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Analyzing Contextual Levels and Applications of Technological Pedagogical Content Knowledge (TPACK) in English as a Second Language Subject Area: A Systematic Literature Review

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ABSTRACT: Technological pedagogical content knowledge (TPACK) defines the knowledge domains required for successful technology integration. Context is identified as an important component of TPACK. The aim of this systematic literature review was to examine context levels and the application of TPACK in the area of English language teaching and learning. The empirical studies reviewed were published between 2009 and 2019. Initial database searches yielded 365 results from which 24 articles were included in the final content analysis. Analysis of the included studies revealed that classroom factors at the micro contextual level were addressed more frequently than those at the meso and macro contextual levels, which were frequently not taken into consideration in the definition and explanation of TPACK. The majority of studies used qualitative methods for data collection which were also commonly determined through self-reporting. When self-reporting is used, TPACK is exclusively viewed as knowledge that teachers possess regardless of their context. The data indicate that teacher's contextual factors such as dispositions are not always included in the operationalization of TPACK. Teachers' contextual factors highlight their perspectives and belief systems. A critical perspective of teacher's TPACK knowledge development across contexts and the roles teachers are assigned in the classroom are vital to understanding the paradigm shifts that inform teachers' practices and training.

Keywords: Technological Pedagogical Content Knowledge, Context, Contextual levels, English language, TPACK application

1. Introduction

Technological pedagogical content knowledge (TPACK) was developed in response to the absence of a theory guiding the integration of technology in education (Koehler & Mishra, 2005; Rosenberg & Koehler, 2015). Rooted in Shulman's (1986) pedagogical content knowledge (PCK) model, TPACK extends to additionally examine the knowledge of how to apply technological resources. Holistically, it considers technological knowledge (TK), pedagogical knowledge (PK) and content knowledge (CK). Rosenberg and Koehler (2015) explain that these three bodies of core knowledge coalesce to comprise technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK), and technological content knowledge (TCK).

Context is identified as an important component of TPACK (Koehler & Mishra, 2008; Koh et al., 2014; Mishra & Koehler, 2006; Phillips et al., 2017; Porras-Hernandez & Salinas-Amescua, 2013; Rosenberg & Koehler, 2015; Swallow & Olofson, 2017). TPACK has been referred to as "context bound" because of how influential contextual factors (e.g., classroom design and layout, school policies, state and national technology initiatives, and teachers' technology experience) are on teachers' development of TPACK (Mishra & Koehler, 2006). The categorization and analysis of the studies in this systematic literature review was guided by a theoretical lens that views TPACK as context bound.

The conceptualizations of TPACK context vary from teachers' epistemological beliefs to classroom and institutional resources (Rosenberg & Koehler, 2015). In their analysis of 170 TPACK focused publications, Rosenberg and Koehler (2015) reported a wide variation in how context is explained and interpreted. Moreover, prior research has found context is frequently missing when TPACK is described (Porras-Hernandez & Salinas-Amescua, 2013; Rosenberg & Koehler, 2015). There is a need to investigate the extent to which context is included in studies examining TPACK, the meaning assigned to TPACK context, and contextual characteristics that enable teachers to leverage technology resources. The current literature review advances the TPACK framework by examining a more complex conception of context that includes teacher's subjective contextual factors such as dispositions to understand technology integration and TPACK knowledge construction.

2. Purpose

The current systematic literature review was conducted in consideration of previous reviews on TPACK, mainly Kelly (2010), Porras-Hernandez and Salinas-Amescua (2013), Chai, Koh and Tsai (2013b), Rosenberg and Koehler (2015), and Willermark (2018). While these reviews were considered throughout this review process, two reviews provided a framework for the current review: (a) Rosenberg and Koehler's (2015) review that examined the extent to which context is included in publications on TPACK in all subject areas, and the meaning of context when it is included, and (b) Willermark's (2018) review that examined the general characteristics of recent TPACK articles as well as the approaches used to identify teacher's application of TPACK. While these reviews did not specifically examine TPACK in English language teaching, the current review was influenced by their search strategies, search terms, limits and coding categories.

This review sharpens the focus by examining recent studies that utilized the TPACK framework in the context of English as a second language subject area. As students' demographics shift due to the increased number of English as a second language students in the United States and abroad (Clair, 1995; Dunn, 2019; Hartshorn et al., 2017; Razfar & Simon, 2011), questions of English language teachers' ability to effectively instruct these students remain. Technology integration is an important component in English language teaching. Examining the characteristics of English language teachers' TPACK, levels of context and teachers' contextual factors including dispositions could further our understanding of TPACK and its enactment in English language teaching and learning.

The review seeks to answer the following questions:

- What are the characteristics of English language teachers' TPACK in the literature on English language teaching and learning?
- What levels of context are included in the operationalization of TPACK in English language teaching and learning?
- What teachers' contextual factors, if any, does the operationalization of TPACK include?

3. Significance and definitions

Context in TPACK is limited on several levels. Porras-Hernandez and Salinas-Amescua (2013) argue that context in TPACK is referred to in a rather ambiguous manner. Contextual references in TPACK include student characteristics; classroom and institutional conditions for learning; situated teaching activities; and teacher's epistemological beliefs. Previous reviews made substantial contributions to the understanding of how context has been included in recent TPACK research, what it means when it is included and the nature of the TPACK framework (Rosenberg & Koehler, 2015; Willermark, 2018). This current review advances understanding of TPACK by including teacher's subjective contextual variables in the form of dispositions to understand characteristics of TPACK and technology integration in the context of English language teaching and learning.

Dispositions in this review are defined from a Bourdieusian perspective and are presented as a missing link between TPACK development and enactment. Bourdieu's (1977) definition of dispositions includes individual attributes, tendencies, practices and sense of the game. They are seen as the result of an individual's past experiences and experiential influences. Conceptually, dispositions are addressed in this review through two main categories: (a) teacher tendencies and beliefs (e.g., willingness to experiment with new technology, belief in the importance of technology in teaching and learning, level of comfort with technology) and (b) teacher practices (e.g., using technology to facilitate learning in the classroom, incorporating technology in planning, designing and executing lesson plans). The interaction between these categories results in a particular outcome which can explain how dispositions may shape a teacher's technological knowledge. Identifying teachers' dispositions in the context of teaching with technology provides a lens to describe and analyze the contextual factors that reciprocally affect teachers' TPACK development (Rosenberg & Koehler, 2015). In other words, the conceptualization of teachers' TPACK contextual factors is conducted in an organized and systematic way within the framework defined by dispositions.

Drawing on the framework advanced by Porras-Hernandez and Salinas-Amescua (2013), the definition of context in this review includes three levels: micro, meso, and macro. Porras-Hernandez and Salinas-Amescua (2013) describe micro level factors as those at the classroom or learning environment level, which involve in-class conditions for learning, available technologies and class norms. The meso level represents factors at the school and local community level, and is defined through the social, cultural, political, organizational, and economic conditions established there. Factors such as the availability of technology at the school level, support

staff and school leadership expectations define this level. The macro level is defined through the social, political, technological, and economic conditions at the state or national level. Factors such as mandated curricular standards, initiatives related to technology development as well as national and global policies define this level. Informed by the conceptualization of context introduced by Porras-Hernandez and Salinas-Amescua (2013) and its operationalization developed by Rosenberg and Koehler (2015), levels of context in the current review are defined as follows:

- Micro: factors in the classroom affecting the development, enactment, or assessment of TPACK. This level of context includes actions and practices of teachers, classroom norms, and technology in the classroom.
- Meso: factors in the school and community affecting the development, enactment, or assessment of TPACK. This level of context includes the school system or individual schools, school culture, infrastructure related to technology, and leadership expectations.
- Macro: factors at the state, national, and global level affecting the development, enactment, or assessment of TPACK. This level of context includes larger social, political, or economic conditions of the state (or country) that shape norms as well as policies such as national curriculum standards and technology initiatives at the state or national level.

Context is important in examining and understanding how different contextual factors may impact and shape teaching practices. Trends in the literature on context levels, dispositions, and TPACK in English language teaching and learning could inform how context is addressed in programs providing professional development and training on technology integration to English language teachers. An in-depth understanding of contextualized dispositions and the characteristics of TPACK are important in facilitating the development of teachers' technological knowledge.

4. Protocol development

A review protocol was developed according to Booth's (2006) criteria to explain all aspects of the review including method, literature search strategy, sample, coding and data analysis. Booth's (2006) criteria, which are referred to as STARLITE guidelines, were followed to systematically categorize and analyze recent publications on TPACK as it relates to context and to minimize the effect of possible bias of the review process. The review protocol is described in the following sections.

4.1. Method

The method for the current review was designed according to the structure and recommendations of other systematic reviews including Chai et al. (2013b), Rosenberg and Koehler (2015), and Willermark (2018) in regard to limits, search, and coding categories. It was also informed by Booth's (2006) criteria, commonly represented with the mnemonic STARLITE (sampling strategy, type of study, approach, range of years, limits, inclusion and exclusion criteria, terms, and electronic sources).

4.2. Literature search strategy

The databases that were selected due to their coverage of TPACK in English language teaching were EBSCOhost covering Academic Search Complete, Applied Science & Technology Index and education; ERIC (Education Resources Information Center); JSTOR; and Web of Science. They include educational technology journals and teacher education journals. Electronic sources were searched using the following descriptors: Technological pedagogical content knowledge OR "TPACK" OR "TPCK" AND ESL OR EFL OR TESOL OR English as a Second Language OR English Language AND Context OR Dispositions. The search terms used were related to TPACK, English language and context. The search covered similar terms used by Chai et al. (2013b), Rosenberg and Koehler (2015) and Willermark (2018), and additional terms to reflect this review's focus on English language and context.

Broad search terms were used to get a comprehensive search result and Boolean search terms AND and OR were included to allow for as many results as possible due to variations in descriptions applied to English as a second language teaching and learning. The use of parentheses ("TPACK," "TPCK") narrowed the search to studies that included either one. The second set of terms (context, dispositions, English as a second language, TESOL, EFL, ESL, English language teaching and learning) limited the results to studies examining context and English as second language. The search was limited to articles published between 2009-2019, which overlaps with previous

systematic reviews, mainly Chai et al. (2013b): 2003-2011; Rosenberg and Koehler (2015): 2005–2013; and Willermark (2018): 2011 to 2016.

4.3. Inclusion and exclusion criteria

Once all publications were collected using search strategy procedures described above, the following inclusion criteria were utilized to evaluate each research study:

- The study is written in English
- The study is peer-reviewed
- The study examines English language education (TESOL, ESL or EFL focused)
- The study is empirically based (quantitative, qualitative or mixed methods)
- The study is published between 2009–2019
- "TPCK," "TPACK," or "technological pedagogical content knowledge" included in the title, keywords, or abstract (or introduction if an abstract is not included)
- The study explicitly addresses context in the description, explanation or operationalization of TPACK
- The study explicitly states intention to explore TPACK
- The study involved pre-service or in-service teachers

The studies that are purely theoretical including systematic reviews, meta-analyses, position papers, conceptual and conference papers were excluded. To be included in the review, the article had to contain empirically based research. Title, keywords and abstract (or introduction if an abstract is not included) were manually and systematically reviewed to decide whether a study met the inclusion criteria. In case of doubt, the publication was kept for full-text reading. Primary sources deemed relevant were listed on a master reference list and a copy of each publication was obtained.

4.4. Coding procedures

The TPACK studies coded in this systematic review include references to context in the description of TPACK. Using Willermark's (2018) coding scheme, self-reporting of TPACK was divided into three subcategories: general TPACK which refers to situations where TPACK is estimated using ranking statements of TPACK constructs regardless of situation or context; specific TPACK which refers to self-reporting of teachers' actions in authentic or fictitious TPACK situations with specific scenarios; and experienced TPACK where actual experiences of conducted teaching activities involving TPACK are self-reported. Such categorization of TPACK is based on the definition of TPACK as knowledge, something teachers process such as rules and procedures of practice reported through self-reporting. Instances where TPACK is defined as competence were also reviewed for comparison. Competence is demonstrated in action and performance of TPACK. It refers to the process of transforming TPACK knowledge into instruction. Willermark (2018) argues that self-reporting of TPACK constitutes an approach that is isolated from teaching activities while TPACK as competence constitutes an application and implementation of teaching in authentic settings involving TPACK.

The categorization of publications in this review was also conducted according to Porras-Hernandez and Salinas-Amescua's (2013) levels of context as well as the Bourdieusian definition of dispositions outlined above. Table 1 summarizes data coding and data segmentation processes.

Table 1. Coding schemes for TPACK context

Variable	Description	Possible code
Definition of TPACK	TPACK as knowledge (general, specific or experienced) or TPACK as performance	1 (included) 0 (not included)
Micro	Factors at the classroom level	1 (included) 0 (not included)
Meso	Factors at the school level	1 (included) 0 (not included)
Macro	Factors at the societal level	1 (included) 0 (not included)
Teacher	Factors related to teacher including dispositions	1 (included) 0 (not included)

Only studies with an explicit focus on English language and which included context in the conceptualization of TPACK were coded for micro, meso, macro and teacher. The coding variables were found in the abstract, introduction, literature review, methods, and data analysis sections of the selected articles. Following Rosenberg and Koehler's (2015) coding strategy, the definition of TPACK is coded "1" only if TPACK is referred to as general, specific, experienced or performed (an indication of competence) knowledge. The inclusion of context

levels and teachers' factors including dispositions were coded "1" each if they are included in the study and "0" if they are not present. An article could be coded "1" or "0" for multiple categories or variables. Coding information for each article selected for this review is presented in Appendix 2.

Coding procedures in this review are grounded in prior empirical and theoretical research. They were adapted from prior research including Porras-Hernandez and Salinas-Amescua (2013), Rosenberg and Koehler (2015) and Willermark (2018). To maintain the validity of research and eliminate bias, studies were coded for explicit contextual criteria. In borderline cases, an external researcher with insight into the field was consulted. Problems in coding were discussed throughout the process and the articles were reviewed by more than one person when necessary. Regular meetings were scheduled with a librarian with expertise in the field of education throughout the database search to ensure that the review and search criteria were applied consistently and exhaustively.

4.5. Study selection

A PRISMA flow diagram is provided in Figure 1 to present the flow of information throughout the systematic review process. After screening for duplicates, all articles were evaluated according to the inclusion and exclusion criteria. This phase of the screening process was straightforward as the focus was on whether there was a mention of TPACK in the title, keywords, or abstract (or introduction if an abstract is not included) and English language, context or dispositions in the rest of the article. If one or more criteria were absent or unclear, the article was considered for full review during the next screening. Studies that met the inclusion and exclusion criteria were listed on a master reference list and a copy of each publication was obtained. The second screening phase included a complete review of studies.

The search yielded a total of 365 articles (65 of them were obtained from ERIC, 46 from EBSCOhost, 55 from JSTOR and 197 From Web of Science) following a filtering procedure regarding English language and context. The number of studies that met the inclusion criteria after the final review was 24. Considering that several recent studies (Redmond & Peled, 2019; Tseng, 2018) reported that research on TPACK is limited, the number of studies that met the inclusion criteria is relatively higher than expected. TPACK has been mainly applied in discipline areas such as math and science.

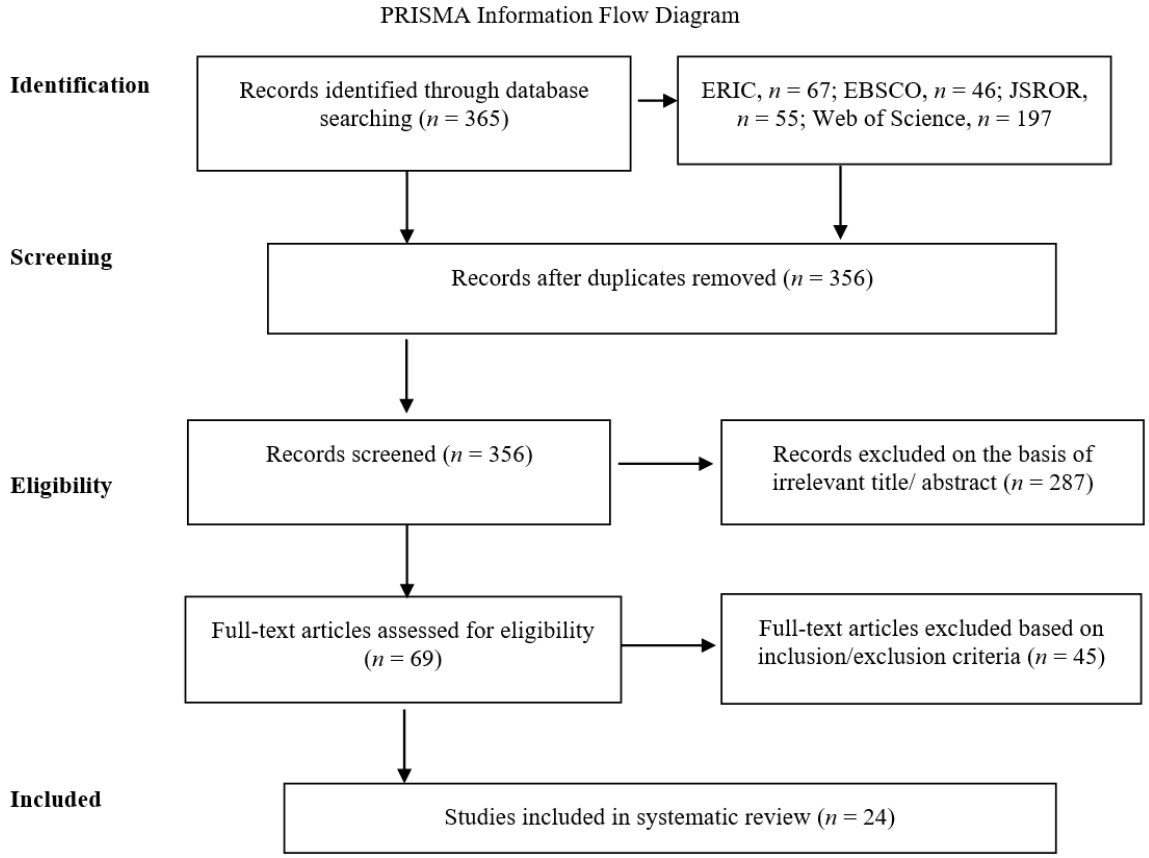

Figure 1. Flow PRISMA diagram of the screening and selection procedure

4.6. Data analysis

The "1" (included) and "0" (not included) codes were computed in the analysis of the data to determine the characteristics of TPACK in the English language teaching context. Frequencies and percentages of context levels (micro, meso, macro) and teacher factors which include dispositions were computed using the "1" (included) and "0" (not included) coding measures.

5. Results

Findings of this review are presented in four sections according to the research questions and data analysis: overview of TPACK studies, characteristics of English language teachers' TPACK, levels of context in TPACK, and English language teacher's contextual factors in TPACK

5.1. Overview TPACK studies

A total of 24 out of the initial 365 identified articles were included in this review. As shown in Figure 2, relatively few articles were included from the years of 2009 through 2015, four total. There was a clear increase of the articles that met this study's inclusion and exclusion criteria in 2016 through 2019. Most studies were published in 2018 followed by 2019.

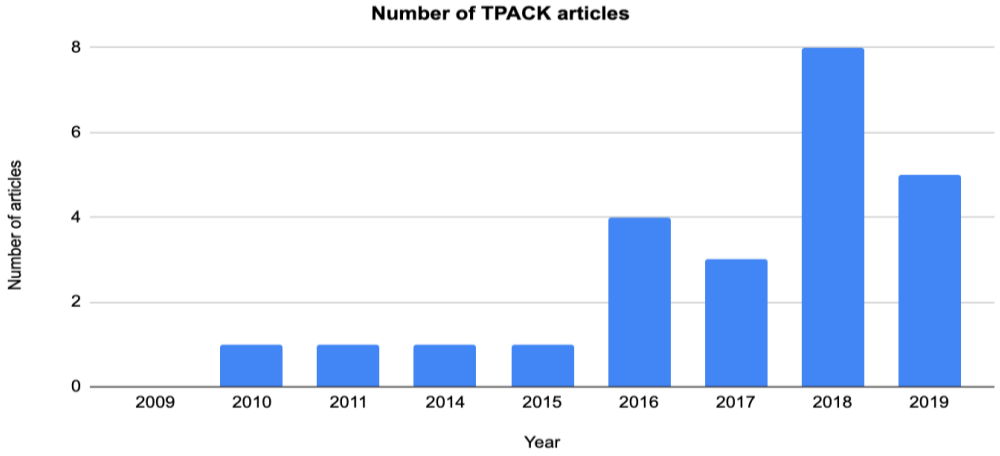

Figure 2. Distribution of the selected number of TPACK articles published between 2009 and 2019 (n = 24)

The highest number of articles, (45.83%), was found in educational technology journals (e.g., Education and Information Technologies, Australian Journal of Educational Technology, and Educational Technology & Society). 33.33% were published in language subject based journals (e.g., Journal of Asia TOEFL, Computer Assisted Language Learning and Journal of Basic Writing), 12.5% in cross discipline journals (e.g., Journal of Qualitative Research in Education and Educational Research and Reviews), and 8.33% in teacher education journals (e.g., Journal of Teacher Education and Educators, and Asia-Pacific Journal of Teacher Education). The data on the number of publications found in each journal are reported in the Figure 3 below.

As indicated in Appendix 1, eight studies—Baran et al. (2019); Baran and Uygun (2016); Chai et al. (2010); Dong et al. (2015); Joo et al. (2018); Khine et al. (2017); Redmond and Peled (2019); and Sang et al. (2016)--included in the review extended the study of TPACK to include other subject discipline areas such as social sciences education, science education, elementary mathematics education, secondary biology education, and languages. Studies with an exclusive focus on English language teaching include: Bandi-Rao and Sepp (2014); Baser et al. (2016), Bostancıoğlu and Handley (2018); Debbagh and Jones (2018); Habibi et al. (2019); Holmberg et al. (2018); Liu et al. (2019); Setiawan et al. (2018); Asık et al. (2018); Getu and Teka (2018); Tseng (2016); Tseng (2018); Tseng et al. (2011); Tseng et al. (2019); Turgut (2017a); Turgut (2017b).

The majority of selected studies used qualitative methods (37.5%; n = 9) for data collection, followed by quantitative (33.33%; n = 8) and mixed methods studies (29.16%; n = 7). The data show that pre-service teachers are the most common participants studied at 54.16% (n = 15). In-service teachers constituted 29.16% (n = 7). Both pre-service and in-service teachers were included in 8.33% (n = 2) studies. EFL students constituted 8.33%

(n = 2). Information about each article (including authors, year of publication, publication outlet, methods and sample groups) is included in Appendix 1.

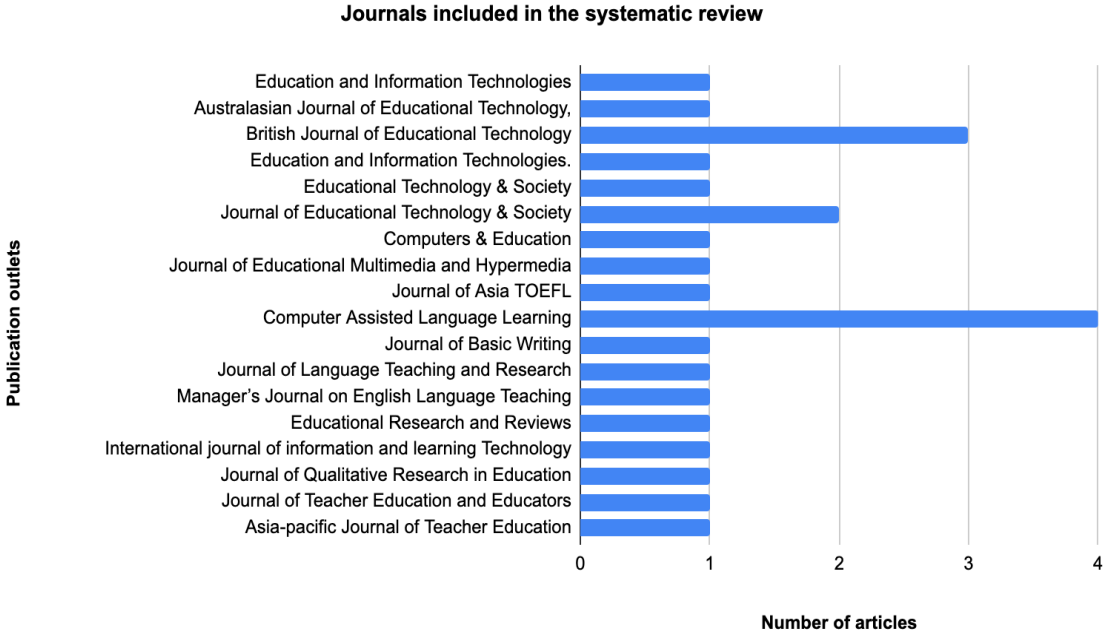

Figure 3. Distribution of the selected TPACK articles in peer reviewed journals (n = 18)

5.2. Characteristics of English language teachers' TPACK

Following Willermark's (2018) coding procedures, the selected articles were analyzed according to how TPACK was approached either through self-reporting or performance. The objective of such identification was to determine whether TPACK was defined as knowledge or as competence. The data show that although approaches to TPACK were often determined through a combination of instruments such as surveys and class observations to triangulate findings, TPACK was commonly determined through self-reporting at 81.82% compared to performance which constituted 18.18%.

Self-reporting was divided into three subcategories: general TPACK, specific TPACK, and experienced TPACK. The data indicate that the application of general TPACK constituted 70.73% and experienced TPACK was 29.62%. Specific TPACK was not applied in any of the articles that were reviewed. Self-reporting provided data regarding teachers' self-efficacy, beliefs and attitudes, highlighting their perspectives and belief systems about technology in teaching. Self-reporting reflects an approach where TPACK is viewed exclusively as knowledge that teachers possess regardless of their context. The majority of the studies were conducted to capture pre-service teachers' TPACK.

Several studies included in this literature review (e.g., Baser, Kopcha, & Ozden, 2016; Bostancıoğlu, & Handley, 2018; Tseng, 2016; Sang et al., 2016; Tseng, 2018) were conducted with the aim of TPACK survey validation and/or adaptation in the English language subject area. Survey completion where participants were asked to numerically rate statements on a 5-point Likert scale was the most frequently used TPACK approach. Survey questions were designed to estimate the knowledge base English language teachers are expected to possess. The most commonly used and referenced TPACK surveys were developed by Mishra and Koehler (2006); Archambault and Crippen (2009); Schmidt et al. (2009); Archambault and Barnett (2010); Chai et al. (2010); Lux et al. (2011); Sahin (2011); Chai et al. (2013a); Chai et al. (2013c); Yeh et al. (2014); and Baser et al. (2016).

Unlike general TPACK, self-reporting on experienced TPACK involved teachers' discussions or interviews on the developing and conducting lesson plans through the TPACK lens (e.g., Turgut, 2007b; Setiawan et al., 2018, and Tseng, 2018). Performance evaluation of teaching activities, where TPACK is defined as competence, usually involved class observations or pre-and post- TPACK assessments (e.g., Tseng et al., 2019; Tseng et al., 2011).

5.3. Levels of context in TPACK

The data were analyzed to determine the inclusion of context in journal articles that were selected. Studies that explicitly discussed context in reference to TPACK were coded for micro, meso and macro. The frequencies and percentages of context levels included in the definition, explanation or operationalization of TPACK are presented in Table 2.

Table 2. Context level frequencies and percentages

Context level	Frequencies	Percentages
Micro	23	46.93%
Meso	11	22.44%
Macro	15	30.61%
Total	49	100.00%

Frequencies and percentages listed in Table 2 indicate that contextual factors according to levels of context were included inconsistently among the selected journal articles. It was found that classroom factors (micro), school factors (meso) and societal factors (macro) constituted 46.93%, 22.44% and 30.16% respectively. Context level variables in the selected studies are aligned with the dimensions of the TPACK framework. Figure 4 below presents the data in regard to the inclusion of context levels.

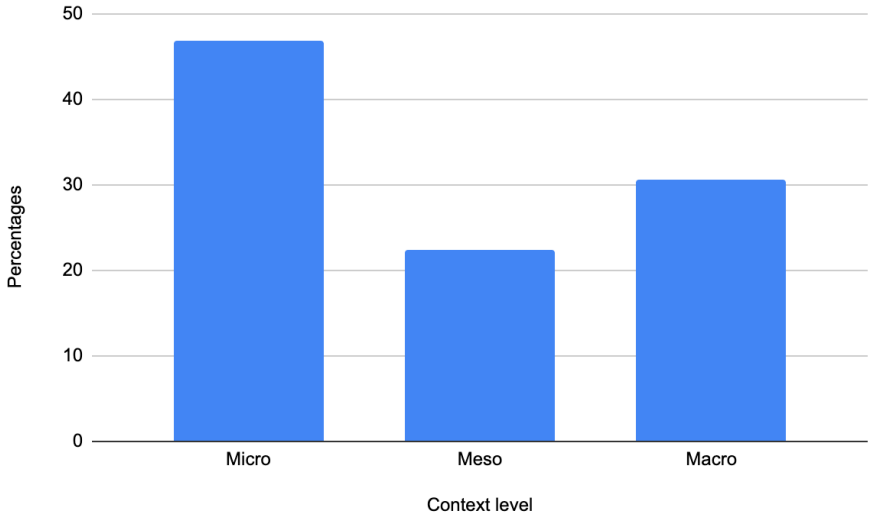

Figure 4. Context level percentages

5.4. English language teacher's contextual factors in TPACK

The operationalization of TPACK that includes dispositions as part of teachers' factors was also examined. No articles that include dispositions as defined from the Bourdieusian perspective were found. However, the data show that teachers' design dispositions in relation to TPACK were explicitly addressed in only one journal article out of 24 selected for this review. The article was published by Dong et al. (2015) who studied teachers with regards to seven factors of technological pedagogical content knowledge, their beliefs about constructivist-oriented teaching (CB) and design disposition (DD). The findings indicate that design disposition consistently predicts both pre-service and in-service teachers' TPACK. Dong et al. (2015) developed and validated a nine factor-model instrument to explore teachers' TPACK profiles and their development, highlighting the importance of design disposition for TPACK advancement.

Overall, the TPACK framework in the data gathered illustrates the interplay between levels of context (micro, meso and macro) and teachers' contextual factors. Some of the variables that were reported in the selected articles are related to teachers' background, self-efficacy, and professional roles. The data show that teachers' contextual factors are included more frequently (75%). These variables were usually framed as part of contextual factors that affect technology integration in the classroom. Moreover, a few studies emphasized student factors such as their perceptions, attitudes, and background. Student variables were presented as exerting an influence on student learning and perceptions of English language teachers' TPACK. The findings suggest that contextual

factors deemed important to the conceptualization of TPACK in a study are more likely to be addressed and considered by researchers.

6. Discussion

The distribution of articles in the findings indicates that education technologists, rather than content specialists, are more interested in research on the TPACK framework in the area of English as a second language. It further suggests the need for collaboration between education technologists and content specialists. Such collaboration could shape the depth of the studies in the main English language journals such as the TESOL journal, TESOL Quarterly and the ELT journal. It can lead to a deeper consideration of how technology impacts students' learning and teacher knowledge development.

The fact that TPACK was commonly determined through self-reporting is consistent with the results from previous literature reviews including Chai et al. (2013b), Rosenberg and Koehler (2015), and Willermark (2018). Self-report measures, open-ended questionnaires, performance assessments, interviews and observation were identified to be the commonly applied measurement methods in TPACK focused studies (Koehler et al., 2011; Willermark, 2018). Willermark (2018) found that teacher self-reporting was the most frequently applied approach used to identify teacher TPACK, while performance evaluations on teaching activities were less frequent. The prevalence of self-report measures suggests a need for developing performance measures of the TPACK framework. This requires a shift in theories and approaches that guide technology integration in teaching and learning.

There is scholarly debate in the literature about the validity and applicability of the existing measurements that rely on self-reporting. Bostancıoğlu and Handley (2018) argue that several TPACK instruments (i.e., Chai et al. (2013a) and Baser et al. (2016)) appear to be influenced by dominant theories in education such as social-constructivist, communicative learning and socio-cultural theories to the exclusion of other theories of second language acquisition. They proposed an assessment of TPACK in the English language subject area which does not prescribe a particular approach or theory. There is a need for a TPACK framework that articulates constructs specific to English language teaching and learning.

The findings suggest a need to reexamine methods followed in TPACK studies. Research methods were not always mentioned in the studies selected for this review. The classification of journal articles in this review was often inferred based on other information provided. The research method classification stated in a study was used when available even if it was deemed a wrong identification for that particular study. For example, Turgut's (2017a) study was classified as mixed methods due to the fact that the data were collected through a TPACK scale (Schmidt et al., 2009) with open-ended questions and classroom observations. The author states that the qualitative data from the open-ended questions was analyzed through phenomenological data analysis. The article does not provide a detailed explanation of how the data was analyzed through a phenomenological approach. It is important to note that the results related to research methods in this review correspond with the results of Chai et al. (2013b) and differ from the results of Willermark (2018) where quantitative methods constituted the most frequently applied approach, followed by mixed methods and qualitative methods.

Consistent with the findings in previous literature reviews (e.g., Porras-Hernandez & Salinas-Amescua, 2013; Rosenberg & Koehler, 2015), the data suggest that the meaning of context has differed widely, from teachers' micro factors to institutional resources and sociocultural contextual factors. The increase in TPACK publications that take contextual factors into consideration in recent years indicate a growing interest in this area. There is a belief that teachers' knowledge and context influence how teachers incorporate technology into teaching. These findings correspond with the results of Tseng et al. (2019) that show how teachers' use of technology was moderated predominantly by teacher-centric factors at the micro level of context.

The examination of context levels and teachers' contextual factors including dispositions further our understanding of how TPACK is rooted in context. There is a need to understand both objective and subjective contextual factors that influence TPACK development and its enactment in instructional settings. Porras-Hernandez and Salinas-Amescua (2013) argue that external conditions are important elements that shape instruction at the micro level. Dispositions, on the other hand, may explain the value assigned to education, student and teacher roles, as well as access to resources and capital. Porras-Hernandez and Salinas-Amescua (2013) explained that while external contextual variables may explain the technology integration process, teacher's subjective variables can bring to light not only the teachers' technology integration process, but also the knowledge construction that takes place in a given situation.

7. Conclusion

The purpose of this review was to provide a comprehensive analysis of TPACK in English language teaching and learning along with the inclusion of contextual levels and factors in the operationalization of TPACK. The empirical studies reviewed were published between 2009 and 2019. A total of 24 out of the initial 365 identified articles were included in this review. The key findings indicate that the highest number of articles was published in 2018, followed by 2019. The majority of studies were found in educational technology journals. Qualitative methods were the most common research approach used. Context level frequencies and percentages indicate that contextual factors were included inconsistently among the selected journal articles. The data also indicate that classroom factors at the micro level were addressed more frequently. Although the data show that approaches to TPACK were often determined through a combination of instruments such as surveys and class observations, TPACK was commonly determined through self-reporting.

A wide range of TPACK assessments were identified including self-reporting and performance assessments which included class observation and interviews. The data suggest there has been a focus on creating and developing measures of TPACK that take context into consideration, a process that is still in its early stages of development. As evidenced by the increase of TPACK publications that address teachers' ability to integrate technology in instruction, there has been a shift towards the inclusion of different levels of contextual factors required for effective technology integration. The argument made was that teacher's subjective variables such as dispositions, which are absent in the studies that were reviewed, should be taken into consideration in designing and explaining TPACK applications.

This review builds on previous literature reviews (e.g., Chai et al., 2013b; Rosenberg & Koehler, 2015; Willermark, 2018) and advances the TPACK framework by including teacher's subjective contextual variables to understand technology integration and TPACK knowledge construction. Such focus has significant implications in shaping technology integration in English language teaching and in redefining TPACK to provide a multifaceted view into teachers' TPACK knowledge base and how the components of technology, pedagogy, and content are manifested in context-based practice.

While the current review provides important insight regarding the characteristics of TPACK and context in the English language subject area, there are limitations that should be noted. Only peer reviewed empirical studies were considered; there are several other publications including book chapters, conference presentations and conceptual papers that were excluded in the review. The data selection procedures produced a relatively limited number of journal articles. Following coding procedures proposed by Rosenberg and Koehler (2015), the articles were identified only if they explicitly included context. Articles that included similar, but different terms, such as situated TPACK were not included. The justification was the term context is explicitly included in the definition of TPACK by Mishra and Koehler (2006) and several other studies.

These limitations are important to recognize; however, it should be noted that this literature review is comprehensive. There are many potential areas to advance the TPACK framework, including students' learning with technology across contextual settings, addressing how the interactions of contextual factors influence and moderate TPACK knowledge development, and reviewing the current TPACK assessments in the context of English language subject area to identify issues, trends, and recommendations that could guide possible areas for future research in TPACK. Greater attention to context in research can support TPACK applications in educational technology programs that promote technology integration.

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Appendix 1: Articles and codes for the publications included in the systematic review (publication outlet, research method, and population sample)

Article #	Authors & Year	Publication outlet	Research method	Population sample
TPACK studies that focused on English as a second language subject area only				
1	Bandi-Rao and Sepp (2014)	Journal of Basic Writing	Qualitative	EFL students
2	Baser, Kopcha and Ozden 2016)	Computer Assisted Language Learning	Mixed methods	Pre-service teachers
3	Bostancıoğlu and Handley (2018)	Computer Assisted Language Learning,	Mixed methods	In-service teachers
4	Debbagh and Jones (2018)	Journal of Educational Multimedia and Hypermedia	Qualitative	In-service teachers
5	Habibi, Yusop and Razak (2019)	Education and Information Technologies	Quantitative	Pre-service teachers
6	Holmberg, Fransson and Fors (2018)	International Journal of Information and Learning Technology	Qualitative	In-service teachers
7	Liu, Wang and Koehler (2019)	British Journal of Educational Technology	Mixed methods	In-service teachers
8	Setiawan, Hamra, Jabu and Susilo (2018)	Journal of Language Teaching and Research	Qualitative	In-service teachers
9	Aşık, İnce and Vural (2018)	Journal of Qualitative Research in Education	Mixed methods	Pre-service teachers
10	Teka (2018)	Journal of Teacher Education and Educators	Qualitative	Pre-service teachers
11	Tseng (2016)	Computer Assisted Language Learning	Quantitative	EFL students
12	Tseng (2018)	Computer Assisted Language Learning	Mixed methods	In-service teachers
13	Tseng, Cheng and Lin (2011)	Journal of Asia TOEFL	Qualitative	In-service teachers
14	Tseng, Cheng and Yeh (2019)	Computers & Education	Qualitative	Pre-service teachers
15	Turgut (2017 b)	Educational Research and Reviews	Mixed methods	Pre-service & In-service teachers
16	Turgut (2017 a)	Manager's Journal on English Language Teaching	Mixed methods	Pre-service teachers
TPACK studies that included other subject discipline areas such as social sciences education, science education etc.				
17	Baran and Uygun (2016)	Australasian Journal of Educational Technology,	Qualitative	Pre-service teachers
18	Baran, Canbazoglu, Albayrak and Tondeur (2019)	British Journal of Educational Technology	Quantitative	Pre-service teachers
19	Chai, Koh and Tsai (2010).	Educational Technology & Society	Quantitative	Pre-service teachers
20	Dong, Sang, Chai, Koh and Tsai (2015)	Educational Technology & Society	Quantitative	Pre-service & In-service teachers
21	Joo, Park and Lim (2018)	Educational Technology & Society	Quantitative	Pre-service teachers
22	Khine, Ali and Afari (2017)	Education and Information Technologies	Quantitative	Pre-service teachers
23	Redmond and Peled (2019)	British Journal of Educational Technology	Qualitative	Pre-service teachers
24	Sang, Tondeur, Chai and Dong (2016)	Asia-pacific Journal of Teacher Education	Quantitative	Pre-service teachers

Appendix 2: Articles and codes for the publications included in the systematic review (TPACK variables and levels of contextual)

Article #	Authors & Year	TPACK as knowledge			TPACK as performance	TPACK context levels			Dispositions	Teacher's factors
		General	Specific	Experienced		Micro	Meso	Macro		
TACK studies that focused on English as a second language subject area only										
1	Bandi-Rao and Sepp (2014)			X		X	X	X		X
2	Baser, Kopcha and Ozden 2016)	X				X		X		X
3	Bostancıoğlu and Handley (2018)	X				X		X		X
4	Debbagh and Jones (2018)	X			X	X				X
5	Habibi, Yusop and Razak (2019)	X				X		X		X
6	Holmberg, Fransson and Fors (2018)	X				X	X	X		X
7	Liu, Wang and Koehler (2019)	X				X	X	X		X
8	Setiawan, Hamra, Jabu and Susilo (2018)			X	X	X				X
9	Aşık, İnce and Vural (2018)	X		X		X				X
10	Getu and Teka (2018)			X				X		X
11	Tseng (2016)	X				X				
12	Tseng (2018)	X		X		X	X			X
13	Tseng, Cheng and Lin (2011)				X	X	X	X		X
14	Tseng, Cheng and Yeh (2019)			X	X	X				X
15	Turgut (2017b)	X			X	X	X	X		X
16	Turgut (2017a)	X		X		X	X	X		X
TPACK studies that included other subject discipline areas such as social sciences education, science education etc.										
17	Baran and Uygun (2016)	X		X	X	X	X			
18	Baran, Canbazoglu, Albayrak and Tondeur (2019)	X				X	X			X
19	Chai, Koh and Tsai (2010)	X				X				
20	Dong, Sang, Chai, Koh and Tsai (2015)	X				X	X	X	X	X
21	Joo, Park and Lim (2018)	X				X		X		
22	Khine, Ali and Afari (2017)	X				X		X		
23	Redmond and Peled (2019)	X				X	X	X		X
24	Sang, Tondeur, Chai and Dong (2016)	X				X		X		