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From knowledge to inclusion: Culturally responsive TPACK (TPACCK)

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Abstract

Technological pedagogical content knowledge (TPACK) is one of the most widely used frameworks mobilized to support technology integration. Building on recent scholarship that calls for more inclusive and contextualized TPACK to improve technological integration at the local level, this study situates and empirically analyzes the influence of cultural variables in TPACK implementation by a Canadian EFL teacher working in the Japanese university context. It uses analytic autoethnography that draws on culturally responsive teaching and Western and Japanese cultural theories. The results highlight the critical limitations of the current TPACK model in intercultural environments and argue for the inclusion of cultural knowledge as a distinct but overlapping knowledge construct (TPACCK). This model would give greater attention to teachers' cultural knowledge, thus better equipping educators and organizations to overcome cultural challenges that arise in implementing pedagogies, content, and technologies in intercultural contexts.

Keywords: Culturally responsive teaching, EFL, Technological Pedagogical Content Knowledge, TPACK, Teacher education

Introduction

There is general consensus among education scholars that, while technology can support and enhance learning, its integration is complex (Jacobsen et al., 2002; Lai & Bower, 2019; Schuck & Kearney, 2008). Its applications have thus been theorized through critical models. One of the dominant models, TPACK (technological, pedagogical, and content knowledge) emerged from Lee Shulman's seminal pedagogical content knowledge (PCK) model (1986). Koehler and Mishra (2005) expanded Shulman's conceptualization to include technological knowledge as a separate, but interrelated construct, resulting in TPACK (Figure 1). Since its introduction, research has found that practical applications of TPACK can support teacher education (Chai et al., 2013; Voogt et al., 2013), and that its framework

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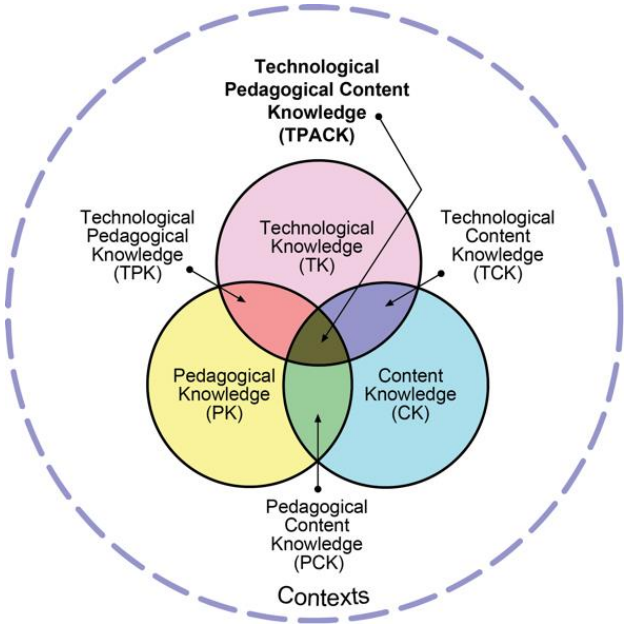


Fig. 1 TPACK reproduced from Koehler (2012, September 24)

for training and evaluation (Chai et al., 2013) is positively related to teacher self-efficacy (Joo et al., 2018). Consequently, TPACK has become one of the most influential technology integration models in education, and developing TPACK has become an objective of teacher education programs globally (Voogt et al., 2013).

Although context is understood to be central to TPACK (Koehler et al., 2013; Rosenberg & Koehler, 2015), scholarship has demonstrated the limitations of the current model in sufficiently addressing the complexity of contextual variables on technology integration in teaching (Greene & Jones, 2020; Koh et al., 2014; Mishra & Warr, 2021; Porras-Hernández & Salinas-Amescua, 2013; Saubern et al., 2020; Warr et al., 2019). Rosenberg and Koehler's (2015) meta-analysis on contextual variables within over 190 TPACK-focused publications not only found that the meaning of context was interpreted in various ways, but that context was often missing altogether in the final analysis. Other research has called for a more nuanced understanding of different levels of context in broader complex sociocultural systems (Porras-Hernández & Salinas-Amescua, 2013; Swallow & Olofson, 2017), even suggesting that the lack of attention to contextual factors in TPACK has limited the effectiveness of its application (Koh et al., 2014; Mishra, 2019; Mishra & Warr, 2021). According to Mishra (2019), contextual knowledge is "of critical importance to teachers, and a lack of it limits the effectiveness and success of any TPACK development, or a teacher's attempts at technology integration" (p. 77).

Literature review

The importance of including cultural variables in technology practice

Research demonstrates that both visible and invisible cultural issues affect technology practice (Kyriakoullis & Zaphiris, 2016) because technology is appropriated and operationalized differently by disparate groups and realized uniquely at an individual level (Angeli & Valanides, 2009; Mishra & Koehler, 2006). In English as a Foreign Language (EFL) contexts, teachers and students rarely share the same cultural attributes, yet they are required to use the same technology. This can result in classroom tension, such as in scenarios wherein teachers and students are required to use technology developed for users with different linguistic and cultural attributes (Lai et al., 2016; Rubadeau, 2018). Further, while sociocultural norms and values shape education (Alexander, 2001; Tobin et al., 2009; Yoshimoto et al., 2007), students and teachers with different cultural backgrounds can have incongruent experiences, values, expectations, and assumptions about education. Pedagogical concepts such as "goal directed learning," "collaborative learning," and "active learning" can have different meanings and manifestations depending on culture; the end result can be sociocultural tensions that affect perception and motivation (Duff & Uchida, 1997; Hu, 2002; Simpson, 2008). Moreover, there can be cultural resistance to imported pedagogies (Hu, 2002). And while it has become common for national policies to set standards for specific content in curriculum (Crăciun, 2018; de Wit & Altbach, 2021), this practice disregards the importance of incorporating content related to students' historical and contemporary understanding and personal interests. As such, inclusion of local cultural values within course content can enhance student engagement and improve efficacy (Aronson & Laughter, 2016). This extends also to technology-enhanced instructional design, as research indicates that cultural factors not only affect the acceptance and ways of using technology for learning (Leidner & Kayworth, 2006), but also the availability of and experience with technology (Arpaci, 2015; Warschauer, 2004). Culture can thus significantly affect technology experiences and uses for both teachers and learners.

Limited research on cultural variables in TPACK scholarship

TPACK has drawn enough attention to have warranted several notable reviews of the growing scholarship (Chai et al., 2013; Greene & Jones, 2020; Rosenberg & Koehler, 2015; Tseng et al., 2020; Voogt et al., 2013; Willermark, 2018; Yeh et al., 2021). However, only three of these reviews referenced culture in TPACK scholarship (Chai et al., 2013; Greene & Jones, 2020; Rosenberg & Koehler, 2015). Furthermore, the references to culture were limited to institutional (school) culture and did not offer in-depth examination of other cultural influences on education and learning, such as national culture and language.

Individual studies that analyze cultural influences in TPACK operationalization are also limited. For instance, approaching 21st century constructivist learning design as a "new culture of learning," Chai et al. (2017) found that teacher beliefs, design thinking, and TPACK were positively related. However, they did not analyze the role of national cultural values on initial beliefs. Adam (2015, 2017) analyzed the role of national culture on teacher beliefs and found that teacher-embodied cultural beliefs affected pedagogical content-oriented and technological practice. But while Adam's research demonstrates the influence of the teacher's culture on their beliefs, it does not consider the influence of context-bound cultural factors on teacher TPACK operationalization. Chai et al. (2013) conceptualized the influence of separate teacher and student TPACK systems; however, the relationship between the two systems has not yet been researched. And Koh et al. (2014) analyzed culture at the institutional level. They found that school organizational culture affected teacher TPACK operationalization; however, they did not examine contested national cultural variables that often exist in culturally diverse classrooms. As such, the TPACK literature analyzing operationalization from a cultural perspective is limited. Particularly given the increasing diversity of global higher education, further development is critically needed.

Culturally responsive teaching

This study draws upon culturally responsive teaching (CRT) (Gay, 2002; Ladson-Billings, 1995), a pedagogical approach that compels teachers to not only accept cultures into their classrooms but also to utilize student culture to promote learning. CRT is also referred to as *culturally relevant*, or *culturally congruent* teaching. A key component of CRT is sociocultural consciousness, defined as "the awareness that a person's worldview is not universal but is profoundly influenced by life experiences, as well as mediated by a variety of factors, including race, ethnicity, gender, and social class" (Villegas & Lucas, 2007, p. 31); under-developed sociocultural consciousness can lead to misinterpretation and miscommunication. CRT developed as a response to concern about the disparity in learning outcomes in multicultural classrooms in the United States, in which student populations are ethnically diverse, but teacher demographics are homogenous, with 90% self-identifying as Caucasian (Vavrus, 2008). Generated in this context, CRT calls attention to the significance of culture as a mediating factor in education. Specifically, it addresses how students coming from culturally divergent backgrounds are marginalized and tend to attain lower results partly because they are expected to perform in educational systems developed within a different worldview. In response, CRT is learner-centered and strives to reform classroom environments by making learning more culturally relevant: teachers are called to proactively use student and community cultural knowledge in education to assist with learning objectives. And although CRT research is heavily focused on multicultural

settings at American institutions, there have been increasing applications of CRT in EFL contexts (e.g., Chou et al., 2018; Lin, 2009; Meihami, 2023), and research that suggests that EFL teachers would benefit from professional development that emphasizes greater integration of local culture (Cheung, 2001; Duff & Uchida, 1997; Iino, 2018; Luk, 2012; Xu, 2002). However, research examining the role of culture on teachers' technology-integrated pedagogical methods remains limited.

This study builds on existing scholarship to advance our understanding of the role of cultural variables in technology integration and TPACK knowledge operationalization in an intercultural context. It aims to address the critical limitations of the current TPACK construct through an empirical examination of the cultural variables in the EFL higher education context. Taking seriously Chai, Koh and Tsai's (2013) call for more ethnographic research to unpack the complexity of understanding teacher beliefs in relation to contextual affordances and constraints in TPACK (p. 38), this qualitative study mobilizes analytic autoethnography. Drawing heavily upon my documented experiences from April 2013 to May 2020 as a Canadian EFL teacher in Japan adopting a culturally responsive approach, this article provides an empirical analysis of cultural influences in context-based TPACK deployment and investigates the following research questions:

1: What cultural tensions influenced my TPACK operationalization as a Canadian EFL teacher working in the Japanese university context?

2: How and why do these cultural tensions affect TPACK operationalization?

3: How are these cultural tensions mediated when adopting a culturally responsive pedagogical approach?

Methods

This inquiry utilizes analytic autoethnography because of how it affords a deep exploration of the lived experience of a Canadian teacher in the Japan EFL context. Autoethnography is qualitative research that utilizes autobiographical data "to engage in cultural analysis and interpretation" (Chang, 2016, p. 43). Analytic autoethnography is distinguished from ethnography in that it uses the researcher's own life and experience as the case to understand broader social issues. It also differs from other forms of narrative analysis, such as memoirs and evocative autoethnography in that it is not meant to simply document a personal experience or provoke an emotional response (Chang, 2016). Rather, its goal is to empirically analyze the data gathered from the researcher's lived experience to gain insight into broader social processes (Anderson, 2006, p. 387).

Based on my extensive experience working in Japanese universities, combined with my background conducting academic research that examines cultural variables in technology implementation and instructional design (Haga, 2017, 2018, 2023; Haga & Rappeneker,

2021), I meet the member–researcher criteria for analytic autoethnography: "(1) a full member of the research group, (2) visible as such in published texts, and (3) committed to developing theoretical understandings of broader social phenomena" (Anderson, 2006, p. 373). Thus, located within accepted practice, my use of analytic autoethnography also widens the research lens by applying the qualitative analysis of my lived experience to the broader discussions on technologically enhanced instructional design in increasingly diverse higher education contexts.

Data collection

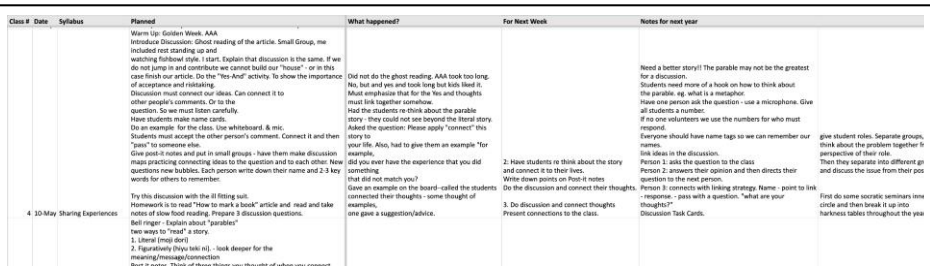
1078 concurrent reflections, 933 post-event discovery reflections and 2345 student survey data were collected for the seven-year period this study analyzed (April 2013 to May 2020) (Table 1). Student survey data were collected anonymously using online software (SurveyMonkey, Google Forms), for which students had given approval for their responses to be used for research purposes.

Concurrent reflections included entries recorded in Excel after each lesson with comments on the lesson's outcomes in terms of student engagement, perceived tensions, and necessary changes (Figure 2).

I used this data to create a timeline of specific events, based on Chang's articulation of post-event discovery reflections, an approach using self-narrative reflections of events, lessons, and student comments (Chang, 2008, p. 100).

Table 1 January 2018 end of term questionnaire

Question
This year we learned the following: 1. How to discuss (making and responding to questions, conversation phrases) 2. How to explain your work experiences logically 3. About different types of jobs 4. About the product cycle (design, research, advertise) How did these topics meet your expectations for the course? What was your impression of the product life cycle unit? What can be done to improve it? How did you feel about making questions in English? What was the least effective activity? Why?



Class #	Date	Syllabus	Planned	What happened?	For Next Week	Notes for next year	
4	10-May	Sharing Experiences	Warm Up: Golden Week. AAA Introduce Discussion: Ghost reading of the article. Small Group, me included rest standing up and watching fishbowl style. I start. Explain that discussion is the same. If we do not jump in and contribute we cannot build our "house" - or in this case finish our article. Do the "Yes-And" activity. To show the importance of acceptance and risktaking. Discussion must connect our ideas. Can connect it to other people's comments. Or to the question. So we must listen carefully. Have students make name cards. Do an example for the class. Use whiteboard. & mic. Students must accept the other person's comment. Connect it and then "pass" to someone else. Give post-it notes and put in small groups - have them make discussion maps practicing connecting ideas to the question and to each other. New questions new bubbles. Each person write down their name and 2-3 key words for others to remember. Try this discussion with the ill fitting suit. Homework is to read "How to mark a book" article and read and take notes of slow food reading. Prepare 3 discussion questions. Bell ringer - Explain about "parables" two ways to "read" a story. 1. Literal (moji dori) 2. Figuratively (hiyu teki ni) - look deeper for the meaning/message/connection	Did not do the ghost reading. AAA took too long. No, but and yes and took long but kids liked it. Must emphasize that for the Yes and thoughts must link together somehow. Had the students re-think about the parable story - they could not see beyond the literal story. Asked the question: Please apply "connect" this story to your life. Also, had to give them an example "for example, did you ever have the experience that you did something that did not match you? Gave an example on the board--called the students connected their thoughts - some thought of examples, one gave a suggestion/advice.	2: Have students re think about the story and connect it to their lives. Write down points on Post-it notes Do the discussion and connect their thoughts. 3. Do discussion and connect thoughts Present connections to the class.	Need a better story!! The parable may not be the greatest for a discussion. Students need more of a hook on how to think about the parable. eg. what is a metaphor. Have one person ask the question - use a microphone. Give all students a number. If no one volunteers we use the numbers for who must respond. Everyone should have name tags so we can remember our names. link ideas in the discussion. Person 1: asks the question to the class Person 2: answers their opinion and then directs their question to the next person. Person 3: connects with linking strategy. Name - point to link - response. - pass with a question. "what are your thoughts?" Discussion Task Cards.	give student roles. Separate groups, think about the problem together fr perspective of their role. Then they separate into different gr and discuss the issue from their pos First do some socratic seminars inne circle and then break it up into harkness tables throughout the year

Fig. 2 Example concurrent reflections for one class

Method of coding and analysis

Qualitative data were systematically coded and analyzed with NVivo 12. A priori codes established from the TPACK model and Western and Japanese cultural concepts were merged with data-driven codes to form themes.

Western cultural frameworks

Cultural implications were coded based on dimensions found in both Western cultural frameworks and Japanese cultural concepts. Two Western cultural frameworks provided an appropriate lens: Hall's (1976) intercultural communications framework and Hofstede's (1980, 2001) cultural dimensions theory. Both of these models are widely used in research to describe aspects of intercultural communication (Kirkman et al., 2006; Kittler et al., 2011), and although there is some overlap, they describe distinct traits useful to this study.

Hofstede's (1980, 2001) cultural model locates culture within six different dimensions: power distance, uncertainty avoidance, individual/collective orientation, gender role socialization, time, and restraint/indulgence. According to Hofstede et al. (2010), the cultures of Japan and Canada are polar opposites in all dimensions (Figure 3).

Edward T. Hall's (1976) intercultural communication theory examines the ways cultures communicate along three dimensions: context, time, and space. Communication in Canadian English and Japanese are viewed to be at opposite ends of the spectrum (Figure 4).

Criticisms of Western cultural models

Despite the wide use of Hofstede and Hall's cultural models, they have been criticized for being highly reductionistic, for ignoring variations within a nation (McSweeney, 2002), and for containing Western philosophical bias that does not accurately reflect cultural attributes of non-Western societies (Fang, 2003; Yeh, 1988). Taking these criticisms into consideration, there is nonetheless an extensive body of research that validates their use (Kirkman et al., 2006). Hence, mobilizing these dimensions in this study offers an empirical basis for describing behavioral differences between cultures. To mitigate the limitations of these models, I also consider tensions from a Japanese emic perspective, bringing Japanese cultural concepts in the data coding and analysis.

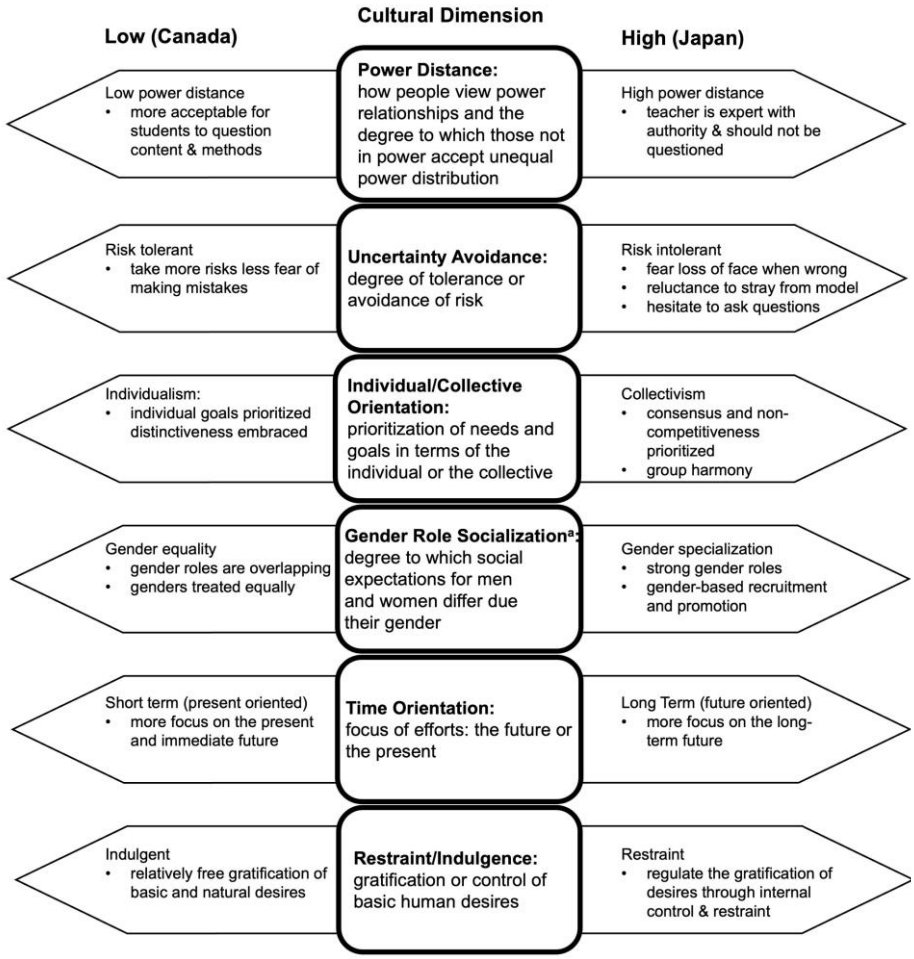


Fig. 3 Cultural model adapted from Hofstede et al. (2010)

[a] The original Masculinity-Femininity label is adapted here to reflect social significance rather than stereotypical labeling of "masculine" and "feminine" values.

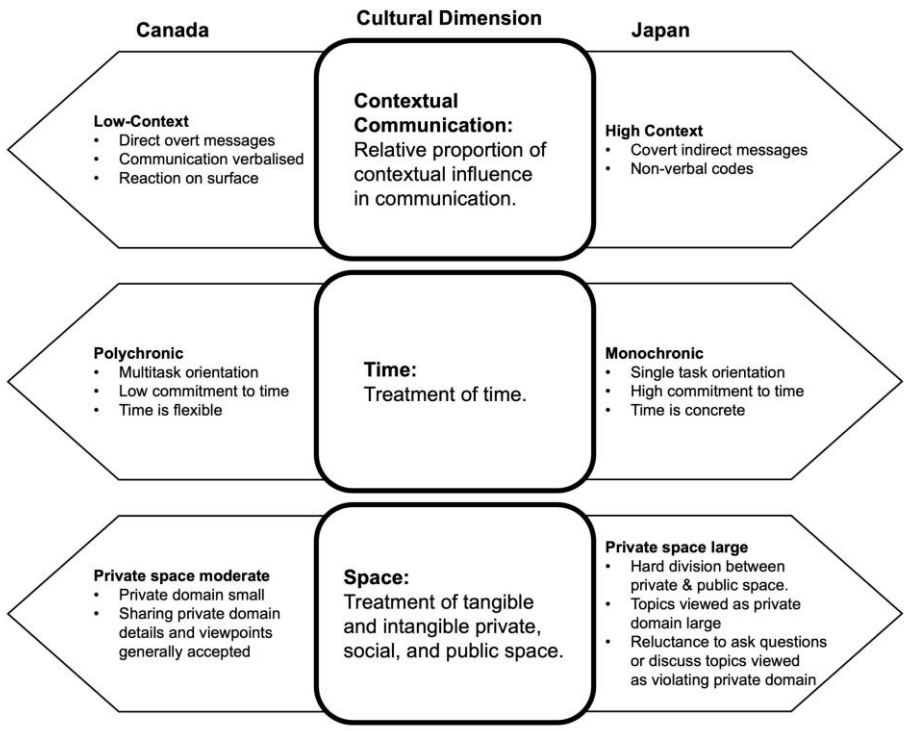


Fig. 4 Cultural dimensions adapted from Hall and Hall (1990)

Japanese cultural values

Interdependent view of self

In Western perspectives, understandings of the self are egocentric, viewed as an independent actor. In contrast, anthropologists indicate that, for Japanese people, the self is viewed as interdependent (Figure 5). Hofstede et al. (2010) refer to this relationship "collectivism" as "the power of the group" over that of the individual (p. 91). Yet the notion of group "power" over the individual is based on Western egocentrism. From the Japanese emic perspective, the connection of "insider" status within a group is not sensed as "powerlessness," but interdependence—like an organ within a body. Another defining distinction is that the Japanese sense of self is accepted as socially and contextually relative (Lebra, 1976), meaning that opinions and goals may change depending on the context. This interdependent, contextually relational view of the self affects communication, which prioritizes harmony (*wa*) within groups.

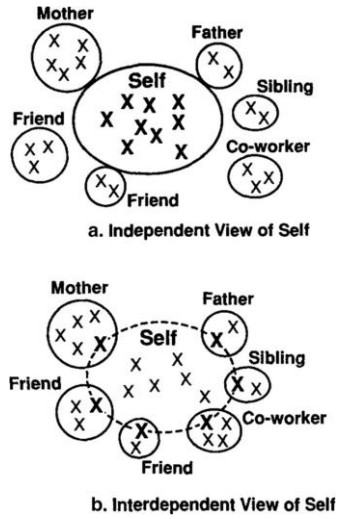


Fig. 5 Independent and interdependent view of self (reproduced from Markus & Kitayama, 1991, p. 226)

Uchi/soto

A fundamental organizational focus of Japanese self, social life, and language is the concept of *uchi* (inside) and *soto* (outside) (Bachnik, 2019, p. 3). These emic concepts in Japanese are distinct from Western etic concepts of "private" and "public." *Uchi* refers to being a member of a collective and *soto* means being outside of that collective. However, the boundaries of *uchi* and *soto* shift in relation to the context. For instance, in the classroom, two students in the same club may view students not in the club as *soto*, but then view them as *uchi* in relation to the teacher. The social influence of these concepts can be compared with "power distance," which refers to how people view power relationships and the degree to which those not in power accept unequal power distribution (Hofstede et al., 2010). However, while power distance is a vertical hierarchy that affects social relations, the *uchi*/*soto* dynamic provides horizontal indexing crucial for Japanese social order and interactions (Bachnik, 2019). Although these processes are universal and not limited to Japanese people, insider/outsider indexing in Japanese society is recognized as a fundamental habitus anchoring social relations that define an interdependent orientation, sense of belonging, and harmonious relations within a community (Bachnik, 2019).

Face

Another important consideration for communication in Confucian-influenced societies, such as China, Korea, and Japan, is "face." Although "face" may be differently understood across cultures, the social significance is similar, whereby "face" informs a "positive social image or honor, or prestige, or reputation" through one's actions (Haugh, 2005, p. 213). In

Japanese interactions, the notion of face extends beyond the individual to include the *uchi* group to which one belongs. The emic notion of face in Japan also has several different meanings and is directly related to the social relativity of an individual's construction of identity and (im)politeness in interactions (Haugh, 2005). And face considerations include the face of others. For example, in the classroom students may protect the face of the higher status teacher by not questioning their explanation.

Cultural code descriptors

All this material was activated to generate an effective coding system for this study. Using cultural dimensions from both Western and Japanese cultural models, I identified an initial list of code descriptors, which I used to code the data (Table 2).

The second level of data analysis involved reducing initial coded items (Table 2) by summarizing and identifying major clusters or "categories." Four categories were identified: social norms and social roles; communication norms; education norms, values, and experiences; and linguistics (Table 3). "Norms" are understood to be "social attitudes of approval and disapproval, specifying what ought to be done and what not be done" (Sunstein, 1996, p. 914). Many norms are specific to social roles that foster particular types of behaviors and expectations. For instance, the roles of teachers and students can be accompanied by assumptions about discrete role-specific behaviors (Heiss, 2017), as can beliefs about gender roles (Eagly & Wood, 2011). Communication norms refer to explicit and implicit expectations and assumptions regarding ways of communicating. As, for instance, in the ways one might express disagreement in a discussion. Education norms, values, and experiences included items related to the beliefs and expectations of formal learning in higher education, and background knowledge. Finally, linguistic items were those related to the ability to understand and operate in a particular language.

These cultural items (Table 3) were then coded in relation to technology, pedagogy, and content knowledge using Mishra and Koehler's (2006) descriptions, in order to interrogate how cultural influences impact all TPACK constructs (Table 4).

Table 2 Initial cultural code descriptors

Variable	Assumptions and expectations related to:
Power distance	• Hierarchy dynamics, perceptions of power
Uncertainty avoidance	• Risk taking and/or avoidance
Individual vs. collective/interdependent orientation	• Relative emphasis of the individual vs. the collective and/or interdependence
Gender role socialization	• Gender expectations
Time orientation	• Temporal focus
Restraint/indulgence	• Restraint or gratification of human desires
Contextual communication	• Verbal vs. non-verbal forms of communication
Space	• Perceptions of private and public space
Uchi and *soto*	• Insider/outsider social relations

Table 3 Final cultural code descriptors

Variable	Assumptions and expectations related to:
Social norms & social roles	• Role-specific behaviors
Communication norms	• Ways of communicating
Education norms, values, and experiences	• School experience and values
Linguistics	• Understanding, ability, and comfort to communicate in a particular language

Table 4 TPACK code descriptors (Mishra & Koehler, 2006, p. 9)

Variable	Assumptions and expectations related to:
Technology (TK)	• Technologies and skills required to operate
Pedagogy (PK)	• Transforming content to learnable form
Content (CK)	• Subject matter—course curriculum
Technological Pedagogical (TPK)	• Pedagogical affordances and constraints of technological tools as they relate to teaching objectives
Pedagogical Content (PCK)	• Understanding of how particular subject matter topics can be organized, presented, and adapted to meet learner needs
Technological Content (TCK)	• Influence between content and technology
Technological Pedagogical Content (TPACK)	• Combined operationalization and interaction of technology, pedagogy, and content to meet teaching objectives

Credibility

To ensure credibility, a multifaceted approach using three strategies described by Driessen et al. (2005, p. 216) was deployed: triangulation, prolonged engagement, and member checking. Coding took place in two phases: first, I annotated and coded all entries; next, I triangulated (Creswell & Miller, 2000) the data by cross-referencing observations with student surveys. I then conducted analysist triangulation (Patton, 2014) by interrogating the findings through comparison with the results of semi-structured interviews with seven teachers working within the same context: three native English speaking EFL teachers (British, Australian, Canadian), two non-native English speaking non-Japanese EFL teachers (African, Russian), and two Japanese EFL teachers. Lastly, I applied reflexive bracketing (Tufford & Newman, 2012) throughout the study to minimize researcher influence on interactions and participant responses. Bracketing in the data analysis and reflexive journaling balanced tensions between insights into emerging themes and negative cases whereby searching for, identifying, and critically examining evidence contrary to my assumptions allowed me to perceive gaps and boundaries of the emerging theory.

Findings

The findings from this research were mobilized in order to address the three questions that guided this study. In this section, I lay out the findings in relation to these research

questions. I begin by identifying the cultural tensions that influenced my TPACK operationalization as a Canadian EFL teacher working in the Japanese university context, and convey how these tensions affected TPACK operationalization. These first two research questions are explored in tandem through the issues of cultural influence on technology and cultural influence on pedagogy. Third, in response to the third research question, I describe how cultural tensions were mediated when adopting a culturally responsive approach.

Cultural influence on technology

Varied social and educational backgrounds affected student experience of and access to technology. Some students had private school education in which technology was used for presentations and written assignments. Others, however, only did handwritten assignments and had limited experience of and access to technology; these students could be seen typing with two fingers or using a smartphone to type an essay. Linguistic proficiency mediated technology operationalization as it was necessary to use class time to introduce new technologies. The more proficient I became in Japanese, or the more proficient students were in English, the easier it became to explain how to use a tool. Concerns about student access and the amount of time required to teach new technologies affected my selection and use of technology.

Technology mediated social and communicative interactions in two ways. First, it created new social spaces: private (e.g., closed social media groups and anonymous questionnaires), and public (e.g., class blogs, collaborative documents). Second, technology impacted contextual messages. For instance, a breath through the teeth can signal apprehension; online, however, that breath might be missed or muted. Smiles, another critical signal, are not seen when video is off.

Cultural influence on pedagogy

Divergent values related to social norms and positioning affected my pedagogical consideration and methods. As a teacher, I was in a position of power, in which I expected my students to follow my instructions. However, as a Canadian teacher who was educated in a system with relatively low power distance, I expected students to ask me questions and be critical of the content, to express a wide range of opinions about topics introduced for discussion. Yet my prompts, such as “Any questions?” or “What did you think about the reading?” were almost always met with reticence—an issue that appears to be related to high power distance and high uncertainty avoidance (Hofstede et al., 2010). In this context, face was clearly at issue, for questioning is face threatening and can cause the student, or the teacher, to lose face. I adjusted my pedagogical approach to find culturally acceptable methods to gather feedback. For instance, I asked students to prepare collective opinions

and questions in small groups and used technology to collect feedback anonymously. Linguistic proficiency also influenced pedagogical applications. For instance, in classes with lower English levels, instructions were more easily delivered if I used Japanese instructions, and I received richer feedback when I allowed Japanese responses (e.g., "It is good" vs. detailed feedback in Japanese)—and this feedback informed my pedagogy.

Communication norms affected my pedagogical approach as I modified Western-influenced methods to be successfully operationalized in the Japanese context. For instance, silence (*chinmoku*) and ambiguity (*aimai*) are important communication values in Japanese culture used to maintain group harmony (Davies & Ikeno, 2011) and mitigate loss of face in uncertainty avoidance cultures (Hall, 1976; Hall & Hall, 1990). Ambiguity allows the speaker to maintain harmony by voicing an opinion that does not directly conflict with or rejection that of others. For example, when I asked my students "Do you understand?" and they responded with "maybe" or "maybe, yes," my Canadian background wanted more direct answers; however. With time I learned to interpret students' contextual signals. For example, were they looking at each other for help? Did they look at me straight in the eye, or did they tilt their head to the side and speak with more hesitance? Also, as an English teacher, my curriculum objectives depend on developing English communication skills, which requires output—the very opposite of silence. Western "active learning" pedagogical methods are often based on individualistic values, including discussions and debates that ask for clear expressions of individual opinions. Silence, ambiguity, and desire for collective consensus conflicts with this pedagogy. For instance, English textbooks have prompts for discussion that require students to "discuss" a text. However, I struggled with these prompts because students would not "discuss" as I expected: they would not express differing viewpoints. Instead, they would simply give their opinions and then agree with each other, and the "discussion" would finish quickly. They would not probe their partner for more details (e.g., ask "why?") or challenge their opinions. It appeared that their communication goals were different than my objectives for critical thinking. Group discussions were often harder and met with more silence. One student commented "the most challenging part of discussion is to say an opinion that is different from the majority" (Yusuke, July, 2017, Questionnaire).

Further, students' context affected my pedagogy, in terms of considering their norms, values, and experiences as related to education. In Japan, education is primarily teacher-fronted, with a heavy emphasis on rote memorization for university entrance exams. As such, students have little experience with social constructivist student-led "active learning" pedagogies, even in Japanese. This meant that I had not only to teach new content to students, but I also had to provide support for these new methods and ways of thinking. Also, the expectations of university students are different than they are in Canada. In Japan, university is recognized within society as a moratorium "leisure land" (McVeigh, 2002,

p. 4). This refers to the widespread societal acceptance that the academic efforts required to pass university entrance examinations in Japan is much greater than completing the course requirements to obtain the degree. As such, the student's ability to *enter* into a university is recognized as the indicator of their academic aptitude (rather than the effort needed to *graduate* which is common in many Western countries). And this affects student motivation in class; rather than concentrating on academics, many university students prioritize developing soft skills, and extracurricular interests that had been postponed for the intense academic study needed to pass university entrance exams. Furthermore, national English policies enforce English study for all university students. This means that students did not elect to study English but must obtain a certain number of English credits to earn their degree. As such, student motivation to study English is varied in these classes, from those who enjoy learning English, to those who only want the credit. Finally, the university curriculum is designed to prioritize job search activities in the final two years. As such, for many, the bulk of the standard four-year curriculum is completed in the first two and a half years of school. My first and second-year students had on average 15 courses a week (100 mins each) with at least 10% of students with more than 20 courses in their first year (compared to my Canadian education where I only had six courses). The overall result is that many students are not highly motivated to learn English or do difficult assignments. Initially I assigned "flipped learning" tasks I expected students to complete before class. However, not only was I not able to do the activities in class because students did not do the homework, but I also received negative course evaluations indicating that I gave them too much homework.

Cultural influence on content

Another issue impacting my pedagogical approach was the ways that culture structured content. Norms relating to social order such as insider/outsider indexing, space values, and gender-role socialization influence perspectives of content appropriateness and the ease with which students (and teachers) were able discuss certain topics. For instance, as a Canadian, I initially viewed personal, open-ended topics as acceptable conversation starters (e.g., "How was your weekend?"). However, student feedback indicated that personal plans are viewed as private space in Japan and students struggled to know what they should "share" with others. Further, gender-role socialization affected interest and engagement in content related to gender. In Japanese society, gender-based division of labor is robust and the burden of childcare and housework continues to lie primarily on women (Brinton & Oh, 2019); in this context, many of my female students expected and wished to become housewives. As such, topics such as developing a career were met with less interest than work–life balance.

National curriculum also affected background knowledge about particular content. My Canadian education included very little about sociopolitical realities in Asia. The content I initially used were topics I felt comfortable teaching, which heavily focused on Western Eurocentric issues. For instance, in 2013, I taught a unit on discrimination, commencing with Martin Luther King. However, students were not familiar with him, and it required additional background knowledge on American history before we could even begin a discussion about discrimination. Discussion that did manifest was stilted because students had to imagine life in America; and although they felt sympathy for marginalized groups in America, it was very hard for them to relate it to their life in homogeneous Japan.

The findings for the first two research questions are summarized in Figure 6.

Culture	Technology	Pedagogy	Content
Social norms & roles • Individual/group orientation • Power distance & hierarchy teacher-student; student-student (e.g. age seniority) • Private/public space values • *Uchi/soto* indexing • Gender role differentiation	**Affects:** • Public & face-threatening social space **Technology mediates:** • Public/private boundaries & face-threatening acts (e.g., anonymous questions teacher/peer feedback) • Collectivist values (e.g., online discussions enhancing shared values)	**Affects:** • What is determined to be socially appropriate to be expressed • Values towards face-threatening acts: e.g., questions, disagreement **Pedagogical methods mediate:** • What is expressed • Social harmony & face-threat • Private and public space boundaries	**Affects:** • Interest in specific content (e.g. what group members are interested in) • Appropriate topics to discuss & allow disagreements **Content choices mediate:** • Social bonds (e.g., shared vs. divergent values/interests) • Interest & motivation to engage
Communication norms • Individual/group orientation -Loss of face avoidance • Uncertainty avoidance -Modesty & restraint • Contextual communication -Silence -Ambiguity tolerance	**Affects:** • How communication occurs over technological tools **Technology mediates:** • Modesty, restraint & face-threat (e.g., anonymous vs public questions & feedback) • Contextual communication cues (e.g., video/audio off during video conferencing)	**Affects:** • The way opinions are communicated • Evaluation of student understanding (e.g., interpretation of contextual signals in the absence of talk) **Pedagogical choices mediate:** • Face-threat (e.g., face-saving strategies, class culture promoting risk-taking) • Degree of verbal vs non-verbal communication (e.g., via assessments)	**Affects:** • The way communication occurs about topics **Content choices mediate:** • Face-threat (e.g., "safe" topic choices reduce restraint needs) • Contextual vs verbal communication (e.g., when self-reflection about different ways to communication becomes the content)
Education norms, values & experience • Expectations of university (as student, teacher, institution) • Prior learning experience • Assumptions about formal education	**Affects**: • Technology available • Technology policies • Psychological & temporal implementation costs For example: Digital literacy, typing skills, specific software experience	**Affects:** • Expectations (e.g., teacher-fronted model followed precisely vs. constructivist "thinking outside the box") • Experience with different pedagogical methods (e.g., experience with group work, and discussion even in mother language) **Pedagogical choices mediate:** • Required curriculum, student & teacher experience and knowledge	**Affects:** • Background knowledge • Motivations towards specific content For example: Different curriculum - Japanese/Asian history vs Canadian history Motivations - government & university policies for English requirements, teacher values, student motivations to learn a "required" language
Linguistics • Understanding, ability, & comfort in communicating in a particular language	**Affects:** • Teacher-student communication • Tool selection • Time cost to set up & teach new tools For example: Teacher using English menus, students using Japanese; selecting tools comfortable navigating/getting support	**Affects:** • How to teach and explain in a way the learners understand For example: using simplified English or mixing local language with target language	**Affects:** • Sourcing content • Ability to understand content For example: Teacher uses English sources or Japanese students source Japanese references for work; linguistic proficiency affects comprehension

Fig. 6 Influence of cultural variables in TPACK operationalization

Cultural distance and cultural knowledge as a mediator

The third question examined how cultural tensions were mediated when adopting a culturally responsive pedagogical approach. The findings indicate that cultural knowledge reduced the cultural distance between the teacher and context to improve efficacy. Cultural distance between my Western-influenced values and pedagogical methods and my Japanese students created tensions, resulting in negative effects. Cultural knowledge reduced that distance to positively affect my technological, pedagogical, and content knowledge systems. I will explain this relationship by first introducing my early teaching career without cultural knowledge, and then explain how it has since developed.

Early in my teaching career I had limited cultural knowledge about Japan and employed pedagogical methods I was familiar with: I gave students lots of autonomy in their topic selection and required them to participate in discussions using Western-designed textbook prompts. I introduced technology that I was familiar with, using English explanations, and would get annoyed with how long it would take them to familiarize themselves with it, and frustrated when they did not use the technology in the way that I had expected. One year, I gave students the task of writing a journal about their weekly activities on an online class blog. This class site used a platform that only had English menus and directed them to the English YouTube channel for support. My end of year feedback scores were low and included comments such as “I cannot see the teacher’s direction,” and “it was hard for me to know what I should do.”

Motivated by the unsatisfactory results of my student evaluations, I consulted experienced teachers to identify pedagogical methods to facilitate learner autonomy while still giving the students the necessary structure they were familiar with. I began to integrate technology as a tool, embedding students’ “cultural filters” of public and private domain values. And I began to adapt content. For example, material that I found to be interesting or that came from their Western-designed textbook was modified to include topics that students had background knowledge in, so that that they could discuss and build upon a foundation of already developed opinions. For instance, I learned that Japanese school curriculum includes inclusive practices for Japanese minority groups such as LGBTQ. I was able to use this background knowledge to initiate English-based discussions about the topic of discrimination from a shared understanding, and then expand this dialogue to include race-based discrimination in Japan. Here, comprehending students’ prior education allowed me to leverage pre-existing knowledge to construct new learning. Discussion activities were modified to help learners to scaffold on their existing understandings, as well as to provide mechanisms to maintain their values of saving face. Socially acceptable topics to discuss were placed at the beginning of the course (e.g., food) and more controversial topics were gradually introduced as students became more familiar and comfortable with expressing divergent opinions. Gradually, my student evaluations

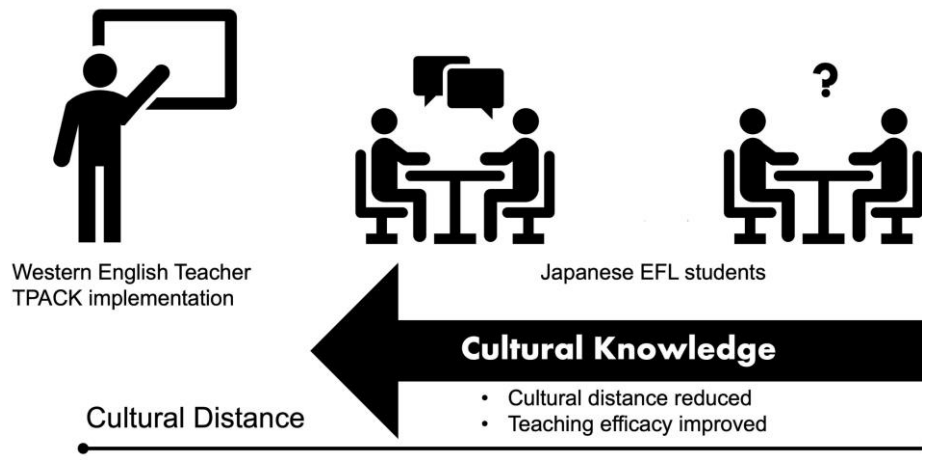


Fig. 7 Influence of cultural knowledge on TPACK implementation

improved and I received positive comments such as "I could learn how to disagree, even in Japanese," and "learning the way to do discussions was most helpful, because it leaded (sic) to be confident." As such, cultural knowledge acted as a separate but integrated system within TPACK operationalization to reduce the distance between my cultural norms and those of my students, ultimately improving my efficacy (Figure 7).

Discussion

This study has sought to examine the role of cultural variables in TPACK operationalization in an intercultural higher education context. The findings build on research that calls for a more nuanced understanding of context in the construct (Mishra, 2019; Porras-Hernández & Salinas-Amescua, 2013). Furthermore, it supports research that asks for more attention to be placed on individual actors (Adam, 2015, 2017; Chai et al., 2013; Porras-Hernández & Salinas-Amescua, 2013). The current TPACK model simply embeds TPACK within context; however, this approach underestimates the impact that cultural knowledge can have on instructional design. The findings from this study suggest that "awareness," or "knowledge" about the individual actors did not operate in a vacuum, but rather, that cultural knowledge interacted with the other TPACK constructs; thus, it is necessary to mediate interactions between the different actors and technology in their context. As such, these findings add further support to the need for culturally responsive pedagogies and greater recognition of cultural elements within TPACK implementation in intercultural contexts. Moreover, the findings highlight the critical limitations of the current TPACK model in complex cultural systems and suggests the need for a reconceptualization that includes *cultural knowledge* as a distinct but overlapping knowledge construct within TPACK: TPACCK.

Proposed TPACCK: Inclusion of cultural knowledge

I propose here a revised TPACCK framework that integrates cultural knowledge (C_lK) as a distinct but interdependent knowledge system (Figure 8).

According to Koehler et al. (2007),

> At the heart of TPCK[b] is the dynamic, transactional relationship between content, pedagogy, and technology. Good teaching with technology requires understanding the mutually reinforcing relationships between all three elements taken together to develop appropriate *context-specific strategies* [emphasis added] and representations (p. 741).

"Context-specific strategies" require knowledge about how the actors negotiate the context through their cultural filters. The findings from this study suggests that this knowledge base is distinct from the other dimensions; it does, however, mutually interact with them all (Table 5). C_lK bridges critical technological mediation issues, such as how teachers and students interact with technology in terms of their language and cultural values. With regard to pedagogy, incongruent cultural systems and beliefs affect how technology and content is implemented and its consequent efficacy. For instance, at the micro level, C_lK includes knowing how Japanese students think and communicate with other Japanese people (e.g., same age level peers vs. older peers, familiar vs. unfamiliar people), how they

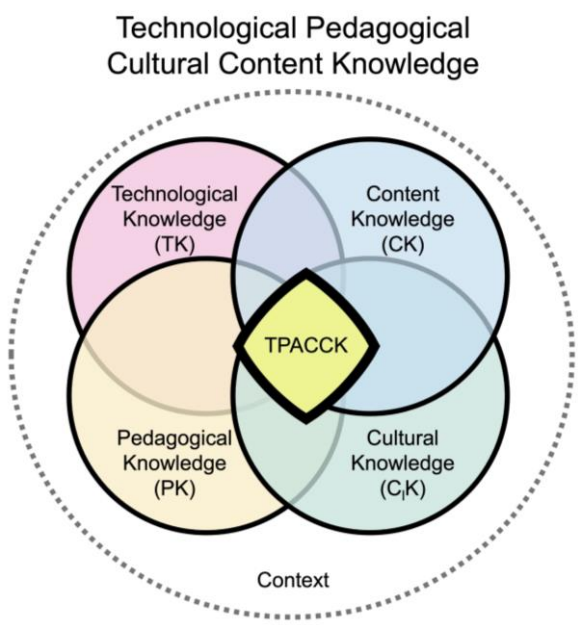


Fig. 8 Proposed TPACCK model

Table 5 C_lK within TPACK

Knowledge System	Examples
Technological (TK)	• Knowing how to use technology
Cultural Technological (C_lTK)	• Knowing what technology students can access, how they use it, and how to explain it to them
Pedagogical (PK)	• Knowing various pedagogies
Cultural Pedagogical (C_lPK)	• Knowing the pedagogical methods students in a particular context are familiar with and how to teach unfamiliar methods in culturally appropriate ways
Content (CK)	• Knowing the subject matter content
Cultural Content (C_lCK)	• Knowing how to relate content and curriculum goals to the cultural context of the students

engage with teachers (different power status), and how teachers manage individual personalities within the classroom. At the meso-level, C_lK includes knowing how the course fits in with the program of the school, how the school is organized, and the nature of its organizational culture, including how teachers, committees, and other systems communicate with each other. At the macro level, C_lK encompasses Japanese policy initiatives to mandate English, cultural expectations, and assumptions about university and learning in general. All told, greater attention to C_lK as a unique knowledge system is essential for effective instructional design.

Implications

There are two key implications for policy makers emergent from my research findings:

- TPACK is critically limited when operationalized in intercultural contexts.
- To maximize learning and teaching efficacy in increasingly diverse technological contexts, teacher education, professional development, and instructional designers need to mitigate cultural and epistemological hegemony and not only consider but actively develop cultural knowledge necessary for implementation of technology, content, and pedagogy.

Limitations and further research

In qualitative research, the purpose is not to generalize to all settings but to provide insights that can be transferred to comparable situations and contexts. One limitation of this study is that it is based on the autoethnographic data of one Canadian EFL teacher in Japan. More qualitative and quantitative studies investigating C_lK on instructional design in other (social and cultural) contexts is recommended to gain a more comprehensive understanding of the interplay of this system with the other constructs from more perspectives. Also, further quantitative research is necessary to examine the correlation between teaching efficacy and specific cultural tensions. Another limitation is that cultural tensions and

efficacy were analyzed primarily from the vantage point of the teacher. Although findings were triangulated with student data from post-course evaluations, further research through interviews to examine student views in direct relation to specific cultural tensions is recommended. Lastly, the intercultural factors at play in this context were primarily located between two different cultures at the micro (classroom) level. Research investigating other elements (e.g., social class, race, religion), and across different (meso, macro) contextual levels is recommended to develop a deeper and a more holistic understanding.

Conclusion

While recognizing the importance of TPACK, this study has highlighted its limitations. Through analytic autoethnography, this article identified and analyzed the cultural tensions experienced by a Canadian EFL teacher in the Japanese university context. The results suggest that cultural knowledge acted as a unique knowledge system within TPACK to reduce cultural distance between the teacher and students, leading to increased efficacy. This raises questions about indiscriminately integrating technology, pedagogy, and content without specific attention to instructors' cultural knowledge. This research broadens our conceptualization of TPACK by proposing that it expand to include cultural knowledge as a distinct but overlapping knowledge construct, TPACCK. At practical and policy levels, this research calls for greater instructor cultural knowledge to mitigate the cultural challenges intrinsic to technology and pedagogy implementation.

Abbreviations

CK: Content Knowledge; ClCK: Cultural Content Knowledge; ClK: Cultural Knowledge; ClPK: Cultural Pedagogical Knowledge; ClTK: Cultural Technological Knowledge; CRT: Culturally Responsive Teaching; EFL: English as a Foreign Language; TPACCK: Technological Pedagogical Cultural Content Knowledge; TPACK: Technological Pedagogical Content Knowledge; PCK: Pedagogical Content Knowledge; PK: Pedagogical Knowledge; TCK: Technological Content Knowledge; TK: Technological Knowledge; TPK: Technological Pedagogical Knowledge.

Endnotes

[a] The original Masculinity-Femininity label is adapted to reflect social significance rather than stereotypical labeling of "masculine" and "feminine" values. [b] Originally referred to as TPCK, the acronym was later changed to TPACK for easier articulation (Thompson & Mishra, 2007).

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Author's contributions

The author is responsible for the whole manuscript. The author read and approved the final manuscript.

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