Technology-facilitated Continuous Professional Development during a pandemic
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Technology-facilitated CPD during a pandemic: a Hong Kong primary school case study

Introduction
The COVID-19 pandemic was a major catalyst in shifting teachers to explore digital instructions further. Hong Kong was no different; schools were forced to stop face-to-face classes. Teachers and students transitioned to learning and teaching online with a mixture of asynchronous and synchronous learning adopted by different schools. In Hong Kong, as with other countries around the world (Chaaban, 2016; Mak, 2010), the Education Bureau (EDB) provides continuous support and professional development to schoolteachers through a variety of means, including school-based professional support (SBPS) (EDB, 2020). SBPS involves external expertise, such as university-based teacher educators or EDB staff, supporting schoolteachers in their schools through different activities, including professional development workshops, co-planning meetings, lesson observations, lesson demonstrations, curriculum and materials development and reviewing documents (UNESCO, 2018). However, due to the impact of the pandemic, teacher support and professional development needed to be re-evaluated. Although there has been a similar study focussing on SBPS in Hong Kong (e.g., Author X and colleagues (2021)), there has been little school-based research using technology to facilitate SBPS. The present study examined how technology can play a role in providing SBPS for a group of ESL teachers from the same primary school in Hong Kong. This small-scale study examined how primary school English teachers could continue professional learning by following a systematic framework facilitated by technology.

Continuous professional development in Hong Kong
Continuous professional development (CPD) refers to enhancing, tracking and documenting the skills, knowledge and experience acquired formally and informally through work beyond the initial training. It records what one experiences, learns and then applies (Rogers and Horrocks, 2010). This learning process eventually changes teachers’ professional practice and their thinking regarding that practice (Kelchtermans, 2009).

CPD is delivered to in-service teachers in Hong Kong in many forms. The most common are structured learning modes organised by the EDB, schools or teacher education institutions. Many of these CPD sessions are delivered as one-shot workshops/seminars, symposia and short-term theme-based courses (lasting from several days to several weeks). One-shot workshops or seminars that introduce new theories or strategies remain the most popular approach to teacher learning (Darling-Hammond et al., 2017). It is also due to their relatively low cost and a top-down and externally driven approach that becomes challenging to tailor to teachers’ individual needs (Zhang, 2019).

Kennedy (2014) describes CPD as transmissive, transitional or transformative. However, there has been little research into whether technology can enhance the capacity of professional autonomy of teachers, as shown in Table 1.
Table 1 – Technology integrated CPD analysis framework, adapted from Kennedy, 2014

<table>
<thead>
<tr>
<th>Model of CPD</th>
<th>Purpose of model</th>
</tr>
</thead>
<tbody>
<tr>
<td>The training model</td>
<td>Transmission</td>
</tr>
<tr>
<td>The award-bearing model</td>
<td></td>
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<tr>
<td>The deficit model</td>
<td></td>
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<td>The cascade model</td>
<td></td>
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<tr>
<td>The standards-based model</td>
<td>Transitional</td>
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<tr>
<td>The coaching/mentoring model</td>
<td></td>
</tr>
<tr>
<td>The community of practice model</td>
<td></td>
</tr>
<tr>
<td>The action research model</td>
<td>Transformative</td>
</tr>
<tr>
<td>The transformative model</td>
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</tbody>
</table>

The transmission perspective of learning takes the format of transmitting knowledge from the teacher to the learner, forming a teacher-centred approach in which the teacher dispenses knowledge. The transformative approach to professional learning should engender critical analytical consideration of knowledge, concepts and theory and assimilate these into everyday professional contexts. The transitional process links the two opposing ends of this continuum (Fraser et al., 2007). The final adjustment includes the addition of teacher agency as a factor in supporting teachers’ increased capacity for autonomy as they move through the stages. The action research model allows the participants to become the researcher and encourages teachers to view research as a process rather than a product of another researcher (Burbank and Kauchack, 2003).

Moreover, for CPD to be genuinely transformative, considerations of the teachers’ needs are the defining factor to allow CPD to be effective. Through the social constructivist view, CPD should consider participants’ special knowledge, skills and beliefs. Only when a teacher is comfortable using technology can they use it within the pedagogical context to allow for enrichment in the classroom (Williams et al, 2022).

**Action research as a means for CPD**

Based on Kennedy’s (2014) CPD analysis framework, action research should provide the most significant professional autonomy in teacher CPD. With action research, the assumption is that practitioners are often the best people to conduct research on their practices, often with the help of academics with relevant expertise. This type of action research is often termed collaborative action research (Conway and Borst, 2001). In most cases, action research happens when there is a problem or phenomenon regarding the teachers’ teaching practice. Action research is traditionally depicted as a spiral consisting of cycles of several steps, as shown in Figure 1 (van Lier, 1994).
Research on effective professional support that leads to pedagogical change suggests that it should occur over an extended period with sufficient intensity and allow for collaboration and support from various stakeholders, including teachers, school administrators and external experts (Author X and colleagues, 2021). Therefore, it appears timely to investigate how SBPS and technology can impact teachers’ CPD during a pandemic and its potential outcomes, given that technology integrated CPD was necessary to support teacher learning at this time.

**Technology integration for CPD**

With the advancement of technology, technological tools in education have greatly influenced technology integration (Sulaimani et al., 2017). There has been an emergence of new methods, strategies and specialised tools for language learning and teaching. Keengwe and Onchwari (2009) explain that educational reforms have pressured educators to integrate technology into
daily teaching. Technology provides information and ideas for improving teaching practices and the understanding of teaching English in myriad ways (Rich, 2014).

As technology evolves with new functions, teachers must decide whether these new tools are valuable to use in the classroom. Kennedy (2021) explains that a blended learning approach is just as practical as traditional face-to-face or online-only methods. Evidence has also shown that a blended learning approach has better outcomes than face-to-face or online learning, but the specifics of the design must be considered to achieve this result (Kennedy, 2021). Numerous studies have stated that a large proportion of CPD targeting technology was woefully inadequate (Borko, 2004; McChesney and Aldrige, 2018). CPD offerings in Hong Kong vary, as mentioned previously; however, teachers still cannot integrate technology pedagogically after participating in development activities (Tondeur et al., 2016). Therefore, CPD needs to focus on teachers’ attitudes and beliefs and enhance their competency in using technology to support CPD (Starkey, 2020). Teachers’ thoughts on adopting new pedagogies with technology coincide with what they believe to be good teaching and effective education (Sullivan and Yang, 2018).

Before COVID-19, numerous studies stated the benefits of integrating technology for second language acquisition through collaboration, interactivity, materials authenticity, and independent learning (Cardenas-Claros and Oyanedel, 2015; Stockwell, 2012). Accordingly, teachers use various technological tools and online environments to adapt, personalise and enhance the student learning experience and improve learning outcomes (Konhke, 2021). Unfortunately, many CPD activities still focus on retooling teachers; they do not actively engage teachers; they simply focus on developing competencies in one specific type of information communication technology application (Konhke, 2021). Teachers apply previous experience with technology when they use new techniques and practices by filtering further information for significance (Hsu, 2016). Since teachers’ beliefs are essential to successful technology integration, this recognition is vital to any approach to CPD. As such, this study aimed to explore teachers’ CPD through SBPS facilitated by technology. The current study proposed the following research questions:

- What factors affect teachers’ ability to engage in technology-facilitated CPD during the disruption caused by the COVID-19 pandemic?
- In what ways can technology facilitate CPD to support teacher learning?

**Methodology**

To bridge the factors that affect teachers’ engagement with CPD and consider how technology can facilitate the process requires a research methodology that seeks an in-depth understanding of teachers and their context (Creswell and Poth, 2018). This study adopted an exploratory and descriptive mixed-method case-study approach to provide an in-depth portrayal of one teacher educator (one of the authors of this study) and a group of English as a second language (ESL) primary teachers, aiming to understand a phenomenon, in this case, using technology to facilitate SBPS during a global pandemic. The intervention took place with the teacher educator (TE) supporting the teachers at the school, following a systematic framework derived from the Kennedy (2014) CPD analysis framework and Van Lier’s (1994) action research cycle. The
Technology Integrated Continuous Professional Development Cycle (TICPDC) was conceptualised for the study. Figure 2 shows an overview of the study.

![Figure 2 – Overview of the entire study](image)

**Participants**

Typical case sampling (Cohen et al., 2011) was adopted in the study. A total of eight ESL primary teachers from the same school were invited to participate in the case study through the author’s network. All the participants were female, comprised of five teachers who were non-native English teachers (NNET) that taught in Primary 1 (students aged six to seven years old), one Native English teacher (NET) and two senior management teachers (also NNETs) who participated in the planning stages. The terms NET and NNET are local terms used in Hong Kong; however, non-native is not representative of the teachers’ proficiency in English. The teaching experience of the participants ranged from 6 to 20 years. Written consent from all participants was obtained, and participants were given pseudonyms for anonymity. For the second data collection stage, a semi-structured interview was conducted with two senior-ranked teachers to get a deeper insight into using the TICPDC and their observations of themselves and their colleagues regarding technology integration CPD. An overview of their responsibilities can be seen in Table 2.
Table 2 – Participant profile of the semi-structured interview

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Position</th>
<th>Date</th>
<th>Role</th>
</tr>
</thead>
</table>
| Jade        | Female | Curriculum Coordinator | 13 Jan 2021 | - Familiarises the content and progress of all subjects at the school  
|             |        |                   |            | - Makes cross-curricular links and supports collaboration between all teachers  
|             |        |                   |            | - Supports and promotes skills and strategies in other curriculum areas |
| Emily       | Female | Head of English   | 14 Jan 2021 | - Supports all English grade levels at the school                       
|             |        |                   |            | - Liaises with other teachers                                           
|             |        |                   |            | - Supports innovative practices and change                              
|             |        |                   |            | - Supports school curriculum development                                |

**Context**

At the time of the study, the EDB called for ‘suspending classes without suspending learning’ (EDB, 2020), where schoolteachers in Hong Kong had to teach online from the onset of the pandemic. During this period, the participants worked with the TE to plan, develop and implement an English Literature unit based on the fables ‘The Wind and the Sun’ (Franklin, 2019). The planning and the developing stages took place when face-to-face classes were suspended. The implementation stage took place when schools resumed face-to-face classes.

**The intervention**

The intervention took place from August 2020 to October 2020. During this time, face-to-face classes were suspended and resumed in October 2020. A total of 16 sessions took place, each lasting one to two hours. These sessions consisted of face-to-face meetings, online meetings and classroom demonstrations. The TE used ten sessions to implement the TICPDC shown in Figure 3.
The first initial meeting with the participants involved an online meeting with the English Panel Chair and the Primary 1 grade coordinator with the TE to discuss their learning intentions and objectives. The TE assumed the role of the School Innovator (SI), as shown in Figure 3 and conducted a workshop for all the participants. The role of the SI was to lead and coordinate the TICPDC, such as providing workshops for colleagues and hosting collaborative planning meetings to identify and address the learning objectives. The workshop focussed on using Google Drive, a cloud-based platform to share and comment on resources. After the workshop, the SI also created a WhatsApp group with all the participants as an alternative communication platform for informal discussions or questions during the intervention. The WhatsApp group allowed the SI to quickly share working schedules, tutorials and virtual meeting links. An example of this is shown in Figure 4.
Planning, acting, observing and reflecting

In the next stage of the TICPDC, the SI took the role of the action researcher. The SI collaboratively planned with the participants and used the cloud-sharing functions of Google Drive. Roles were distributed to design and develop learning and teaching materials for the participants. A total of ten lesson plans were created, each with an expected teaching time of 30 minutes. During the planning stage, the SI provided feedback on the materials uploaded.

Once all the teaching materials were finalised, the SI taught one class a week before the other classes. All the lessons taught by the SI were filmed and uploaded onto Google Drive for all participants to view. Participants could also attend the SI’s face-to-face lessons. Video observations have been promoted as beneficial to teacher CPD (Shulman and Shulman, 2004). As an alternative to observing the full recorded lesson demonstrations, participants also had the opportunity to review shortened versions of the videos. The shortened videos were made using video editing software, and a self-reflection voice-over of the parts the SI deemed necessary. The self-reflection voice-over allowed for deeper reflection, with more detail on what went well during the lessons and what could be improved (Rosaen et al., 2008).
The SI used six days to complete all ten lessons, as some were taught as double lessons. The following week, participants followed the lesson plans and reviewed the video recordings to prepare for their lessons. Once all the classes had completed their English Literature unit, an evaluation meeting was held to review the strengths and weaknesses by referring to the lesson objectives.

**Procedures and data collection**

The data collection was divided into two parts, with an online questionnaire to collect quantitative data, while a semi-structured interview was used to collect qualitative data. An online questionnaire using Google Forms was sent out to all the participants. It established the teachers’ beliefs towards implementing the TICPDC and their thoughts towards using technology. It was hoped that this would provide initial ideas for further exploration in the interview stage. Of the eight participants, seven completed the questionnaire as one was on extended sick leave. The questions were adaptations from Kohnke’s (2018) study of ESL teachers’ CPD needs in Hong Kong. All the authors of this paper reviewed these questions to ensure that questions allowed for ease of understanding, and a good visual layout, eliminating potential ambiguities or problematic wording (see Appendix A) (Dörnyei, 2007).

In the second stage, face-to-face one-on-one semi-structured interviews (See Appendix B for questions) were conducted with two participants, each lasting approximately 45 minutes. The two participants held senior management roles within the school. It was hoped that these two teachers would share their experience of the whole study and their observations on any changes in their colleagues regarding their CPD. Following the interpretive paradigm, the interviews allowed multifaceted descriptions of how CPD and technology integration was possible following the TICPDC. Participants had the option to review their interview transcripts and remove any comments they felt that they did not wish to include in the study.

**Data analysis**

The data collected was analysed in two stages following the interpretive paradigm (Carter and Little, 2007). Data collected from the online questionnaire were analysed using descriptive statistics. Data collected from the semi-structured interviews were analysed using thematic analysis. Patterns and themes within the data were identified to provide a rich, detailed and complex account of the data (Braun and Clarke, 2006). The themes of the study were determined using a six-stage coding process:

1. The researchers read and reread the transcript to familiarise themselves with the data.
2. Initial codes were generated by the researchers and then compared systematically.
3. Within the themes, subthemes were identified.
4. The themes were reviewed by all three researchers and organised.
5. The three researchers agreed upon the final themes.
6. Extracts were selected that illustrated the themes, and the report was compiled.

Throughout the process, the researchers kept in close communication: checking understandings, asking for clarification, and discussing any differences in interpretations (Miles et al., 2018).
The quantitative data highlighted the beliefs and perceptions of the participants and their preferences during the intervention. Qualitative data collected from the two senior teachers allowed for deeper insight into the usage of the TICPDC and a perspective of how middle management could utilise the framework for future use. The interview transcripts were reread, and 21 themes emerged from the data. A total of 117 codes were generated from the two interviews. The codes and themes were reviewed and organised into four major overarching themes. These are then linked to show the three stages of CPD during the intervention through transmission, transitional and transformative changes, presented in Figure 5.

**Figure 5 – Interview codes and themes**

**Results and Discussion**

This study set out to investigate the use of technology to facilitate CPD through SBPS during the pandemic caused by COVID-19. The results from the quantitative data of the questionnaire are discussed, followed by the qualitative data from the two interviews. The online questionnaire and excerpts from the interviews are discussed to exemplify the participants’ experiences and reveal the complexity of their CPD, thereby providing a thick description in their own words of their encounter using the TICPDC. The questionnaire and the semi-structured interviews revealed that participants found certain aspects of the TICPDC more beneficial than others. Table 3 summarises the questionnaire response from question 3 to question 8.
Table 3 – Summary of the questionnaire responses (Q3 to Q8)

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Strongly Agree</th>
<th>M [SD]</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 – Lesson objectives were clear</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>4 (57.1)</td>
<td>5.57 (0.53)</td>
</tr>
<tr>
<td>4 – Teaching resources met my needs</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4 (57.1)</td>
<td>5.43 (0.53)</td>
</tr>
<tr>
<td>5 – Planning/teaching inspired me to try in other classes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>3 (42.9)</td>
<td>5.14 (0.9)</td>
</tr>
<tr>
<td>6 – Google Drive and Google Meets were useful for my professional development</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>3 (42.9)</td>
<td>5.71 (0.49)</td>
</tr>
<tr>
<td>7 – Lesson demonstrations were useful</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>2 (28.6)</td>
<td>5.29 (0.76)</td>
</tr>
<tr>
<td>8 – Planning/teaching gave me a deeper understanding of teaching ‘reading to writing’</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>2 (28.6)</td>
<td>5 (0.82)</td>
</tr>
</tbody>
</table>

The mean scores for all the questions were above 5, indicating that participants found the experience positive. Participants also found that using Google Drive and the video conferencing software Google Meets were the most valuable to their CPD (Q7, M = 5.71).

Question 9 of the questionnaire asked the participants which resources they found most useful during the study. A total of six options were available, and participants were able to select multiple answers. A summary of the choices is shown in Figure 6.

Figure 6 – Responses of the most useful resources

Face-to-face meetings were important to all the participants, and 85.7% of them valued using Google Drive and watching the self-reflection videos created by the SI. The participants felt that the least useful resource was online meetings, with only 28.6%. While this may not be surprising, as not all the participants may have felt ready or comfortable using technology, it was similar to the Author X and colleagues (2021) study. This preference became apparent when all the participants agreed that face-to-face meetings were the most useful. This could be
because of the emotional support the SI provided throughout the intervention, as the pandemic has been challenging for everyone, especially for teachers who had to take on new digital roles to deliver their lessons to their students, leading to additional anxiety and stress (Wong and Moorhouse, 2020).

**Transmission CPD in the TICPDC**

Kennedy’s (2014) spectrum of CPD models discussed earlier assumes that different CPD models can increase teacher autonomy as teachers experience through transmissive to transitional and transformative CPD.

Within the TICDPC, the participants went through ‘the training model’ of Kennedy’s (2014) spectrum. The SI conducted two workshops for the participants one on using Google Drive to collaboratively work together and the second on how to use Google Meets to conduct online virtual meetings. The SI delivered the workshop following a traditional delivery.

Jade shared how the workshop conducted for the participants allowed for greater collaboration among the teachers. Furthermore, using Google Drive allowed her to show her colleagues how all the resources and teaching materials could be organised in a more user-friendly way.

> I cannot imagine meetings without Google Drive. Some teachers who are well-organised can create folders so that I can find everything. It is easier to have meetings with colleagues online or face-to-face now. (Jade)

Participants valued the introduction to using Google Meets when teachers were uncertain whether face-to-face lessons would return anytime soon. Emily also shared her observations with her colleagues after learning new technological tools from the workshop. She also shared her new knowledge with colleagues teaching different grades and subjects.

> You [SI] showed us how things could be done, which is not our usual way, but how things could be done outside our comfort zone. Just like Google Meets, we all joined and learned. After that, all the English teachers started using it, and other subject panels also used it. (Emily)

**Transitional CPD in the TICPDC**

After the workshop, what followed in the TICPDC was to make connections to the classroom context. Training models have been criticised because they often lack connection to the classroom context (Day, 1999). This gap was bridged through ‘the coaching/mentoring model’ and ‘the community of practice model’ in the TICPDC.

The role of the SI involved counselling and professional friendship elements (Rhodes and Beneicke, 2002). The coaching/mentoring model also allowed for ‘peer coaching’, whereby colleagues collectively worked together to reflect, refine and build new skills (Rhodes and Beneicke, 2002). The TICPDC allowed the group to work collectively online using Google Drive, Google Meets and WhatsApp. What was necessary for the coaching/mentoring model
to be successful was to remove the hierarchical philosophy (Rhodes and Beneicke, 2002). Jade shared her views on how the SI held no hierarchical position when sharing potential innovations with the participants:

I observed how you [SI] organised things, and I shared the experience with other teachers. You were always willing to help… and I guess that is why the teachers were willing to listen to your advice and your ideas. You do not act like you are high and mighty and tell teachers what to do. (Jade)

The communities of practice model followed a similar approach to the coaching/mentoring model; however, one significant difference is that the communities of practice model generally involves more than two participants. The WhatsApp group allowed for informal group discussions, where questions could be answered by one another. Allowing participants to comment on each other’s work using Google Drive also allowed for teaching and learning to occur within the community and branch out to colleagues not part of the study. This created strong learning communities within the school, allowing for a foundation to develop new knowledge beyond existing models (Boreham, 2000).

**Transformative CPD in the TICPDC**

Finally, the action research model and the transformative CPD were integrated into the TICPDC. The action research model was based on participants acting as researchers to improve a situation. As discussed earlier, collaborative action research allows for a more significant impact on CPD.

One aspect that Emily shared in the interview was her observation of how all the participants were part of the planning and delivery of the unit.

It was wonderful that teachers actively contributed to the planning and implementation process. With collaborative planning and implementation, teachers felt more prepared and ready. (Emily)

Moreover, this form of CPD allowed for a shift in the balance of power towards teachers as they successfully undertook research activities. Sachs argues that the extent to which teachers increase their professional autonomy is developed when teachers effectively critique themselves (Sachs, 2003):

I think the reflective style is really helpful…We all saw the same clip from your lessons [SI] and then had an open discussion. (Emily)

When it comes to the transformative model, one must be aware that it integrates multiple CPD models that support change in education (Kennedy, 2014). Emily saw the potential future to change by adopting things she had learnt to create a CPD policy for her school:
I liked this approach, and maybe by the end of the year, teachers could record and play their recordings and conduct a live commentary in front of the staff. I think that this would benefit the teachers. (Emily)

To conclude, it is also essential to be aware of the contextual pressures on teachers. Teachers may become emotionally drained when conducting individual classroom research, which Golombek (1998) describes as ‘instructional tension’. Inevitably, multiple factors can affect the teachers’ social and emotional well-being. School policies such as appraisal observations hinder teachers from freely expressing themselves. However, when the hierarchical and appraisal criteria were removed, both Jade and Emily agreed on the importance of teacher professional development growth.

I think even when we all sat in the computer lab, I saw all the teachers, and I think they all felt empowered because they would never have imagined being able to do something like this. (Emily)

I think it has been wonderful for our teachers to have someone come in and model for them. It’s not just on paper; you [SI] went into our classroom and demonstrated how it could be done. (Jade)

Furthermore, the current study found that consistency and continuing support were required for sustainable CPD. Participants needed the guidance and confidence factor from the SI to promote CPD. In regards to providing SBPS, Emily found the guidance and feedback from the SI extremely useful, similar to Author X and colleagues (2021) study, in that a trusting relationship is an important factor for CPD to succeed.

Having the SI here is not just a one-time thing. It is good that we were being checked on, ensuring we did our work and ensuring the work we created applied to what we needed in the lessons. At least we know it is not just doing it for the sake of it. (Emily)

Interestingly, the flexibility of the TICPDC aligns with the transformative CPD model suggested by Kennedy (2014), whereby the capacity to adopt multiple personal and professional identities can lead to greater teacher autonomy. Kennedy (2014) also argues that few CPD models are transformative, as this model of CPD requires significantly more time and effort from the teachers. However, further research on the effectiveness of the TICPDC is currently limited to this study. A one size fits all approach to CPD may have been brought about by policymakers; however, for CPD to be transformative requires opportunities for teachers to observe and interact in lessons where first-hand experiences impact their beliefs to integrate technology into their own CPD.

Limitations
While the current study offers insight into ESL teachers in Hong Kong interacting with technology to promote CPD, the results have limitations. First, the results were only from one
school in Hong Kong. Although the sample size was small, small sample sizes are quite common in qualitative studies (Boddy, 2016). However, the sample size for this study included ESL teachers with varying teaching experience, and as such, the sample was purposely chosen to make sense of what was happening (Guba and Lincoln, 1989). Another study limitation is the researcher’s potential bias since the participants had worked with the researcher before. To minimise bias in the research, all participants were informed of the intentions of the study and that their perceptions and beliefs towards the study were valued in the research allowing for context-free truth about the objective reality producing relevant responses, with minimal bias (Holstein and Gubrium, 1995). Nonetheless, additional participants from different schools with a range of teachers with varying responsibilities in school would have added more breadth to this study. It is left to the reader to position themselves vis-à-vis the research, deciding the relevance and value to their context (Merriam and Grenier, 2019).

Conclusions and implications
This small-scale exploratory case study explored how teacher CPD can still occur during a pandemic using technology. While the pandemic changed the participants’ practices, notably the shift from teaching students face-to-face to a virtual space, planning and delivering a lesson was still necessary for effective learning and teaching. Despite the small sample from one school in Hong Kong, this study may have resonance for other educational contexts for teacher educators, teachers and policymakers, as it supports the findings from previous studies of in-service professional support (Author X and colleagues, 2021; Chaaban, 2016), suggesting that effective support should be sustained over a period of time. Although this study looked into how technology played a crucial role in teachers’ CPD, other factors, such as rapport with the learning community and building relationships with the teachers, are vital to effective SBPS. With the abundance of technological tools available, teachers will require time to adjust to implementing technology into their daily teaching practice. Even though online meetings were valuable when schools were closed, teachers valued the face-to-face meetings and the interactions they had with each other. These findings concurred with Author X and colleagues (2021), where social interactions were vital to SBPS.

Interestingly, of the different forms of professional development modes, the findings have shown that a mixture of informal and formal collaborations is still a driving force in teacher CPD. Allowing teachers to collaborate actively brought out a learning community within the group of participants but also produced a community of practice where everybody was learning and teaching among equals. Using Google Drive and WhatsApp allowed for informal and formal mentoring, where all the participants could be the mentor or the mentee in encouraging each other through a supportive network (Kohnke, 2020).

COVID-19 brought about many changes in the educational field. Still, as we begin to see the transition of teachers and students returning to ‘the new normal’, where lessons are returning to the classroom, issues around CPD modules in education will continue, with debates about the effectiveness of CPD. From a theoretical perspective, teachers must be satisfied with the education provided and the essential information conveyed through collaborative action research to accept using technology as a facilitating CPD tool. Therefore it is crucial to consider
teachers’ beliefs about using technology for CPD and, as a long-term goal, improving new educational methods instead of replicating existing content. Furthermore, there is support in the CPD literature for social constructivists’ approaches to teaching and learning. Trowler (2008) argues that social interactions using ‘tools’ support the understanding of how effective CPD can facilitate teaching and learning.

As technology advances exponentially, educators must also understand effective pedagogical strategies rather than focusing on the technology itself. Teacher CPD will only become effective and transformative when it is embedded into the teachers’ practice of work, allowing for daily use throughout their teaching career.

In conclusion, the current study showed that technology can facilitate transformative CPD through collaborative action research. The TICPDC incorporates a systematic framework that allows for a mixture of CPD models, allowing teachers’ to take on different personal and professional identities to create mutual respect within their learning community. While this study provides a glimpse into teacher CPD through the use of the TICPDC, further studies are necessary to estimate the effectiveness of the TICPDC in teacher education with a broader audience to develop further insight into ways of enhancing teacher CPD after the pandemic.

References
Author X and colleagues (2021)


