Examining the Difficulties Experienced by Teachers in Utilising Technology in English Teaching

英語科教員が抱えるテクノロジー使用に関する問題点の検証

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Abstract

This study investigates issues Kyushu Sangyo University (KSU) Language Education and Research Center (LERC) English teachers experience in utilising technology in teaching and considers the kind of support needed to overcome difficulties. The Technological Pedagogical and Content Knowledge (TPACK) framework is used to assess the degree of teachers' current technological knowledge and skills in teaching. Data was collected by mixed methods: (1) a TPACK-EFL survey and (2) a semi-structured (online) questionnaire. Participants were 20 full-time in-service LERC English teachers. 45% of participants reported experiencing difficulties when utilising technology in teaching. Based on the classification of barriers developed by Ertmer (1999) and Hew and Brush (2006), both external (first-order) and internal (second-order) barriers to utilising technology in teaching were identified. The strongest barriers were second-order barriers; specifically, technology-related classroom management skills such as 1) "student engagement/interaction," 2) "cheating/discipline" and 3) "discrepancy of students' skills". Analysis of results showed that teachers' difficulties are caused by not only teachers' own knowledge and skills but by students' technological knowledge and skills. Although the present study investigated teachers' voices and perceptions toward addressing these issues, the strategies to overcome each type of barrier remain unclear. Further research is required to clarify the kind of support required by teachers to overcome each type of issue.

本研究の目的は九州産業大学語学教育研究センター(LERC)に所属する英語科教員が授業においてテクノロジーを使用する際にどのような問題を抱えているかを明らかにすること。また、それらの問題を解決するためにどのような支援を必要としているかを検討することである。本研究では、「技術と関わる教育的内容知識(TPACK)」の理論的枠組に基づき、教員のテクノロジー使用に関する知識と技能を調査した。データは、(1)TPACK-EFL調査と(2)半構造化(オンライン)質問紙調査によって収集した。本研究はLERCの現職常勤英語科教員20名を対象としている。45%の教員が、テクノロジーを活用する際に何らかの問題(障壁)を経験していると回答した。Ertmer (1999)、Hew and Brush (2006)の分類法に基づき障壁を分けたところ、教員にとっての外的障壁（一次的障壁）と内的障壁（二次的障壁）の双方を教員は経験しており、最も強いものは二次的障壁であることが分かった。具体的には、1)「学生との関わり・相互作用」、2)「学生の不正行為・授業規律」、3)「学生の（テクノロジー使用に関わる）技能格差」といった、「テクノロジーを活用しながら授業を運営する力」に関わる問題点が明らかになった。この結果は教員が経験する「困難さ」は、教員自身だけでなく、学生の知識や技能にも起因していることを示唆している。これらの問題にどう対応するか、という教員の考えも本研究では調査したが、具体的な解決方法はまだ明らかになっていない。各々の課題を克服するために教員はどのような支援を必要としているかを明らかにするため、今後さらなる研究が必要である。

Background

How to make effective use of technology in teaching has been a critical issue in innovative practices in various parts of the world. Although COVID-19 forced schools in Japan, including the Language Education and Research Center (LERC) at Kyushu Sangyo University (KSU), to digitalise education, the presence of technology in Japanese schools is not as prominent as it is in other countries (National Institute for Educational Policy Research, 2022).

Furthermore, there is a very limited number of studies examining teachers' use of educational technology in Japanese school contexts, especially within the English language teaching (ELT) sector. Much of the research in this area focuses on the advantages of educational technology without critically examining the context-specific issues (Shin et al., 2014). Clarifying the context-specific issues with the use of technology is required to develop more efficient and effective technology-integrated pedagogy.

First-order and second-order barriers

In my previous study, I investigated the issues within my familiar school context: the public high schools in Japan and in Australia at which I worked between 2012 and 2018. Based on the classification of barriers developed by Ertmer (1999) and Hew and Brush (2006), I investigated the issues that English teachers at public high schools in Japan experience in utilising technology in classroom teaching before the pandemic (Tanaka & Saito, 2021). The study identified both external (first-order) and internal (second-order) barriers to teachers. The first-order barriers identified in the Japanese school context involved (a) resources: the lack of IT infrastructure and technical support, (b) institution: school policy, inadequate classroom size and limited time, (c) subject culture: the pressure and high expectations of improving students' academic performance and (d) assessment: high-stakes examinations. The second-order barriers included (e) teachers' attitudes and beliefs: fixed mindset and (f) knowledge and skills: the lack of professional development. The complicated relationship among teachers was also identified as a context-specific issue.

Based on the classification developed by Ertmer (1999) and Hew and Brush (2006), extensive research has also demonstrated that the strongest barriers preventing teachers from using technology were second-order barriers, namely, their existing attitudes and beliefs toward technology, as well as their current levels of knowledge and skills (Shin, Han, & Kim, 2014). On the other hand, first-order barriers such as ICT policy does not have a significant effect on teachers' use of technology (Shin et al., 2014). Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur and Sendurur (2012) suggest the significance of examining teachers' intrinsic factors, stating that "although first-order barriers had been documented as posing significant obstacles to achieving technology integration, underlying second-order barriers were thought to pose the greater challenge" (p. 423).

Thus, this study will focus more on second-order barriers, which are internal barriers to teachers such as teachers' knowledge, skills, attitudes and beliefs toward educational technology. As a first phase, the present study aims to assess the teachers' current knowledge and skills and to examine what kind of support they need to develop their technology-integrated pedagogy. In this study, I take a neutral position for the use of technology in teaching with the belief that technology could have both positive and negative impacts on teachers' teaching practice.

A theoretical framework

To examine the second-order barriers that teachers experience, there needs to be a theoretical standard that can be shared among teachers. This study employs the Technological Pedagogical and Content Knowledge (TPACK) as a framework to assess the teachers' technology integrated pedagogy. The TPACK framework (see Figure 1) was designed to account for teachers' ability to integrate technology into the curriculum.

Figure 1

The TPACK Framework
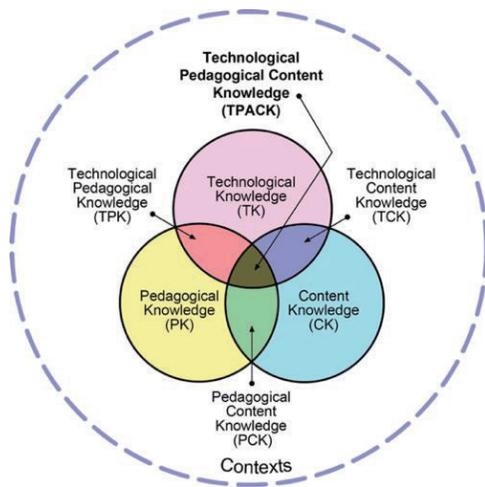
Note. Adapted from "TPACK image," In tpack.org. Retrieved from http://matt-koehler.com/tpack2/using-the-tpack-image/. Copyright 2012 by "tpack.org". Adapted with permission.

TPACK builds on Shulman's (1986) pedagogical content knowledge (PCK), which covers knowledge of the variety of ways in which subject matter might be transformed into representations that promote understanding among learners, and an awareness of the teachability and learnability of different areas of the subject matter (Shulman, 1986). Mishra and Koehler (2006) expanded PCK and proposed the TPACK framework, arguing that effective teaching with technology involves seven components (see Table 1): content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological

pedagogical knowledge (TPK) and technological pedagogical and content knowledge (TPACK) (Mishra & Koehler, 2006). Chai et al. (2013) provided a succinct definition of each construct accompanied by examples (see Table 1).

Table 1

Definition and Examples of TPACK Dimensions

TPACK Constructs	Definition	Example
TK	Knowledge about how to use ICT hardware and software and associated peripherals	Knowledge about how to use Web 2.0 tools (e.g., Wiki, Blogs, Facebook)
PK	Knowledge about the students' learning, instructional methods, different educational theories, and learning assessment to teach a subject matter without references towards content	Knowledge about how to use problem-based learning (PBL) in teaching
CK	Knowledge of the subject matter without consideration about teaching the subject matter	Knowledge about Science or Mathematics subjects
PCK	Knowledge of representing content knowledge and adopting pedagogical strategies to make the specific content/topic more understandable for the learners	Knowledge of using analogies to teach electricity (see Shulman, 1986)
TPK	Knowledge of the existence and specifications of various technologies to enable teaching approaches without reference towards subject matter	The notion of Webquest, KBC, using ICT as cognitive tools, computer-supported collaborative learning
TCK	Knowledge about how to use technology to represent/research and create the content in different ways without consideration about teaching	Knowledge about online dictionary, SPSS, subject specific ICT tools e.g. Geometer's Sketchpad, topic specific simulation
TPACK	Knowledge of using various technologies to teach and/represent and/ facilitate knowledge creation of specific subject content	Knowledge about how to use Wiki as an communication tool to enhance collaborative learning in social science

Note. Adapted from "A Review of Technological Pedagogical Content Knowledge," by Chai, C.-S., Koh, J. H.-L., & Tsai, C.-C, 2013, Educational Technology & Society, 16 (2), 33. Copyright 2013 by "International Forum of Educational Technology & Society (IFETS)". Adapted with permission.

The biggest contribution of TPACK has been in teacher education and professional development (PD) (Koehler, Mishra, Kereluik, Shin, & Graham, 2014) and it has been embraced as the theoretical basis for structuring ICT curricula in teacher education programmes (Jamieson-Proctor et al., 2013). Mishra and Koehler (2006) suggest that the TPACK framework can be used to support an argument against teacher education and PD programs that simplistically view teacher technology knowledge in isolation from content and pedagogy.

TPACK assessment often relies on teachers' self-reports, focusing on the extent to which they feel competent in the knowledge domain (Scherer et al., 2018). TPACK, which is a relatively new theoretical framework in the Japanese context, is expected to offer a new

perspective for the further development of teachers' technological and pedagogical knowledge to efficiently utilise technology.

English teachers' TPACK

Until the present day, empirical research has mostly focused on investigating teachers' domain-general TPACK enactment (e.g. Koh, Chai, & Tsai, 2014) and English teachers' TPACK has not been widely investigated (Cheng, 2017). Baser, Kopcha and Ozden (2015) developed the first TPACK-EFL (English as a Foreign Language) survey to provide foreign language teachers with a way to assess their TPACK. Although subject specific strategies were used to measure TPACK, they suggest that validity needs to be further examined in other contexts (Baser et al., 2015). Furthermore, research has focused on pre-service teachers and the situation among in-service teachers has not been widely explored. Enhancing in-service teachers' TPACK enactment should also be examined as it might be more difficult to change their fixed teaching styles as they become more experienced in teaching.

In Japan, the use of the TPACK framework in education is relatively under-researched, specifically in ELT context (Oyanagi, 2016). Oyanagi (2016) suggests the potential use of TPACK in educational development in Japan, arguing that the framework has been mainly employed in mathematics and science and there are very few studies in other subject areas. Further subject-specific studies are needed as technology use in teaching is "context bound" and variable, dependent on its subject area.

Research gaps

This section provides the rationales of the limitations and implications of research relevant to the current study.

(1) TPACK framework in the Japanese ELT context

The TPACK framework is relatively under-researched in Japan, especially within English education sectors. In addition, the instruments to assess English teachers' TPACK have not yet been well developed although it is increasingly acknowledged that subject-dependent instruments might better capture teachers' TPACK.

(2) In-service teachers' TPACK development

Much of the existing research on TPACK focuses on the TPACK development of pre-service teachers rather than in-service teachers. Examining in-service teachers' technology integrated pedagogy will contribute to assessing how their pedagogies can be transformed and developed.

Aims

This study, therefore, explores the following research questions:

RQ1: What degree of TPACK do LERC English teachers have?

RQ2: What difficulties do LERC English teachers experience in utilising technology in teaching?

RQ3: What kind of support do LERC English teachers believe they need to overcome difficulties?

By addressing the issues involved in integrating technology into schools, the present study will contribute to the development of pedagogy in language education sectors. This study will serve to encourage English teachers, teacher educators and school administrators to re-examine their current teaching practices.

Sampling and Methods

This study employs a mixed methodology, combining qualitative and quantitative approaches. The TPACK framework will be used as a theoretical framework. The participants of this research are 20 full-time in-service LERC English teachers (16 foreign teachers and 4 Japanese teachers). Figures 2, 3 and 4 illustrate the profile of the research participants. Most teachers were aged between 31 and 50, had between 11 and 20 years of English teaching experience, and between 1 and 5 years of teaching experience at the LERC.
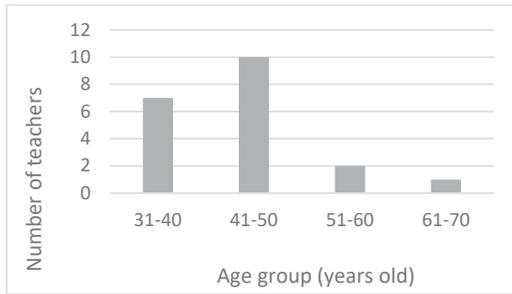
Figure 2

Age of LERC English Teachers (N=20)

Figure 3

LERC English Teachers' year(s) of English Teaching Experience (N=20)
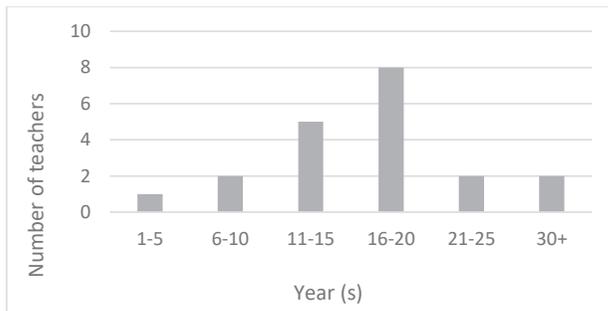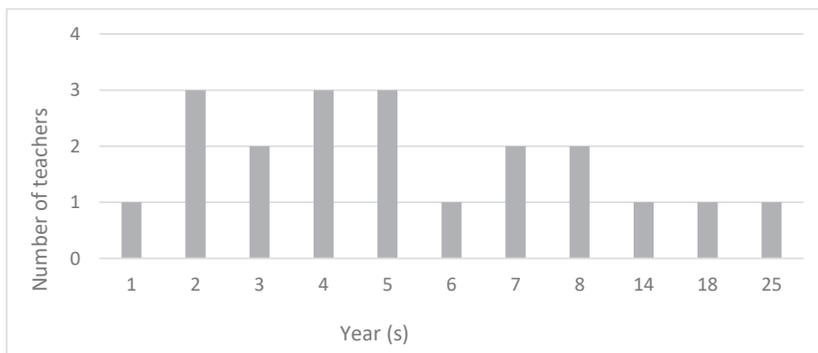

Figure 4

LERC English Teachers' year(s) of English Teaching Experience at the LERC (N=20)

Data was collected in March 2023 by mixed methods: (1) TPACK-EFL survey (see Appendix A) and (2) semi-structured (online) questionnaire (see Appendix B).

(1)   TPACK-EFL survey

A TPACK-EFL survey items, developed by Baser et al. (2015), are used to investigate the degree of teachers' TPACK (RQ.1).

(2)   Semi-structured (online) questionnaire

The TPACK-EFL survey contains 39 items in total (see Appendix A) and the participants were asked to numerically rate statements on a 5-point Likert scale (e.g., 1=strongly disagree, 2=disagree, 3=medium, 4=agree and 5=strongly agree). The pattern codes (e.g. TK1) used in the survey and subsequent data analysis are described below:

- Technological knowledge (TK): TK1-TK9 refer to questions 1-9 in the TK section of the survey
- Content knowledge (CK): CK10-CK14 refer to questions 10-14 in the CK section of the survey
- Pedagogical knowledge (PK): PK15-PK20 refer to questions 15-20 in the PK section of the survey
- Pedagogical content knowledge (PCK): PCK21-PCK25 refer to questions 21-25 in the PCK section of the survey
- Technological content knowledge (TCK): TCK26-TCK28 refer to questions 26-28 in the TCK section of the survey
- Technological pedagogical knowledge (TPK): TPK29-TPK35 refer to questions 29-35 in the TPK section of the survey
- Technological pedagogical and content knowledge (TPACK): TPACK36-TPACK39 refer to questions 36-39 in the TPACK section of the survey

This research also used a semi-structured (online) questionnaire to better understand the context-specific issues that teachers experience in teaching, and specifically the difficulties (RQ.2) and the support required to overcome them (RQ.3). This data was analysed using thematic analysis and data reduction techniques: transcribing, generating categories through coding, and interpreting data. I used the understandings of Hew and Brush (2006)'s theoretical framework, which distinguishes between two types of barriers that impact teachers' use of technology in the classroom: first-order barriers and second-order

barriers. I used pattern codes (e.g., 1-B=first-order barriers, 2-B=second-order barriers) during the process.

Results

The current use of technology in teaching

This section summarises technology that English teachers use in their classes (including online teaching). The data shows that the devices they use in their classes are PCs, tablets, smartphones, projectors, CD players and Blu-ray players in order of frequency used. Table 2 shows the software, applications, and websites the teachers mainly utilise in their classes with their designated purposes. Compared to foreign teachers, it was found that Japanese teachers tend to use less devices, software, applications, and websites in their Reading & Writing classes.

Table 2

Software, Applications, and Websites Frequently used by Teachers in Classroom Teaching

Software/apps/websites	Purposes
Moodle	Display lesson posts, post and explain assignments, assignment submissions, grading, e-learning, give instructions, managemsnt of resources, attendance, grade calculation
PowerPoint, Keynote, Googele slides, Word, Chrome, OneNote	Display content (instructions, homework deadlines, materials…etc.) in class, demonstrate presentation design, make lesson plans, note-taking, worksheet creation
DeepL, Google Translate, ChatGPT, dictionary (e.g. alc dictionary)	Show translations and usage notes of English words, translate instructions and answer student questions
Excel	Create worksheets, grading, attendance list, assignment completion tracking
Google forms	In class quizzes, student feedback, surveys
Randomlists.com	Put students into random groups/pairs
Xreading.com	Assign and review homework, inclass reading
Quizlet	Vocabulary review in class,vocabulary practice
OneDrive/Google Docs	Share documents with other teachers
zoom, Loom, Final Cut Pro	online/remote teaching
Instagram, TED, Spotify, YouTube, Vimeo	Provide media for use in leaning activities, show videos related to lesson content, BGM
Kahoot	Whole class review games
ELLLO.org, lyricstraining.com, Youtube	Dictation, Listening practice
MyELT	Assign and review homework
Xreading.com, Breakingnewsenglish.com, iSLCollective, BBC, British Council	Reading, create and present content

Note. The classes and the students' year were included in the questionnaire to analyse the research context, but they are not shown in the table to maintain participants' anonymity.

TPACK-EFL survey results

This section examines the findings relating to RQ1: What degree of TPACK do LERC English teachers have?

The TPACK survey section means, displayed in Figure 5, indicate that the degree of CK and PCK are high, with mean scores of 4.7 and 4.3 respectively on a 5-point scale. The degree of TK, PK and TCK are almost the same, with mean scores of approximately 4. TPK and TPACK are low, with mean scores of 3.8 and 3.5 respectively.

Figure 5

Mean TPACK-EFL Survey Section Scores
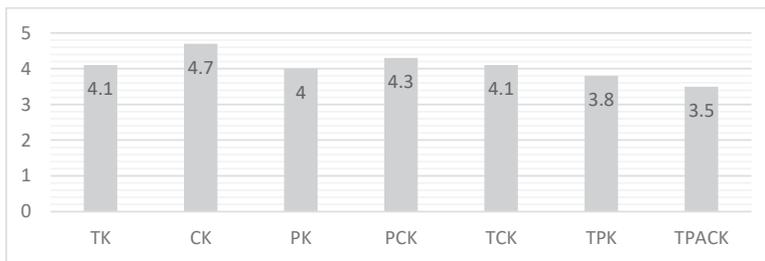
The scores for individual survey items, displayed in Table 3, show that the following items were rated lowly, indicating that teachers are not confident with creating original content using multiple media.

[Technological knowledge (TK)]

TK7: I can create multimedia using text, pictures, sound, video, and animation.

TK8: I can use collaboration tools in accordance with my objectives.

[Pedagogical knowledge (PK)]

PK19: I can reflect the experiences that I gain from professional development programs to my teaching process.

PK20: I can support students' out-of-class work to facilitate their self-regulated learning.

It can also be interpreted that teachers' self-efficacy for supporting students' use of technology in language learning is particularly low. This implies that teachers face issues related to students' technological knowledge and skills as well as their own knowledge and skills. This is shown by the following items being rated lowly:

[Technological pedagogical knowledge (TPK)]

TPK29: I can meet students' individualized needs by using information technologies.

TPK31: I can support students as they use technology such as virtual discussion platforms to develop their higher order thinking abilities.

[Technological pedagogical content knowledge (TPACK)]

TPACK 36: I can use collaboration tools to support students' language learning.

TPACK37: I can support students as they use technology to support their development of languages.

Table 3

Scores for TPACK-EFL Survey Items (N=20)

Technological knowledge (TK)

	Strongly disagree (%)				Strongly agree (%)
	1	2	3	4	5
TK1	0	0	5.3	15.8	78.9
TK2	0	5.3	0	15.8	78.9
TK3	0	0	0	26.3	73.7
TK4	0	5.3	21.1	10.5	63.2
TK5	0	0	5.3	47.4	47.4
TK6	0	0	10.5	36.8	52.6
TK7	10.5	21.1	21.1	21.1	26.3
TK8	21.1	26.3	21.1	10.5	21.1
TK9	5.3	5.3	36.8	15.8	36.8

Pedagogical knowledge (PK)

	1	2	3	4	5
PK15	0	0	5.3	42.1	52.6
PK16	0	0	10.5	42.1	47.4
PK17	0	0	26.3	42.1	31.6
PK18	0	5.3	42.1	31.6	21.1
PK19	5.3	0	5.3	52.6	36.8
PK20	0	10.5	36.8	36.8	15.8

Technological content knowledge (TCK)

	1	2	3	4	5
TCK26	0	0	15.8	31.6	52.6
TCK27	0	0	31.6	26.3	42.1
TCK28	0	5.3	36.8	21.1	36.8

Technological pedagogical content knowledge (TPACK)

	1	2	3	4	5
TPACK36	5.3	21.1	36.8	15.8	21.1
TPACK37	0	10.5	21.1	31.6	36.8
TPACK38	0	42.1	5.3	26.3	21.1
TPACK39	5.3	5.3	26.3	26.3	36.8

Content knowledge (CK)

	Strongly disagree (%)				Strongly agree (%)
	1	2	3	4	5
CK10	0	0	5.3	15.8	78.9
CK11	0	0	10.5	10.5	78.9
CK12	0	0	0	15.8	84.2
CK13	0	0	5.3	10.5	84.2
CK14	0	0	10.5	5.3	84.2

Pedagogical content knowledge (PCK)

	1	2	3	4	5
PCK21	0	0	5.3	31.6	63.2
PCK22	0	0	10.5	52.6	36.8
PCK23	0	0	10.5	42.1	47.4
PCK24	0	0	15.8	47.4	36.8
PCK25	0	0	5.3	42.1	52.6

Technological pedagogical knowledge (TPK)

	1	2	3	4	5
TPK29	0	15.8	36.8	26.3	21.1
TPK30	0	0	36.8	47.4	15.8
TPK31	5.3	31.6	26.3	26.3	10.5
TPK32	0	0	21.1	36.8	42.1
TPK33	0	5.3	15.8	36.8	42.1
TPK34	0	10.5	21.1	31.6	36.8
TPK35	0	0	10.5	52.6	36.8

The barriers that English teachers experience when utilising technology in teaching

The following results relate to RQ2: What difficulties do LERC English teachers experience in utilising technology in teaching?

The data shows that nine (45%) of the participants answered that they have had some difficulties with the use of technology in teaching. I have classified the difficulties and challenges identified in this study according to the knowledge developed by Hew and Brush (2006) (see Table 4). Both first-and second-order barriers were identified.

The first-order barriers identified involve (a) lack of resources: occasional connectivity issues, (b) institution: leadership (e.g. no uniform standards stated by KSU for student hardware requirements), (c) Assessment: homework. The second-order barriers included (d) teachers' attitudes and beliefs and (e) knowledge and skills: technology-supported pedagogy skills (e.g. a steep learning curve) and technology-related classroom management skills (e.g. cheating/discipline).

Table 4

The Classification of Barriers Identified in This Study

Classification of barriers			Examples
First-order	**(a) Lack of resources**	(1) Availability of technology/technical support	Occasional connectivity issues
		(2) Access to technology/time	Multiple sign-ins required for different sites in one class
	(b) Institution	Leadership/school plan	No uniform or minimum standards stated by KSU for BYOD by students
	(c) Assessment	Evaluating students' learning	Homework
Second-order	**(d) Attitudes & beliefs**	Teachers' belief about the educational purpose of using technology in the teaching and learning process	*"Technology for the most part gets in the way of the learning experience."*
	(e) Knowledge & skills	(1) Technology-supported pedagogy skills	(i) A steep learning curve
			(ii) Making teaching materials for online classes
		(2) Technology-related classroom management skills	(i) Student engagement/interaction
			(ii) Cheating/discipline
			(iii) Discrepancy of students' skills

Regarding second-order barriers, most of the teachers have positive attitudes toward the use of technology in their classes, however, they answered that they have experienced some difficulties due to the lack of their technological knowledge and skills. As Table 4 displays, (e)-(1) technology-supported pedagogy skills: (i) a steep learning curve, and (ii) making teaching materials for online classes as examples of barriers relating to teachers' knowledge and skills.

> Teachers' voices:
>
> *"The biggest difficulty with any technology was learning how to use it in the most efficient and effective way, which takes time."*
>
> *"Recording video lessons was particularly time consuming and not something I enjoyed."*

The strongest second-order barrier: technology-related classroom management skills

The data shows that (e) knowledge and skills: (2) technology-related classroom management skills, such as (i) student engagement/interaction, (ii) cheating/discipline, and (iii) discrepancy of students' skills are the strongest challenges experienced by teachers (see Table 4).

> Teachers' voices:
>
> *"One of the main challenges was not having any face-to-face contact with students in this time. I think students also struggled."*
>
> *"Students often use technology to cheat."*
>
> *"Greater flexibility led to students seeking 'shortcuts' to complete assignments."*
>
> *"Students have a wide range of ICT knowledge."*
>
> *"I struggled dealing with technical problems students had."*

How to overcome difficulties

This section explores the findings relating to RQ3: What kind of support do LERC English teachers believe they need to overcome difficulties?

The data shows that teachers believe that the university needs to take more responsibility to improve certain difficulties such as occasional connectivity issues. A teacher answered that he/she stopped using video when teaching on Zoom due to an unstable Internet

connection. On the other hand, some teachers were able to solve these technical issues themselves (e.g. by lightening the volume of the data or by asking students to download the data prior to the class). These teachers also advised that they did not have any difficulties in utilising technology for online teaching. This implies that there is discrepancy of teachers' skills, specifically, among their technological pedagogical knowledge (TPK) and technological pedagogical and content knowledge (TPACK).

For difficulties concerning teachers' knowledge and skills, some teachers do not believe that they need much support while others answered that it is too challenging for them to learn new technology.

> Teachers' voices:
>
> *"I don't need much support really. I think I need to educate myself better about technology."*
>
> *"I use certain websites. The rest are simply too difficult to use."*
>
> *"There should be training in using certain tools, for example, by taking online courses on how to use a tool."*

Regarding (e)-(2) technology-related classroom management skills such as (ii) cheating/discipline (see Table 4), some teachers answered that "the university should have clear and strict rules regarding academic dishonesty and cheating." The data shows that some teachers assume that letting students use their smartphones during the class disrupts classroom discipline. A teacher answered that they even stopped letting the students use digital devices during face-to-face classes, as they could not stop students from cheating.

For "discrepancy of students' skills", it was found that teachers believe it is too challenging to address the issue on their own.

> Teachers' voices:
>
> *"I didn't have difficulties in doing online classes. However, I think students found it hard to do online classes."*
>
> *"I think students also struggled (under COVID-19), as failure rates for English courses increased significantly."*
>
> *"There should be less of a laissez-faire approach by the university regarding training of students and there should be minimum requirements for hardware."*

Some teachers answered that "having students take online courses on how to use certain tools would be required to diminish the discrepancy of the students' technological knowledge and skills." Further studies are required to identify what types of training are needed to address these issues.

The online teaching experience under COVID-19 and teachers' pedagogical beliefs

While some teachers answered that they have had various issues with the use of technology in teaching, others possess positive attitudes toward the use of technology in their class.

Teachers' voices:

"It hasn't affected my teaching philosophy, but it has made me more organised because I now keep everything in an organised format online."

"I use PPT to present materials in face-to-face classes. It helped me realize the advantages and disadvantages of both face-to-face and online learning. I feel that a mix of both should be used."

"Teaching online has made me re-think how I use technology. I don't use technology now unless I feel it adds something valuable (...)."

As the data shows, some teachers believe that the shift from traditional face-to-face class to online teaching experience under COVID-19 has positively affected their pedagogy.

Discussion

The strongest barriers to utilising technology in teaching and how to overcome them

It was found that the strongest barriers to the use of technology in teaching are second-order barriers, specifically, teachers' knowledge and skills, which strengthens the existing knowledge discussed in the literature review (Shin, Han, & Kim, 2014). In this research context, teachers' (1) technology-supported pedagogy skills and (2) technology-related classroom management skills were identified as the strongest barriers.

As discussed in the results section, some teachers possess negative attitudes and beliefs toward the use of technology in teaching. Some teachers believe that allowing

students to use their smartphones during the class disrupts classroom discipline. A teacher even answered that "technology for the most part gets in the way of the learning experience." On the other hand, those who have a positive perspective toward educational technology have started utilising artificial intelligence (AI) chatbots such as ChatGPT in their classes. Some teachers are even developing their original applications for teaching. This implies that the discrepancy of teachers' technology-supported pedagogy skills might be broadened depending on their pedagogical attitudes and beliefs.

Although it will be controversial to suggest that all teachers should use the same tools in the same ways, there should be an opportunity to share difficulties with other teachers regardless of their pedagogical beliefs. At the LERC, there is a regular professional development (PD) meeting held once a week. During this meeting, teachers can share their teaching practice, including both successes and failures in developing technology integrated pedagogy. For those who believe that they do not need much support, the PD session might be received as a "waste of time". To make the sessions meaningful for those teachers, there should be clear and concrete objectives relating to their own problems. As discussed in the results section, the ways of using technology seem to be different depending on the class (e.g. teachers use less devices, software, applications and websites in reading and writing classes). Teachers can be divided into smaller groups during the session depending on the class (e.g. listening and speaking, and reading and writing, or student proficiency level) to encourage them to discuss more context-specific issues. Furthermore, observing other teachers' classes (both face-to-face and online) could also give teachers new perspectives that could be employed in their own teaching practice. It should be discussed whether these PD sessions are mandatory or optional as it could have a negative impact on teachers' pedagogical belief if they feel "forced".

The present study also identified the issues concerning students' use of technology in the classroom. Specifically, "discrepancy of students' skills" was identified as one of the strongest barriers teachers have experienced. This adds new insight into the theoretical framework developed by Hew and Brush (2006), as the classification of barriers has previously focused only on teachers.

The Organisation for Economic Co-operation and Development (OECD, 2023) notes that teachers' and students' skills in utilising technology in education are interrelated. "Developing students' digital competences constitutes a core objective of the national

curriculum in Japan. This may provide indirect incentives for teachers to develop their own digital skills and competences." As mentioned in the results section, some teachers believe that "having students take online courses on how to use certain tools would be required to diminish the discrepancy of the students' technological knowledge and skills." However, students may take "shortcuts" if they are forced to take "compulsory" online training. Further research should be undertaken to examine what kind of support is needed to overcome the issues concerning students' technological competencies.

Conclusion

The aim of this study was to investigate the issues LERC English teachers experience in utilising technology in teaching and to examine what kind of support they need to overcome difficulties. By employing the TPACK framework, the present study assessed teachers' current technological knowledge and skills in teaching. The results of the TPACK-EFL survey show that the degree of CK and PCK are high, while the degree of TPK and TPACK are low. The analysis of the data revealed that teachers' self-efficacy for assisting students' use of technology in language learning is particularly low. This implies that the issues teachers face are related to students' technological knowledge and skills as well as teachers' own knowledge and skills.

The results illustrate that 45% of the teachers answered that they have faced some difficulties when using technology in teaching. The first-order barriers identified in this research context involve (a) lack of resources: occasional connectivity issues, (b) institution: leadership (e.g. no uniform standards stated by KSU for student hardware requirements), (c) Assessment: homework. The second-order barriers included (d) teachers' attitudes and beliefs and (e) knowledge and skills: (1) technology-supported pedagogy skills and (2) technology-related classroom management skills. Amongst 2) technology-related classroom management skills, (i) student engagement/interaction, (ii) cheating/discipline and (iii) discrepancy of students' skills were identified as the strongest challenges experienced by teachers.

The present study also examined what kind of support is required for teachers to overcome difficulties. It was found that teachers believe that the university needs to take more responsibility to improve the issues such as occasional connectivity issues and students' academic dishonesty and cheating. For "discrepancy of students' skills", which was identified

as one of the strongest issues, it was found that teachers believe it is too challenging to address the issue on their own. Although some teachers answered that having students take online courses will be effective to diminish the discrepancy of the students' technological knowledge and skills, further studies are required to clarify what types of training are needed to address these issues.

Tondeur et al. (2012) argue that it is essential to provide teachers with training, not only in the use of specific technologies, but also in how to select and adapt technologies for use in specific educational contexts to teach specific subject content. We must develop the strategies to overcome these issues by sharing difficulties with other teachers in the faculty. The instalment of technology does not always lead to the effective use of technology as educational technology integration in teaching depends on teachers' intrinsic factors. As Wong (2013) suggests, technology in itself cannot change classrooms; it is the teachers and their pedagogical use of technology that will enhance teaching and learning. This research will contribute toward knowledge about how to develop teachers' technology integrated pedagogies, specifically in language education sectors.

Limitations and Future Research

Although this study strengthens the existing knowledge developed by Hew and Brush (2006), the strategies to overcome each type of barrier remain unclear. Particularly, ways to address the difficulties concerning technology-related classroom management skills, such as (i) student engagement/interaction, (ii) cheating/discipline and (iii) discrepancy of students' skills are not clear. Further research will be required to clarify what kind of support is required for teachers to overcome these issues.

This study has only focused on teachers' use of technology in teaching without examining students' perceptions in language learning. As the strongest barriers identified in the present study are related to the students' technological knowledge and skills, as well as the teachers' own knowledge and skills, further research from students' point of view will be required. For future research, I would like to investigate the issues students experience in utilising technology in language learning at the LERC and explore what kind of support is needed to overcome the difficulties. If doing a study of only the students in my own classes, conducting a survey and interviewing a selection of students from a sample size of approximately 300 to 350 students would be feasible. The study would need to be conducted

considering student variables such as students' proficiency levels and the type of the class (e.g. listening and speaking, and reading and writing) to investigate context-specific problems. I would also like to focus on teachers' "non-use" of technology in future research. Some teachers answered that technology can get in the way of the learning experience, however, their pedagogical beliefs behind their "non-use" are not examined in the present study. I would like to conduct qualitative research focusing on those who possess negative attitudes toward educational technology or those who do not utilise technology in teaching.

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Appendix A

TPACK-EFL Survey Items

Technological knowledge (TK)
(1) I can use basic technological terms (e.g. operating system, wireless connection, virtual memory, etc.) appropriately.
(2) I can adjust computer settings such as installing software and establishing an Internet connection.
(3) I can use computer peripherals such as a printer, a headphone, and a scanner.
(4) I can troubleshoot common computer problems (e.g. printer problems, Internet connection problems, etc.) independently.
(5) I can use digital classroom equipment such as projectors and smart boards.
(6) I can use Office programs (e.g. Word, PowerPoint, etc.) with a high level of proficiency.
(7) I can create multimedia (e.g. video, web pages, etc.) using text, pictures, sound, video, and animation.
(8) I can use collaboration tools (e.g. wiki, 3D virtual environments, etc.) in accordance with my objectives.
(9) I can learn software that helps me complete a variety of tasks more efficiently.

Content knowledge (CK)
(10) I can express my ideas and feelings by speaking in English.
(11) I can express my ideas and feelings by writing in English.
(12) I can read texts written in English with the correct pronunciation.
(13) I can understand texts written in English.
(14) I can understand the speech of a native English speaker easily.

Pedagogical knowledge (PK)
(15) I can use teaching methods and techniques that are appropriate for a learning environment.
(16) I can design a learning experience that is appropriate for the level of students.
(17) I can support students' learning in accordance with their physical, mental, emotional, social, and cultural differences.
(18) I can collaborate with school stakeholders (students, parents, teachers, etc.) to support students' learning.
(19) I can reflect the experiences that I gain from professional development programs to my teaching process.
(20) I can support students' out-of-class work to facilitate their self-regulated learning.

Pedagogical content knowledge (PCK)
(21) I can manage a classroom learning environment.
(22) I can evaluate students' learning processes.
(23) I can use appropriate teaching methods and techniques to support students in developing their language skills.
(24) I can prepare curricular activities that develop students' language skills.
(25) I can adapt a lesson plan in accordance with students' language skill levels.

Technological content knowledge (TCK)
(26) I can take advantage of multimedia (e.g. video, slideshow, etc.) to express my ideas about various topics in English.
(27) I can benefit from using technology (e.g. web conferencing and discussion forums) to contribute at a distance to multilingual communities.
(28) I can use collaboration tools to work collaboratively with foreign persons (e.g. wiki, etc.).

Technological pedagogical knowledge (TPK)
(29) I can meet students' individualized needs by using information technologies.
(30) I can lead students to use information technologies legally, ethically, safely, and with respect to copyrights.
(31) I can support students as they use technology such as virtual discussion platforms to develop their higher order thinking abilities.
(32) I can manage the classroom learning environment while using technology in the class.
(33) I can decide when technology would benefit my teaching of specific English curricular standards.
(34) I can design learning materials by using technology that supports students' language learning.
(35) I can use multimedia such as videos and websites to support students' language learning.

Technological pedagogical content knowledge (TPACK)
(36) I can use collaboration tools (e.g. wiki, 3D virtual environments, etc.) to support students' language learning.
(37) I can support students as they use technology to support their development of language skills in an independent manner.
(38) I can use Web 2.0 tools (animation tools, digital story tools, etc.) to develop students' language skills.
(39) I can support my professional development by using technological tools and resources to continuously improve the language teaching process.

Appendix B

Questionnaire Items

Please answer the following questions.

Q1. Age group (please circle)

     21〜30 ・31〜40 ・41〜50・ 51〜60・ 61〜70・ 70 years old+

Q2. How many years of teaching experience as an English teacher do you have? (please circle)

     1〜5 ・ 6〜10 ・ 11〜15 ・ 16〜20 ・ 21〜25 ・ 25〜30 ・ more than 30 years

Q3. How many years of teaching experience at KSU do you have? (   ) years

Q4. What kind of ICT hardware devices do you utilise when teaching English at KSU? (*including online teaching) e.g. iPad, PC…etc.

Q5. What kind of apps/software do you utilise when teaching English at KSU? (*including online teaching) e.g. PowerPoint, Keynote, ChatGPT…etc.

Q6. In which classes do you use these ICT tools? e.g. Speaking and Listening class

Q7. How do you utilise these tools in teaching at KSU? (*including the purposes)

Q8. Do you have any difficulties/challenges when utilising the technology in teaching at KSU?

     Yes / No

Q9. If you answered yes, what kind of difficulties/challenges do/did you face?

Q10. What kind of support do you think you need to overcome these difficulties?

Q11. How did the shift from traditional face-to-face class to online teaching experience between 2020 and 2021 under COVID-19 affect the way you use technology in teaching? Did you have any difficulties/challenges at that time?

Q12. How has that online teaching experience at that time affected your current face-to-face teaching? Did that experience affect your pedagogy?

Note. The online questionnaire can be accessed using the following link:
https://forms.gle/Txk5CLHndjKmZN2M8