sub-factors were .77 for the use of technology as an information tool (e.g., I encourage students to use technology to select and search for information), .83 for the use of technology as a learning tool (e.g., I use technology to better understand the content students are learning), and .84 for learning basic technology skills (e.g., I teach students how to use a keyboard mouse). The C.R was .88 and the AVE was .72.

The instrument translated into Mongolian was reviewed by one content expert and one Mongolian secondary school teacher. Some modifications were made in the statements based on their comments. All items were measured on a 5-point Likert scale (1=Strongly disagree, 5=Strongly agree). Initially, 38 items were used in the analysis. However, 6 items (2 items for TK, 1 item for TPK, 1 item for Basic Technology skills, 1 item for Technology as an Information Tool, and 1 item for Technology as a Learning Tool) with less than .30 factor loading were deleted due to the low commonality. Table 4 shows the composition of the final instrument used for the data analysis.

Table 4. Instrument and Variables

Variable	Sub-factor	No. of items	Reliability	Reference
School support	Environmental support	5	.78	Lam et al., (2010)
	Peer support	5	.84	
TPACK	TK	4	.89	Koh et al., (2013)
	TPK	4	.95	
	TCK	3	.92	
	TPACK	4	.94	
Technology use	Basic technology skills	2	.84	Tondeur et al., (2007)
	Technology as an information tool	4	.77	
	Technology as a learning tool	3	.83	
	Total	34		

Data Analysis

The collected data were analyzed using SPSS and AMOS. First, descriptive statistical analysis was conducted to understand the characteristic of the participants. Second, exploratory factor analysis (EFA) was conducted to identify the number of reliable and interpretable factors in the observed data. EFA used maximum likelihood as a factor extraction method and direct oblimin as a factor rotation method. Third, Cronbach's α was used to confirm the reliability of the instrument, and the Pearson correlation coefficient was calculated to understand the relationship between the factors. Forth, the validity of the measurement model was confirmed by conducting a confirmatory factor analysis (CFA). Fifth, structural equation modeling (SEM) was used to assess the fit of the proposed research model. Since each variable was normally distributed, the maximum likelihood estimation was selected as an appropriate statistical estimation method. The goodness of fit indices include chi-square (χ^2), Tucker-Lewis index (TLI), comparative fit index (CFI) and root-mean-square error of approximation (RMSEA). Finally, Sobel test was conducted to verify the mediating effect in the structural model. All statistical testing was conducted at the significance level of .05.

Results

Descriptive Statistics

The means, standard deviations, skewness, and kurtosis for all the measurement variables were analyzed (see Table 5). Since the absolute skewness and kurtosis values were less than 3 and less than 10 respectively, the data met the assumption of the multivariate normal distribution for SEM (Kline, 2015). The relationship between TPACK and environmental support was not significant. TCK did not have

significant relationships with several measurement variables. If TCK is included in the structural model, the possibility of errors in statistical conclusions may increase as the effective sample size decreases or the degree of freedom decreases (Lee, Cho, & Lee, 2018; Seong, 2019). For this reason, TCK was removed for further analysis. Most of the variables were significant at the level of .05.

Table 5. Descriptive statistics and correlation coefficients

	Measurement variable	1	2	3	4	5	6	7	8	a	b	c
a	1 Environmental support	-								-		
	2 Peer support	.50*	-									
b	3 TK	.18*	.22*	-								
	4 TPK	.35*	.30*	.52*	-					.32*	-	
	5 TPACK	.12	.22*	.53*	.55*	-						
c	6 Basic technology skills	.28*	.45*	.36*	.37*	.34*	-					
	7 Technology as an information tool	.24*	.41*	.31*	.27*	.23*	.65*	-		.39*	.47*	-
	8 Technology as a learning tool	.23*	.41*	.28*	.26*	.28*	.48*	.61*	-			
	Mean	3.16	3.51	3.49	3.56	3.70	2.99	3.31	3.24	3.38	3.58	3.18
	Standard	.61	.57	.48	.58	.56	.87	.57	.74	.51	.45	.62
	Skewness	.04	.-49	.23	-.23	-.01	-.10	-.47	-.18	-.24	.14	.04
	Kurtosis	-.07	.80	.40	.19	.23	-.72	.27	-.50	.57	.60	-.51

※ *a = School support, b = TPACK, c = Technology use*
$p < .05$

Measurement and Structural Models

Table 6 shows the goodness of fit indices for the measurement model with the collected data. All factor loadings in CFA were significant at the level of .05, ranging from .66 to .83, as shown in Figure 2. The results indicated the adequate validity of the measurement model since all the loadings were greater than .50 (Hair, Black, Babin, & Anderson, 2009). In addition, the cross-loadings of the variables

ranged from .48 to .61, confirming that all constructs in the measurement model fulfilled the condition of convergent validity and discriminant validity.

Table 6. Fit statistics for the measurement model

	χ^2	df	p	*CFI*	*TLI*	*RMSEA* (90% confidence interval)
Measurement model	33.47	17	.01	.97	.95	.068 (.033 ~.102)
The goodness of fit indices			> .05	> .90	> .90	< .08

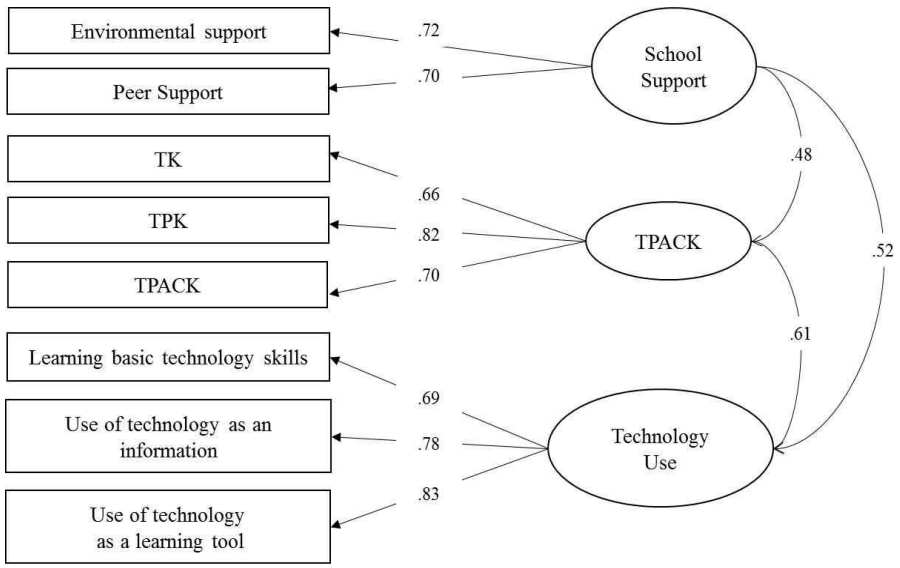


Figure 2. Confirmatory factor analysis results

Table 7. Fit statistics for the structural model

	χ^2	df	p	*CFI*	*TLI*	*RMSEA* (90% confidence interval)
Structural model	*33.47*	*17*	*.01*	*.97*	*.95*	*.068 (.033 ~.102)*
The goodness of fit indices			*>.05*	*> .90*	*> .90*	*< .08*

As shown in Table 7, fit indices also show the acceptable fit of the data on the structural model. CFI and TLI values were above .90 and RMSEA was less than .08, suggesting the overall good fit (Hair et al., 2009).

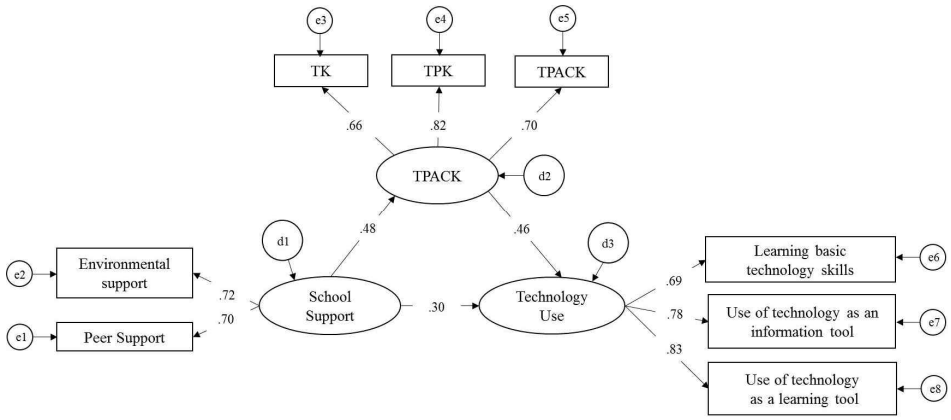
Hypothesis Testing

We proceeded to test the first and second research hypotheses: H1- School support will have a direct effect on teachers' technology use and TPACK; and H2- TPACK will have a direct effect on teachers' technology use. Direct effects among school support, TPACK, and technology use were examined by the β weights. Table 8 and Figure 3 show that the effect of school support on TPACK was $\beta = .48$ ($t = 4.26$, $p < .05$), the effect of school support on technology use was $\beta = .30$ ($t = 2.86$, $p < .05$), and the effect of TPACK on technology use was $\beta = .46$ ($t = 4.57$, $p < .05$). Overall, the results indicate that school support affects TPACK and technology, and TPACK affects the use of technology. Hence, both H1 and H2 were accepted.

Table 8. Decomposition of direct and indirect effects

Variables		*Unstandardized Coefficient (B)*			*Standardized Coefficient* (β)		
		Total	*Direct*	*Indirect*	*Total*	*Direct*	*Indirect*
TPACK	←*School support*	*.47**	*.47**	*.00*	*.48*	*.48*	*.00*
Technology use	←*School support*	*.59**	*.34**	*.25**	*.52*	*.30*	*.22*
	←*TPACK*	*.53**	*.53**	*.00*	*.46*	*.46*	*.00*
R^2	*TPACK*			*22.7%*			
	Technology use			*43.5%*			

*$p < .05$



*$p < .05$

Figure 3. Structural model with standardized path coefficients

Next, the third hypothesis was tested: H3-TPACK will have a mediating effect between school support and teachers' technology use. We examined the significance of the indirect effect between the variables by Sobel test (Sobel, 1982). The indirect effect of school support on technology use through TPACK was z = 3.07 ($p < .05$). Table 8 presents the decomposition of direct and indirect effects in the structural model. Overall, it was concluded that TPACK has a partial mediating effect on the relationship between school support and technology use.

Discussion and Conclusion

Discussion of Key Findings

Teachers' technology integration is a complex process that involves the interweaved interaction among epistemological belief, pedagogical approaches, knowledge, and skills. Taking the Mongolian teachers as the research participants, this study attempted to examine how teachers perceive the relationship between

internal and external factors surrounding their use of technology for teaching and learning in a transition period with the top-down policy imposing technology integration.

First, we found that the research model proposed in this study is suitable to explain the relationship between school support and TPACK and how these variables affect the use of technology by Mongolian teachers. The results imply that it is important for Mongolian teachers to be provided with environmental support such as time and place where technology use can be planed, and peer support including support from fellow teachers and principals. This study also suggests that teachers' use of technology in schools can be improved when teachers are provided with training programs with a focus on developing relevant competencies on TPACK.

Second, it was confirmed that school support had a significant direct effect on teachers' use of technology. This finding provides implications related to the educational challenges faced in developing countries. It has been reported that developing countries have significantly low technology utilization rates despite significant investments put in technology supply to schools (Law, Pelgrum, & Plomp, 2008). Despite the spread of technology in schools, teachers have not been well prepared to effectively integrate technology into teaching and learning processes (Khokhar, Gulab, & Javaid, 2017; Tondeur et al., 2015). This implies that simply providing equipment and technical support is not a sufficient condition for effective technology integration. For better technology integration, there should be supportive school cultures such as increasing training opportunities and access to educational resources. That is, education reform through ICT in education should aim at enabling transformational changes. The policy for education reform in Mongolia needs to expand the level of school support. Strategies suggested by the SABER-ICT framework by World Bank can be useful for developing countries to consider how to provide various levels of school support, such as (a) support relevant stakeholders to collect, process, analyze, and share learning management

information systems and learning data, (b) monitor learning and assessment that support more innovative uses of technology, and (c) support to promote ethical practices related to the use of technology in education, including data safety and security and appropriate privacy regulations (Trucano, 2016).

Third, TPACK had a significant direct effect on teachers' use of technology. This result can be interpreted that when Mongolian teachers have higher levels of knowledge about effective teaching methods with technology, they are likely to use technology in practices. The third curriculum reform initiative in Mongolia emphasized that teachers in their 1st, 5th, and 10th years of teaching in school should complete necessary professional development courses. However, it is insufficient for teachers to complete such mandatory training every five years to extend teacher certification. To build a robust knowledge base for utilizing various technologies in the rapidly changing environment, there should be continuous long-term planning of teacher professional development considering teachers' career paths. The integrated teacher education model with TPACK can be a good solution in the situation of educational reforms in Mongolia (Williams, 2020). For effective technology integration, teachers should be provided with thematic technology integration methods and help them improve their skills in the context of a learner-centered pedagogy to their subject of teaching (An, 2018). In addition, teacher education programs in Mongolia should be re-designed by applying the TPACK model to enhance both pre-service and in-service teacher's abilities to integrate educational technology.

Fourth, it was confirmed that school support has an indirect effect on technology use through the mediation of TPACK. This suggests that systematic school support should be developed along with a strategy to improve teacher's TPACK. For instance, strategies such as collaborative lesson design, peer feedback, emotional support among teachers, and teacher learning communities can be used to help teachers form an integrated knowledge base of TPACK. Recent technological advances have enabled teachers to participate in various online

community activities to collaborate anytime and anywhere (Lee, Kim, Kim, & Park, 2019). Online learning community and social media can be an effective way to promote information sharing activities for teacher's TPACK, given that 93% of the Mongolian population have mobile devices (Zhu, Lee, Do, & Ishdorj, 2016) and 74% of the Internet users use SNSs such as Facebook and Twitter (ICIPA, 2018).

Limitations and Areas for Future Research

Some limitations of this study should be noted. First, since data were collected by the self-reported survey, data may not represent the actual level of technology integration in class. Future research needs to employ additional measures such as reporting the frequency of actual technology utilization through observations and interviews. Second, this study has limited generalizability to other profiles of teachers beyond the Mongolian school system. In particular, Mongolia is in the stage of introducing educational technology. In future research, it is necessary to conduct research targeting teachers with larger sample sizes and various profiles. Third, this study did not examine teachers' beliefs and psychological factors. Teachers tend to design lessons based on their beliefs (So & Kim, 2009). Therefore, in future studies, it is necessary to examine the relationship between various factors for technology use from an integrated perspective.

Conclusion

In this study, we found that teachers tend to use technology when they are provided with both environmental support and peer support. This finding implies that merely providing material support is not sufficient unless it is coupled with emotional and social support. In addition, this study found that TPACK has a mediating effect on the use of technology. Based on this, we suggest that to cultivate teachers' TPACK in Mongolia, long-term support for enhancing teachers'

knowledge levels through various formal and informal opportunities for professional development should be provided to help them better utilize technology with careful consideration of content and pedagogy in the school context.

This study contributes to the literature by providing empirical evidence on teachers' technology integration in terms of the nature of teachers' knowledge and the environmental factors surrounding them. Moreover, to our best knowledge, this study is the first empirical research that reports findings on Mongolian teachers' technology use, TPACK, and associated factors. We believe that this study provides useful insights into how the complexity of teachers' technology use should be understood under the context of developing countries that take a similar path as Mongolia.

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