Multiple Perspectives with Online EFL Practicum Technology Learning: Case Study on a Cloud

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Abstract
This yearlong study describes multiple stakeholders’ perspectives of 20 preservice English as Foreign Language (EFL) teachers, 43 elementary school students, 2 online mentors, and a teacher-researcher during a technology professional development practicum on a cloud. The case study provides qualitative and quantitative data from stakeholders concerning technology integration after participating in online project-based EFL instruction. The participating stakeholders encountered affordances and challenges that enhanced their online learning and teaching repertoires and offered nuanced evidence within this online professional development community. The findings call for continuing exploration of online practicums in preservice (language) teacher education and further research documenting complexities of multiple stakeholders’ technology professional development.

Keyword EFL teacher education · Online practicum · Preservice teachers · Technology professional development

Professional development is continuously a key issue to determine (language) teachers’ meaningful engagement with technology integration in the 21st-century digital era (Cutrim Schmid, 2017; Tafazoli, 2021). Belland (2009) defined for educational communities technology integration as a sustainable and persistent educational reform “by the adoption of technology to help students construct knowledge” rather than mechanical application of various computer facilities (p. 354). Gess-Newsome et al. (2003) suggested that technology professional development programs engage teachers in designing contextual learning content and pedagogically appropriate methods after learning new software applications, with an aim to “develop shared understanding of goals for student learning” (p. 330). Online teaching practices offer abundant opportunities for teachers to apply technology-enriched instruction to scaffolding students’ language learning among various professional learning modules (Pineda et al., 2021). Yet, language teachers’ lack of experiences and readiness challenges the quality of online language education (Gao & Zhang, 2020); hence it is salient to prepare preservice language teachers for developing and enhancing online instructional skills before they start a teaching career (Sun & Zou, 2022). Preservice teacher development in technology integration addresses various (language) education contexts to enhance student learning outcomes (e.g., Brenner & Brill, 2016; Marull & Kumar, 2020; Noori, 2019; Schmid, 2017; Torsani, 2016). Preservice teachers (PTs) either participate in design-based technology learning teaching projects to peers in training classes (e.g., Chien et al., 2012; Jeong, 2017) or in traditional internship or practicum schools with limited technology application opportunities (e.g., Chen & Chan, 2011; Mouza et al., 2014). Subsequently, some researchers promote online practicum mechanisms to replace or supplement traditional modules (e.g., Ersin et al., 2020; Frey, 2008; Wang et al., 2010). Online practicum in the wider educational literature variously refers to practical experiences offered to PTs applying subject-related knowledge to instructional practice via asynchronous or synchronous online contexts, along with receiving supervision...
and feedback pertinent to this professional learning process (e.g., Howell et al., 2020). Frey (2008) noted that “[t]he integration of online practicum experiences with coursework holds great promise as means for facilitating teacher change” (p. 205).

**Literature Review**

The accumulating evidence within investigations of professional development technology integration continues to offer glimpses of PTs’ experiences, perceptions, and understandings. Variously, the wider general and more specific second language education literature addresses PTs’ professional development, PTs’ technology integration, and PTs’ practicum experiences, usually, but not always, using the overarching nomenclature of technological pedagogical content knowledge (TPACK, e.g., Mishra & Koehler, 2006). Yet, Tseng et al. (2020) found research specifically concerning TPACK in practice quite limited in language teacher education and argued it paramount to further document complexities inherent in teacher technology integration via authentic practices. Although few researchers have documented PTs’ technology integration within online instructional practices in the language (e.g., second/foreign) field (e.g., Cheng, 2018; Tseng et al., 2019), there have been nominal studies of preservice language teacher development in technology integration. Our literature review offers various aspects and insights from general (e.g., diverse content-domain areas) and language education professional development technology integration. Studies provide evidence from (1) quantitative survey investigations, (2) multiple data sources utilization investigations, and (3) professional learning processes (field experiences and practicums). Together such information offers pieces of an unfinished puzzle that sketches the nascent educational landscape of professional development integrating technology including fragments from language teaching and learning.

**Quantitative Survey Investigations**

Some researchers documented various factors in relation to teacher candidates’ current technology improvement (e.g., Anderson & Maninger, 2007; Sang et al., 2010). The participants’ technology application behaviors were directly determined by variables such as practice experiences, teacher/computer self-efficacy, constructivist teaching beliefs, or value/intention to use software. Other researchers invited PTs to self-assess perceived growth and/or changes in using instructional technology once completing educational technology courses (e.g., Fleming et al., 2007; Swain, 2006). EFL PTs in Koşar (2021) were compelled to suddenly move their practicum from placement schools to a distance education system on account of the COVID-19 pandemic. Participants shared disappointment toward their designed coursework that requested them to review teaching regulations and school rules, followed by completing paper-work assignments. These prospective EFL teachers had difficulties enhancing their technology professional development without opportunities to teach students online.

Teo and colleagues developed the technology acceptance model to predict PTs’ attitude toward technology infusion (e.g., Teo, 2010; Teo & Noyes, 2011; Teo et al., 2008); the recruited participants’ perceived usefulness of technology determined their behavioral intention. Sun and Zou’s (2022) investigation of EFL PTs’ acceptance level of online technology-mediated teaching during the COVID-19 pandemic confirmed, more recently, similar findings of Teo and colleagues. Yet, the EFL PTs’ willingness to implement web-based instruction was confined by their low level of TPACK, due to limited experience in practicing technology-supported tools via online platforms. Mei (2019) suggested EFL teacher preparation programs address the alignment of technology, curriculum, and pedagogy, after documenting a large group of PTs’ unsatisfactory technology acceptance levels.

**Multiple Data Sources Utilization Investigations**

Earlier researchers had PTs apply constructivist approaches to design multimedia and/or synchronous tasks for networked online contexts (e.g., Lim & Chan, 2007; Martin & Vallance, 2008). The short-term instructional tasks implemented among peers may promote and improve teacher candidates’ professional learning; yet, participants in Lim and Chan (2007) did not change their original pedagogical belief in technology application due to lacking practical experiences. Jeong (2017) fostered EFL PTs’ digital literacy by involving them in designing a Moodle learning platform to enhance trainees’ confidence in technological infusion as well as expertise in relevant pedagogical design. Ersin et al. (2020) had EFL PTs deliver microteaching practices online; these trainees with peer evaluation and mentor support increased self-efficacy in technology-based instruction.

Additional studies conducted peer-assessment and/or self-evaluation on lesson design (e.g., Chai et al., 2011; Chien et al., 2012; So & Kim, 2009; Song et al., 2020). The participants were aware of potential positive impact of technology-related instruction on student learning outcomes. However, it was reported that PTs may not feel confident to transfer perceived technology literacy into future classroom instruction, on account of no experience in teaching authentic students. In fact, PTs in So and Kim (2009) encountered difficulties in matching technology tools, pedagogical skills, and problem-based learning content when designing technology integrated lessons in various subject areas. EFL PTs in an online TESOL course were engaged in nonteaching
activities (e.g., reading, field observations, teaching design) via a multimedia platform (Song et al., 2020). PTs’ self-reflection entries and final papers particularly reveal that various web-based learning contexts facilitated a high-level reflexivity among peers and fostered pedagogical creativity where EFL PTs adopted innovative and technology-mediated educational practices.

Professional Learning Processes (Field Experiences and Practicums)

Some researchers arranged PTs to collaborate with inservice teachers when designing and implementing technology-enhanced lessons delivered in authentic face-to-face classroom contexts. Brush and Saye (2009), for example, found that PTs majoring in social studies perceived how technology empowers inquiry-based instructional practice. A school-based experience in situated contexts allowed EFL teacher candidates to evaluate the impact of technology on language education (Schmid & Hegelheimer, 2014).

Other extant studies fostered PTs implementing technology into practice in face-to-face field experiences after offering relevant web-based training sessions (e.g., Chen & Chan, 2011; Marshall et al., 2010; Mouza et al., 2014). Most recruited participants became aware of a student-centered teaching philosophy, revisited previous perceptions of technology integration, and improved computer literacy and/or self-efficacy. Yet, Mouza et al. (2014) raised issues of PTs’ limited access to technology use and insufficient role models of effective technology integration demonstrated by the assigned cooperating teachers.

A few studies on technology professional development provided preservice language teachers with online practicum opportunities. For example, Wang et al. (2010) engaged EFL PTs in synchronous cyber teaching practice and observation for eight weeks. This online-based practicum experience with real students brought enthusiasm to PTs while enhancing their computer literacy and confidence/intention to transfer traditional face-to-face classroom pedagogy to networked instruction. In another study, EFL PTs synchronously delivered English instruction to high school students via digital platforms under mentors’ supervision (Shinta & Aprilia, 2020). The self-reported data showed most participants’ limited preparation and orientation for the e-practicum owing to the urgent switch to this alternative mechanism during the COVID-19 outbreak. They appeared much less confident in managing online classrooms and unsatisfied with insufficient access to facilities, despite a majority’s positive perceptions of this online practice to revisit their knowledge of technology integration. Tseng et al. (2019) adopted design thinking to investigate how EFL PTs enacted TPACK during web-conferencing instruction to low-level students. These PTs’ collaborative design conversation frequently focused on PCK rather than technology-based subcomponents due to contextual factors such as technical problems, student prior knowledge, and short attention spans.

Problem Statement and Research Questions

Most previous studies on preservice (language) training relied on participants’ self-assessment instruments (e.g., Baser et al., 2016; Jang & Chen, 2010) and a few added teacher educators’ perspectives (e.g., Cherney & Curry, 2017). Yet, teachers’ perceived beliefs, competence, and performance may not be consistent with what and how students learn from teachers’ instruction (Tondeur et al., 2017b); students also play a discernable role to justify (language) teacher technology professional development (Tseng, 2016). There remains a dearth of research in second languages including student perceptions of PTs’ achievement with technology use, while a few extant studies investigated the effectiveness of inservice teachers’ technology use via students’ points of view (e.g., Chuang et al., 2018; Tseng, 2018). Limited studies have conducted in-depth analysis of how PTs apply and further develop their online technology repertoires once engaged in classroom practices (Tondeur et al., 2017a; Tseng et al., 2020), even though some studies examined the levels of PTs’ TPACK after completing educational technology courses.

The present study documented technology integration professional development while PTs engaged in authentic practices in an online practicum as part of a yearlong TEFL Methodology Course. Professional development included project-based instruction (PBI) and professional experimentation in an online field experience guided by two mentors and a teacher-researcher. The case study provided below contextualizes PTs’, their students’, mentors’, and teacher-researcher’s experiences and knowledge providing evidence of potential learning and increasing motivation when applying technology into instructional practices. This case study documented multiple stakeholders’ perspectives applying PBI as practice and addressed the following research questions:

1. How do EFL preservice teachers perceive their technology development via online project-based practicum?
2. What insights from elementary language learners, mentors, and a teacher-researcher further explain PTs’ learning to teach with technology?

Methodology

Stake (1995) contended “The case is a specific, a complex, functioning thing” (p. 2). Moreover, he argues a “case researcher tries to preserve the multiple realities, the
different and even contradictory views of what is happening” (p. 12). This case study shares the complexity functioning of online teaching and learning while examining multiple realities when participating in professional development on a cloud.

**Participants**

The 20 central participants (18 females and 2 males), all English majors, registered for a yearlong *TEFL Methodology Course*. These PTs (aged from 21 to 23) were either college juniors or seniors. The majority took 26-credit teacher education courses within two academic years while pursuing an Arts B.A. degree at a private Taiwan university. They generally spent 6 to 8 h on taking relevant preservice training courses per semester. In total, 80% of these participants reportedly served as English tutors for elementary or junior high school students before or during this study.

The participants also included 43 (25 females and 18 males) elementary school students (grade 5 or 6) receiving online English instruction from the participating PTs. More than 85% strived to improve their English ability; around 75% were interested in online learning; and about 58% regarded English as a useful tool for future study. Approximately 47% of these students were identified as mid-level, 28% low-level, 25% high-level English learners according to school achievement test results. Each PT class included high- and mid-level students or mixed with mid- and low-level learners.

Two female online mentors (Mandy [3 years’ experience] and Tina [five years’ experience], pseudonyms) guided the participating PTs’ technology and pedagogy workshops on a Cloud platform. Mandy earned a Bachelor’s degree in English language and literature in Taiwan, and Tina held a Master’s degree in TESOL from the U.S.A. These mentors in their early thirties were qualified technology coaches serving as full-time staff at a charity association with branches in Taiwan and the U.S.

Author 1 was the teacher-researcher and functioned as “participant observer” (Hadar & Brody, 2016) to promote teacher growth. She took field notes when accessing documents relevant to PTs’ professional learning and promoted reflectivity among these trainees by posting guiding questions for discussion forums. She maintained an object account of human interaction with PTs to the extent possible as an insider-researcher (Mercer, 2007).

**Data Sources and Analyses**

Data collection included surveys, focus group interviews, reflection entries, in-depth interviews, and field notes (see Table 1). The survey provided information about the PTs’ three major elements of TPACK knowledge: content, pedagogy, and technology (Koehler et al., 2007; Mishra & Koehler, 2006), including technology knowledge (TK), pedagogy knowledge (PK), content knowledge (CK). The connections and interactions between/among these elements result in pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK). The survey data gave a glimpse as to how PTs integrated technology in their online teaching and learning context with specific content in meaningful pedagogical ways that possibly enhanced student learning. Quantitative survey data collected were analyzed by SPSS 20.0 for Windows in terms of reliability (α = 0.96 and 0.98 for PTs’ two surveys; α = 0.76 for students’ survey), descriptive analysis (i.e., means, standard deviations, and paired-samples t-tests), and correlation analysis of TPACK constructs developed through participants’ responses. Qualitative data collected from (focus group) interviews and reflection entries were analyzed by open/axial coding techniques (Corbin et al., 2014). Furthermore, teacher-researcher’s field notes were outlined to offer additional perspective to assist description of these PTs’ professional online learning experiences. Overall, data collection was conducted in Chinese to elicit data without interference of language performance, except for PTs’ English survey. Any collected data in Chinese were translated by the researcher and reviewed by a near-native English speaker. Collected data were compared and contrasted to draw holistic understandings of issues for this case study (Silverman, 2015; Stake, 1995).

**Table 1** Data collection from participants

| Participants            | Number | Data collection                                      |
|-------------------------|--------|------------------------------------------------------|
| Preservice teachers     | 20     | Pre- and post-surveys, 3 focus group interviews, reflection entries |
| Students                | 43     | Survey                                               |
| Mentors                 | 2      | 2 in-depth interviews                                 |
| Teacher-researcher      | 1      | Field notes                                          |

**Case Study**

**Context: Online Project-Based Practicum**

Project-based instruction (PBI) fosters students to work as self-directed learners gathering information on topics related to real-world problems, discussing the topics with others, compiling and finishing the reports, and finally sharing what they have learned among peers (e.g., Blumenfeld et al., 1991). This learner-centered pedagogical approach has been widely implemented in EFL contexts with studies documenting PBI effectiveness enhancing
learners’ motivation, collaboration, autonomy, and/or language development (e.g., Park & Eisenhow er, 2019; Putri et al., 2017; Wang, 2020). Furthermore, PTs learning how to design and implement technology-enabled PBI are able to contextualize teachers’ knowledge in authentic instructional contexts that support deep learning and will have more motivation to apply technology into future instructional practices (e.g., Chen & Chan, 2011; Tseng & Yeh, 2019).

Author 1 initiated the practicum project in cooperation with a charity that enhanced underprivileged students’ language literacy via a student-centered, innovative, and technology-enhanced learning environment by recruiting college volunteer students to serve as online tutors. The project-based online practicum was integrated into the teaching schedule of a yearlong TEFL Methodology course (see Liu, 2017) and also attended to Baran and Correia’s (2014) online framework for professional development including attention to support at the teaching, community, and organizational levels. The professional development practicum integrating technology development offered three major components: 1) pre-practicum training, 2) online instruction, and 3) reflective discussions (see Fig. 1 for the implementation procedures).

**Pre-practicum training:** The participating PTs received semester-long TEFL methods instruction (including PBI) from the teacher-researcher during regular face-to-face class meetings (2 h per week). It was then followed by three training workshops (3 h per week) offered by online mentors regarding how to use multimedia functions on a Cloud-based teaching platform (http://blog.joinnet.tw/), such as Interactive White Board, asynchronous/synchronous chatting rooms, and discussion forums.

**Online instruction:** These PTs were engaged in two online teaching projects (i.e., color recognition and direction inquiry) for 10 weeks. The goal was to teach daily vocabulary to young learners by simultaneously integrating four language skills during the teaching flow (see sample screenshots in Fig. 2). These PTs (divided into small groups [n = 4 or 5]), collaboratively designed and delivered English instruction to underprivileged elementary school students under the online supervision of Mandy and Tina. Each group tutored/taught 6–10 students 3 to 4 h per week after school. The PTs in each group were further divided into two teams, rotated to prepare online instructional materials (e.g., worksheets,
PowerPoint files, and quizzes), and team taught the pre-scheduled class sessions. In total, the duration of respective groups’ online teaching was around 35 h during this project. Individual PTs’ online authentic practices lasted 7.5–8 h and their engagement in preparing instructional materials was about 10–12 h.

**Reflective discussions:** Individual groups of PTs were involved in reflective discussions after finishing each online class session. Group members reviewed streaming teaching videos and submitted reflection entries to discussion forums concerning their instructional procedures, strengths, and/or drawbacks of teaching practice. Afterwards, they participated in asynchronous discussions with peers and mentors about their reflections in the forums. They may have had synchronous discussions with Mandy or Tina, if needed, particularly regarding how their technology application matched the delivery of teaching content. Subsequently, each group had face-to-face meetings with the teacher-researcher to evaluate group collaboration and individual performance right before their preparation for the next class session.

### PTs’ Self-Reported Perceptions

To sketch the PTs’ experiences and knowledge, we first present PTs’ qualitative data that portray their overall experiences, understandings, and concerns throughout the practicum; then survey data assist to quantify PTs’ responses. PTs’ voices from interviews underlined a positive outcome of using technology in presenting online project-based instruction.

PTs appreciated the opportunities offered to access various multimedia technological applications on a Cloud platform. Almost all PTs (n = 19) reported their perceived improvement in TK regarding how to manage an online platform and utilize the embedded instructional tools. At the middle of this project, these PTs reported they learned “how to use pictures and videos to stimulate students’ online learning” and “how to monitor students’ absent-minded behaviors and lack of attention in online classrooms.” They also became familiar with how to “apply all the online sources and multimedia to teaching assigned materials” and “design lesson plans to match the goals of online English instruction” when drafting reflection entries on instructional practice. Near the end of this practicum, most (n = 17) highlighted online teaching practice as an intriguing experience to reinforce technology applications in future classroom contexts. They further contended that the PBI they implemented online was beneficial for learning to teach, because it increases interest “in creating interesting project themes by means of different technological gadgets.”

Yet, only under half of the PTs (n = 9) were totally satisfied with how they integrated technology with project-based instruction (i.e., TPACK). Typically, one positive report highlighted, “Our group followed the major teaching concepts [of PBI] and gradually learned how to choose the right topic, content, and teaching methods to help students with their online learning.” More than 50% of these PTs (n = 11) confessed either difficulties or concerns they encountered when developing TPACK subcomponents. Primarily, they regarded PK and TPK as the most challenging components after completing online teaching. Two typical quotes as examples include: “I sometimes really couldn’t manage the online classroom very well... Students may go crazy at certain special games this time but then they got bored next time.” “We need to make more efforts to improve our creativity in designing activities or games which could stir up students’ interaction with us.” Other than that, the development of CK and TCK also concerned around 70% of these PTs unsatisfied with their online practice (n = 8 out of 11). For example, “Our group couldn’t actually make designed teaching materials meet students’ language proficiency levels.” “We came across difficulties specifically matching online multimedia (e.g., YouTube clips, animation games) to facilitate teaching content.” Similar worries appeared in PTs’ reflection journals, such as “the project theme we chose is terrific, but the content is just fine for students to get involved” or “our group seemed to get lost when making final decisions to cover specific vocabulary to be taught.”

The PTs’ quantitative data further highlighted some of the qualitative conundrums shared. The composite mean scores for all PTs on all scales in the post-survey are higher than in the pre-survey (see Table 2). Statistically, these PTs improved TK, TPK, TCK and TPACK after partaking in an authentic online teaching experience despite their PK, CK and PCK remaining similar. The t-test shows that there

| TPACK variables | TK     | PK     | CK     | PCK    | TPK    | TCK    | TPACK  |
|-----------------|--------|--------|--------|--------|--------|--------|--------|
| Composite       | 3.82   | 4.28   | 4.15   | 4.27   | 3.67   | 3.83   | 3.90   |
| Mean Scores     |        |        |        |        |        |        |        |
| (Standard       | 0.96   | 0.57   | 0.72   | 0.47   | 0.96   | 0.95   | 0.84   |
| Deviation)      |        |        |        |        |        |        |        |
| Pre-survey      | 4.55   | 4.53   | 4.48   | 4.48   | 4.44   | 4.57   | 4.51   |
| Post-survey     | 0.76   | 0.55   | 0.67   | 0.55   | 0.67   | 0.69   | 0.65   |

6 = strongly agree, 5 = agree, 4 = mildly agree, 3 = mildly disagree, 2 = disagree, 1 = strongly disagree
is significant improvement in the participants’ technology-related competence; yet no significant difference among the other three constructs (see Table 3). As shown in the composite mean scores of both surveys ($M = 4.15 – 4.53$), these PTs solely showed slight agreement with their competence of these TPACK subcomponents not directly related to technology attributes.

The statistical results show that some constructs of these PTs’ TPACK appeared less well-developed before they received the online practicum training (see Table 4). Specifically, these PTs’ PK, CK, and PCK appear to have weak relationships with the essence of their TK. By contrast, after the online project-based instruction, there are strong correlations among all seven constructs of these PTs’ TPACK repertoire ($r = 0.77 – 0.94$, $p < 0.01$, see Table 5). What these findings mean on the one hand is the more these PTs agreed with the improvement of their TK, PK, and CK, the more they showed an agreement with the intensification of their TPK, TCK and as a whole their TPACK. On the other hand, the statistical results may also suggest that when some PTs developed less TK, PK and CK, the less they improved their knowledge bases regarding integration of TPK, TCK, and TPACK in a pedagogically sound manner.

### Elementary Students’ Learning Feedback

When we examined elementary students’ perspectives of their interactions with PTs, we found that not all technology-infused project instruction may have made for a completely successful online learning experience. These students rated PTs’ professional learning with an overall average of 7.56 out of 10 points (respectively in terms of technology application [7.98], online teaching pedagogies [7.44], and instructional content [7.28]). We further documented students’ learning feedback through rating scores for various questions. More than 90% of the 43

| Constructs | Test | Mean | SD | t | p |
|------------|------|------|----|---|---|
| TK         | Pre-test | 22.95 | 5.80 | | |
|            | Post-test | 27.30 | 4.59 | -2.325* | .031 |
| PK         | Pre-test | 34.30 | 4.63 | | |
|            | Post-test | 36.25 | 4.47 | -1.143 | .267 |
| CK         | Pre-test | 24.95 | 4.35 | | |
|            | Post-test | 26.90 | 4.04 | -1.242 | .229 |
| PCK        | Pre-test | 34.20 | 3.83 | | |
|            | Post-test | 35.90 | 4.46 | -1.137 | .270 |
| TPK        | Pre-test | 29.40 | 7.73 | | |
|            | Posttest | 35.55 | 5.39 | -2.744* | .013 |
| TCK        | Pre-test | 23.00 | 5.72 | | |
|            | Post-test | 27.45 | 4.16 | -2.707* | .014 |
| TPACK      | Pre-test | 31.20 | 6.73 | | |
|            | Post-test | 36.05 | 5.22 | -2.446* | .024 |

The survey includes 50 items (6 respectively in TK, CK, and TCK, and 8 in the others). The Shapiro–Wilk test shows normal distribution of survey data in individual constructs

$^*p < .05$

| Constructs | Test | Mean | SD | t | p |
|------------|------|------|----|---|---|
| PK         | 1. TK | .51* | .51* | .36 | .83** |
|            | 2. PK | .86** | .79** | .41 | .42 |
|            | 3. CK | .88** | .49* | .35 | .44 |
|            | 4. PCK | .32 | .19 | .32 | |
| TPK        | 5. TPK | .81** | .86** | 29.40 | 7.73 |
|            | 6. TCK | .91** | 23.00 | 5.72 |
|            | 7. TPACK | 31.20 | 6.73 | |

$^*p < .05$, $^{**}p < .01$

| Constructs | Test | Mean | SD | t | p |
|------------|------|------|----|---|---|
| PK         | 1. TK | .79** | .77** | .77** | .83** |
|            | 2. PK | .88** | .93** | .92** | .86** |
|            | 3. CK | .91** | .88** | .94** | .87** |
|            | 4. PCK | .91** | .90** | .90** | 35.90 | 4.45 |
| TPK        | 5. TPK | .92** | .88** | 35.55 | 5.39 |
|            | 6. TCK | .93** | 36.05 | 5.22 |
|            | 7. TPACK | 36.05 | 5.22 | |

$^{**}p < .01$
students complimented PTs’ use of entertaining games, animations, and video clips to match vocabulary instruction \( (n=40) \) as well as PTs’ enthusiastic teaching attitude and creation of an exciting learning atmosphere \( (n=39) \). Nevertheless, about 75% of students \( (n=32) \) noted PTs’ lack of initiative to stop noisy peers, leading sometimes to perceived chaotic online classrooms. More than 62% of students \( (n=27) \) mentioned the time management skills PTs needed to improve in order to finish the scheduled learning projects. Other than that, about 45% of students \( (n=20) \) expressed that PTs’ vocabulary explanations and practices were sometimes not intelligible to them.

We are mindful on average most elementary students did not frequently perceive these PTs’ effective application of technology into teaching content and pedagogy delivery in their responses to 5-point Likert-type survey items (Composite mean scores: TCK = 3.88, TPK = 3.67, TPACK = 3.76). We refer to the correlation and individual item analyses of survey subcategories which give some viable insights of students’ considerations of PTs’ professional growth. Overall, these students may feel the ways PTs infused online instructional pedagogies and relevant technology had an influential impact on how teaching content was presented, as there is a significant relationship in these students’ data between PTs’ TPK and TCK performance \( (r=0.453, p=0.002 < 0.01) \). Yet, we depict insignificant correlation between students’ considerations of the development of PTs’ TCK and TPACK \( (r=0.101, p=0.521) \) as well as TPK and TPACK \( (r=-0.139, p=0.374) \). The extent to which technology, pedagogies, and content were integrated (TPACK) in PTs’ online instruction did not reach a positively significant level. Seemingly, these students recognized PTs’ more frequent achievement in presenting content by technology, compared to integrating technology into pedagogies. It appears that students often preferred how PTs associated the Internet resources (i.e., games and/or activities) with vocabulary learning content (TCK), yet only two TPK items concerning online interaction with peers/teachers and involvement in online learning activities/games earned students’ agreement. In particular, they disagreed with PT’s competence in adjusting teaching materials to meet learning difficulties (TCK) and in managing online learning behaviors well (TPK), despite positive responses to one of the three TPACK items showing their frequent experience in finding how PTs tried to use various technology gadgets, and teaching strategies in teaching units.

Mentors’ and Teacher-Researcher’s Observations

Mandy and Tina acknowledged these trainees’ professional growth during this 10-week practicum and were deeply impressed by the creative themes PTs designed in teaching projects. For example, “In addition to animal farms we introduced to them, they came up with several themes which could trigger students’ interest and imagination, such as Alice’s wonderland, space world, and detective cases.” The mentors shared their amazement concerning PTs’ well-designed projects and technology-based games employed in teaching assigned vocabulary. “The Jumping Monkeys or Explosion Game they were using did motivate students to figure out what the vocabulary meanings are.” Author 1 observed that “almost all the groups surfed the Internet and searched which intriguing game(s) could make students involved in vocabulary learning. They are always very excited and confident in integrating games into online instruction.”

Nonetheless, such online, joyful games lead to some difficulties managing classroom behaviors, as noticed by mentors. Tina noted that “students sometimes became distracted by games and PTs couldn’t drag students back to the right track of teaching flow.” Typically, Mandy regarded online classroom management as a prerequisite before PTs relied on game-based instructional mode, saying “These trainees have got to learn how to manage student behaviors, such as using Monitoring Pen or Highlighter on the platform. Otherwise, students usually go nuts and don’t know the purpose of playing games.” It seems that these mentors both underscored the priority to manage, if not discipline, student learning behaviors on a Cloud platform alerting to challenges of PTs continuing TPK development.

PTs’ uncertainty in using appropriate classroom management and pedagogies in delivering project-based instruction is further revealed in Mandy’s comments. “[PTs] were sometimes not good at wrapping up teaching projects by referring to the [PBI] strategies, although they were fine with handling online pre- and during-tasks.” Tina further stressed, “Problem–solution pedagogies were supposed to be used in several [PBI] sessions. Yet, PTs mostly adhered to CLT activities rather than being flexible to match different online sessions with specific pedagogies.” Additionally, these PTs’ constrained online assessment skills also revealed the need to strengthen their TPK. Both mentors reiterated such concerns, primarily underscoring “[PTs]’ frequent use of quizzes or tests [that] may decrease students’ learning interests,” and “they need to learn how to transfer traditional paper-based test format into online learning assessment.” As described in the field notes,

When [PTs] were talking over assessment design on discussion boards, most of them underscored the use of quizzes because they regarded it practical and valid to evaluate student learning outcome. It seems that they did not re-conceptualize what assessment means to them after they attended a workshop introducing online communication-oriented assessment techniques last month.
Finally, PTs were nervous to use other technology applications/gadgets or teaching skills to present the project content, when employing backup plan to substitute something wrong during teaching process. This may be caused by underdeveloped TPACK they overall espoused. For example, fieldnotes documented two groups encountering problems in applying alternative animation games regarding their pre-tasks.

Group one had problems in playing “spaceship games” and Group four in “missing treasure games” during the pre-task presentation this afternoon. It was a bit out of order when they replaced the original games with another alternative(s). They explained it was beyond their expectation when the original games contained too many megabytes to display smoothly on the platform.

We continue to see the participating PTs and their students experienced affordances and constraints during this online practicum’s mission through mentors’ and teacher researcher’s insights. The teacher researcher noted at different stages throughout the experiences, “more than 4 groups revealed frustrations during authentic online instruction delivered to elementary school students in the second month of Spring Semester.” Most groups requested several urgent meetings with mentors to cope with teaching difficulties. According to a field note, several PTs confessed “to design teaching projects is one thing, to teach students what we designed is another.”

Discussion

This case study provides multiple data sources collected from various stakeholders depicting these PTs’ professional online development practicum. Overall, these PTs have positive perceptions toward and encouraging learning experience during technology-enriched teacher training; even though previous research found that PTs appeared with a lack of readiness and confidence to put technological theories into real practice when not offered authentic face-to-face or online teaching practices delivered to students (e.g., Chien et al., 2012; Sun & Zou, 2022). Referring to self-reported survey data, these PTs reported their enhanced technology competence (TK) and relevant TCK, TPK, or TPACK, which is in line with the extant similar studies (e.g., Chen & Chan, 2011; Schmid & Hegelheimer, 2014). The survey data further show stronger correlations among the TPACK subcomponents after the online practicum, compared to PTs’ original competence before participating in this project. However, there is no significant difference of their CK, PK, and PCK development before and after this practicum as a whole. This may suggest their perceived competence in applying teaching content and pedagogies remained similar throughout the current study, if not challenges in developing these TPACK subcomponents. As noted in previous research, PTs could not highly enhance the quality of their technology-based instruction if they did not have an in-depth understanding of teaching content and pedagogies, even when they were capable of infusing technology into instructional process (e.g., Cherner & Curry, 2017; Hofer & Grandgenett, 2012). Such survey results may imply why these PTs mentioned teaching challenges or difficulties in their interviews and reflection entries. They sometimes could not attract students’ learning attention, discipline student behaviors, or increase teacher-student interactions that were related to their integration of technology and pedagogies (TPK). The PTs’ uncertainty in selecting teaching materials in parallel with students’ mixed language proficiency levels in online classes may result from limited development of these trainees’ content knowledge together with technology competence (TCK).

Other stakeholders’ perspectives buttressed the potential effects of this online practicum project, along with echoing what PTs needed to improve in online classes. Similar to previous language research including students’ points of view in inservice training, the participating elementary school students in this study complimented various technology functions/tools PTs used, appreciated teacher engagement, and showed their preference for this online learning experience (e.g., Chuang et al., 2018; Tseng, 2018). These students were further invited to judge the frequency levels of preservice language teachers’ effective, if not professional, instructional practice, which remains less studied in the extant literature. Mostly, these students offered their views that they felt more effort needed to be made in improving PTs’ integration of technology into teaching content and instructional pedagogies (i.e., TPACK as a whole). While the extant studies usually reported students’ overall perceptions or mostly positive comments on the effectiveness of inservice EFL teachers’ technology applications inside face-to-face classroom contexts (e.g., Liu & Kleinsasser, 2015; Tseng, 2018), the current research documented students’ evaluation, both positive and negative, on and to 20 PTs’ technology training outcomes via online practicum before they step into a teaching career. Chuang et al. (2018) stressed that up to date few studies have explored students’ perceptions regarding the knowledge of teachers who handle technology-supported classes. The findings of this study accordingly render additional evidence and meanings regarding what and how teacher educators could attend to technology professional development during various stages of preservice teacher preparation.

Overall mentors’ and teacher-researcher’s perspectives concerning PTs’ professional development and learning were positive, despite a few drawbacks highlighting a need for further improvement. The mentors acknowledged PTs’
achievement in designing technology-based teaching projects and praised their devotion to serving as online instructors. To justify PTs’ career development, mentors pinpointed the need to improve pedagogical strategies of PBI and online assessment skills, which was also evident in the teacher-researcher’s field notes. The findings of Chuang et al. (2018) implied that their inservice English teachers needed more training in order to match adequate assessment methods with student learning situations. It was a challenging task for the PTs in this study to design appropriate assessment for young language learners, particularly in terms of online implementation format. Very frequently, the mentors highlighted how PTs were supposed to better manage classroom behaviors in a well-organized manner. It seems that the constructivist teaching philosophy instilled into their mentoring module was not as much as what was promoted by the charity association. According to researchers in the field of ICT instruction, constructivist teaching approaches will focus more on student-centered, autonomous, and higher-order learning objectives (Lim & Chan, 2007; Martin & Vallance, 2008). Yet, the mentors in this study appeared to highlight student discipline a lot, which in turn reinforced PTs’ attention to such efforts throughout the practicum. The findings buttress the influence of mentoring on teacher trainees’ web-based instructional practice (Dorner & Kumar, 2016; Ersin et al., 2020), which may direct trainees’ attention to the focus of instructional practice and assessment.

Conclusion

The findings within this particular case study recommend several implications for teacher educators. First, the participating PTs’ technology professional development suggests the potential effectiveness of applying online (project-based) practicum into fostering trainees to recast instructional modules and redefine teacher roles. More teacher training programs may engage preservice (language) teachers in online teaching practices with an aim to transform student learning and reshape learners’ cognition development in this digital age (see also McKnight et al., 2016). Second, the PTs’ limited development of CK and PK after this online practicum experience shows the requisite to strengthen trainees’ repertoire of PCK before and during their application of technology (e.g., Chan, 2007; Martin & Vallance, 2008). Team-based teaching projects as implemented in this study may allow peer assessment on “TPACK profiles” that record individual PTs’ choices of teaching content and pedagogies in technology infusion, along with technological content knowledge (e.g., deur et al., 2017a). Third, these PTs’ reliance on quizzes/tests to evaluate student learning outcome reveals their limited TPK in designing digital assessment to meet the essence of PBI. It calls for a need to familiarize trainees

with constructivist technology-supported assessment to stimulate student learning and achieve instructional goals (e.g., Malone, 2017), for example by infusing multimedia, gaming, or online resources into (language) assessment (see Voss, 2018). Fourth, this study continues documenting PTs’ (online) classroom management challenges as serious obstacles to PTs’ technology development and use. PTs may need to build student–teacher relationships starting with one-to-one interaction modules at a web-based classroom (e.g., Higgins & BuShell, 2018) before they face groups of online students. The participating mentors’ added their concerns about student discipline may be tied to PTs’ confined collaboration with other teaching supervisors. To enhance the effectiveness of online mentoring, Kelly et al. (2018) suggested building online dialogical communities among a circle of mentors who are provided with opportunities in deep and critical discussions about how to relate trainees’ teaching practice to different online classroom contexts. This study continues to reveal and uncover particular connections and conundrums that encourage insights into future practices and research.

There is wide contention that “achieving ‘technology integration’ is still a complex process of educational change” (Tondeur et al., 2017b, p. 555). The findings of this online practicum project weave meaningful threads into the intricate tapestry of complex (preservice) teacher technology development through the lenses of multiple stakeholders. The limitations of this case study recommend future researchers explore ongoing inquiry of online practicum mechanisms in other EFL and discipline specific contexts collecting other data sources from students (e.g., interviews and screen capture videos) and from other stakeholders to depict various learning outcomes. Inservice school teachers and other potential stakeholders (e.g., instructional designers) could be further involved in online preservice (tutor) training especially when researchers and practitioners promote the significance of incorporating preservice and inservice teacher education.

Declarations

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