Transforming Initial Teacher Education Program with Mobile Technologies. A synthesis of qualitative evidences

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Abstract

Mobile technologies have increasingly been used in education for enhancing teaching and learning among students. The authors reviewed qualitative studies that focused on approaches towards transforming initial teacher education programs with mobile technologies. With the use of meta-ethnography approach, we compared, contrasted and interpreted the synthesis of qualitative evidences across numerous studies. This review analyzed 13 eligible studies from Web of Science conducted in different countries from 2012 to 2022. The findings were divided into three sections: (1) theme related to conceptions about the use of mobile technologies at micro-level (e.g., perceptions and affordances), (2) themes related to institutional approaches at the meso-level (e.g., professional training, technical supports, motivating and collaborative environment) and (3) theme related to policies and financial supports at the macro-level. Based to these findings, the model for transforming initial teacher education programs with mobile technologies was developed. By intensive discussions of the results, feasible conclusions were derived and future directions for further research on mobile technologies were provided.

Keywords

Mobile technologies; Initial teacher education program; Transforming; Synthesis of qualitative evidence

I. Introduction

Advancement of science and technology indicates enough evidence to the development and adoption of mobile technologies in teaching and learning. The use of mobile technologies become mostly used and acceptable means to support education at all levels (Churchill et al., 2018). These adoption of mobile technologies in classroom environment such as online and offline courses provide students and teachers with essential changes in their learning process (Martins et al., 2018). Different studies on mobile technologies (e.g., Churchill, 2016; Churchill & Wang, 2014; Lim & Churchill, 2016; Wong, 2010; Wong & Looi, 2011) highlighted the affordances of mobile technologies in the aspects of social medias, representational and cloud computing which enabled the adoption of various new pedagogies across different learning environment.

However, these studies categorized mobile technologies into main three areas which need more attention such as learning with mobile technologies (Churchill, 2016; Churchill & Wang, 2014) learners on move (Lim & Churchill, 2016; Wang & Shen, 2012) and ubiquitous learning environment (Kearney et al., 2012; Song, 2014). Tavernier & Hu, (2020) stipulated that, all these mobile technologies bring and support the constructive, behaviorist, collaborative, situated, informal as well as lifelong learning. These ubiquitous environments impacted, enhanced and transformed the traditional learning approaches through substituting with the modern approaches.

It should be noted that mobile technologies development cannot be separated from the initial teacher education program which prepare teachers (Tsai & Tsai, 2019; Wong & Looi, 2011). Most of teachers and students in teacher education programs use mobile devices such as smart-phones, tablets for communication, personal readings, students note, online discussion with peers, registration procedures and students can download lecture notes from the system. However, other advanced mobile technologies have the features of computers (Syaharuddina et al., 2021) this includes spread sheets, word processing, presentations, photos, videos which performing similar functions with computers. With this abrupt change and growth of mobile technologies, informs the initial teacher education program to transform their instructional delivery to adopt with this development.

Some universities in Asia, USA and Europe have invested into the application of mobile technologies in teaching and learning (Qarkaxhja et al., 2021; Wang & Shen, 2012). The university of Sussex, University of Glasgow and University of Regensburg are the good examples of the integration of mobile technologies in ITE program (Cheon et al., 2012; Kalinic, 2011). Meanwhile, the full integration of mobile technologies in ITE program requires high degree of critical awareness as well as positive attitudes to both students and teacher educators towards these technologies. The study of Cheon et al., (2012) found that teacher educators and students personal theories has been affected negatively which resulted to unsuccessful integration of mobile technologies in ITE program. These findings contradicting with Yilmaz et al., (2011) who found high level of mobile technologies acceptance among master's students as effective learning tool(s), which provide students with "flexibility in learning" and students can learn anywhere with assistance of different applications. Other studies Kearney et al., (2015); Martins et al., (2018) highlighted the use of mobile technologies in ITE program increases students learning motivations and strengthening levels of communication between students themselves and their teachers.

Despite these ubiquities of mobile technologies in ITE program and growing evidences to demonstrate its impacts on students learning (Kearney et al., 2015; Park, 2011) this transformation process has been faced with many challenges. The studies (e.g., Burden & Hopkins, 2016; Naismith, 2004) identified different levels such as external and internal barriers to mobile technologies in ITE program. Li & Choi, (2014) categorized these barriers as the first order and the second order barriers. For the matter of fact, the first order described external challenges such as infrastructure problem, resource allocation, training and support and other barriers associated with

hardware and software problems. At the same time, described the second order barriers which includes internal challenges to teachers such as personal competences, confidences, attitudes and pedagogical beliefs during the instructional practices. Out of these barriers Burden & Hopkins, (2016) carried meta-analysis research on forty-eight studies and identified key barriers which are similar to (Li & Choi, 2014) such as teachers' knowledge and skills, teacher beliefs and teachers' attitudes as the highly cited challenges to the adoption of mobile technologies in ITE program. These barriers from external and internal affected negatively the usage of mobile technologies.

Undoubtedly, mobile technologies for professional practices in ITE has captured the ingenuity of voluminous teacher educators in universities (see Kearney et al., 2012, 2015; Syaharuddina et al., 2021) especially those interested to transform their teaching and to integrate technology during instructional practices (Cheon et al., 2012). Moreover, series of qualitative substantiations on the solicitation of mobile technologies in teaching and learning has indicated positive impacts to the students learning outcome (Kearney et al., 2015; MARTINS et al., 2018). These increase in number of qualitative researches which aimed to understand the applications and effects of mobile technologies in education, advances itself to synthesis as the technique of assembling different individual studies to come up with unified understanding (Atkins et al., 2008)

This call for synthesis qualitative evidences to understand the approaches for transforming ITE program with mobile technologies through bringing together the multifarious perspectives and evidences which may not be exemplified within a single study. With this review, enabled the researches to go beyond the findings of individuals qualitative studies (Flemming et al., 2019). The current review contributing to the existing literature and inform the practices towards transforming of ITE programs with mobile technologies.

II. Research Method

In this study, the authors used Synthesis of Qualitative Evidences (SQE) to examine the approaches towards transformation of ITE program with the mobile technologies. To be more specific, we adopted meta-ethnography which is steadily finest and commonly useful and convoluted qualitative evidence synthesis approach, in the process of synthetizations of qualitative data (Flemming et al., 2018). Though, this approach was developed by (Noblit & Hare, 1988) in education research, but has been commonly employed in the studies related to health and illness. Beside the use of meta-ethnography in this study, we compared, contrasted and interpreted the SQE across numerous studies on mobile technologies and finding ways for smoothly adoption in ITE program. The important stages were highlighted in Table 1.

No.	Item	Descriptions
1.	Aim	Focus of this study is to understand how ITE program can be transformed with the use mobile technologies
2.	Synthesis methodology	Meta-ethnography which intended to interpret SQE across numerous studies
3.	Inclusion criteria	Qualitative research studies, from 2010-2022, written in English language
4.	Data source	Web of Science
5.	Electronic search strategy	mobile technologies", "the use of smartphones", "mobile learning" together with "Initial Teacher Education", "teacher education", "preservice teacher", "student-teacher", "teacher trainee", "teacher educators" and "prospective teacher"

6.	Studying screening methods	Authors passed through the titles, abstracts and full texts to unpack the respective studies.
7.	Study selection results	111 studies were obtained from the initial search, with exclusion criteria only 13 studies were included for the final review. Fig. 1
8.	Appraisal items	Authors use modified version of Critical Appraisal Skills Program (CAPS) (Ames et al., 2019; Purssell, 2020) Table 2
9.	Coding process	Searching the concept rather than line by line coding
10.	Study comparison	Subsequently studies were coded into pre-existing concepts, and new concepts were created when deemed necessary
11.	Derivation of themes	Creation of themes were deductive rather than inductive
12.	Quotations	All quotations based on authors interpretation to explain the constructed themes
13.	Synthesis output	Model for transforming ITE program with mobile technologies was created.

Table 1. Completing meta-ethnography based on Atkins et al., 2008; Flemming et al., 2018.

After the aim of the study, we identified the synthesis methodology i.e., meta-ethnography which intended to interpret SQE across numerous studies. The third stage meant to unpack the inclusion criteria; in this case we focused on qualitative research studies from 2012 to 2022, written in English language. The fourth stage enmesh the data source; in this study we used Web of Science to get relevant research studies in the field of education. Fifth stage involve the electronic search strategy which includes "mobile technologies", "the use of smartphones", "mobile learning" together with "Initial Teacher Education", "teacher education", "preservice teacher", "student-teacher", "teacher trainee", "teacher educators" and "prospective teacher"

Steps sixth and seventh were aimed at screening methods and study selection results. The authors passed through the titles, abstracts and full texts to unpack the respective studies. However, one hundred eleven studies were obtained from the initial search. With the exclusion criteria explained above ninety-eight studies were excluded from the pool and make (). Find the full details in the Fig 1. Steps eight involves quality assessment or appraisal processes. Authors use modified version of Critical Appraisal Skills Program (CAPS) as highlighted by (Ames et al., 2019; Purssell, 2020) to assess the quality of studies on mobile technologies, refers to Table 2.

Steps nine and tenth enmesh coding process and study comparison respectively. Whereby coding involves searching the concept rather than line by line while subsequently studies were coded into pre-existing concepts, and new concepts were created when deemed necessary. The eleventh and twelfth steps were intended to identify derivation of themes and quotations. Creation of themes were deductive rather than inductive while the all quotations based on authors interpretation to explain the constructed themes. Thirteenth steps involve synthesis output; in this step the findings were used to create model for transforming ITE program with mobile technologies.
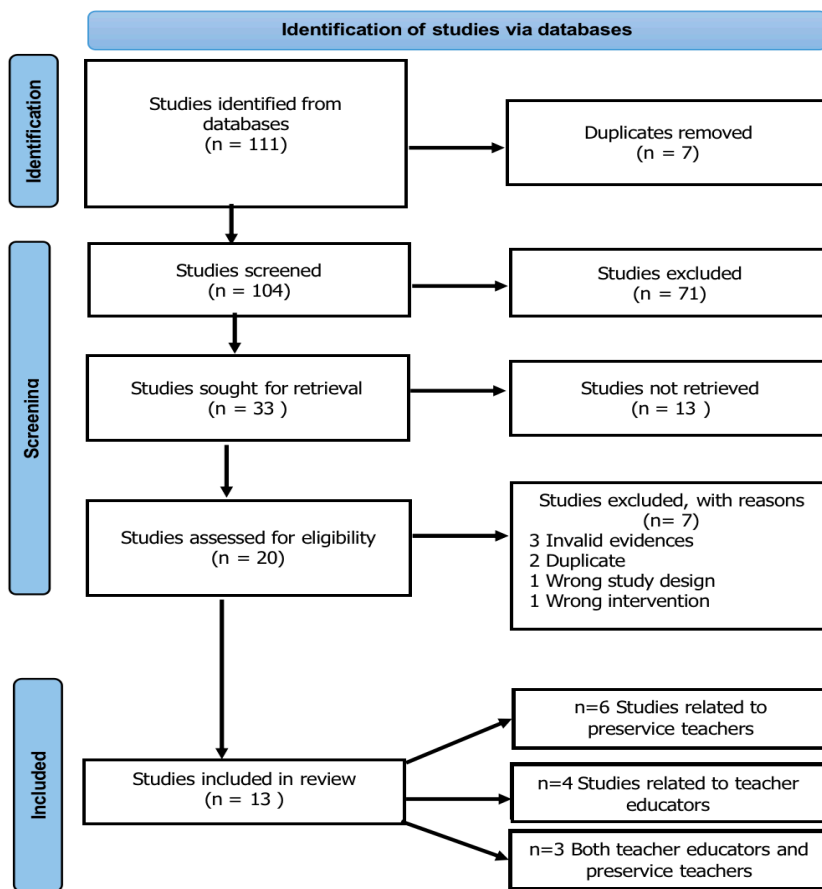
Fig. 1. PRISMA flowchart for Synthesis of Qualitative Evidences (SQE)

Author(s)	Was the context described?	Was the sampling strategy appropriate and described?	Was the data collection strategy appropriate and described?	Was the data analysis appropriate and described?	Were the findings supported by evidence?	Is there evidence of researcher reflexivity?	Have ethical issues been taken into consideration?	Overall assessment of methodological limitations
(Tsai & Tsai, 2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Minor to moderate concerns
(Xue & Churchill, 2020)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Minor concerns
(Jie & Sunze, 2021)	Yes	Yes	Yes	Yes	Yes	Yes	Mostly	Minor concerns
(Biddix et al., 2016)	Yes	Yes	Yes	Mostly	Yes	No	Insufficient	Minor concerns

(Hamzah & Muchlis, 2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Minor concerns
(Sebbowa & Muyinda, 2018)	Yes	Yes	Yes	Yes	Yes	Mostly	Insufficient	Minor concerns
(Xue & Churchill, 2020)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Minor concerns
(Qarkaxhja et al., 2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Minor concerns
(Handal et al., 2013)	Yes	Yes	Yes	Yes	Yes	Mostly	Yes	Minor concerns
(D. Churchill & Wang, 2014)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Minor concerns
(Baran et al., 2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Minor concerns
(Kearney et al., 2012)	Yes	No	Yes	Yes	Yes	Mostly	Yes	Minor concerns
(Baytiyeh, 2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Minor concerns

Table 2. Quality criteria and results (Ames et al., 2019; Purssell, 2020) based on CAPS)

A u t h o r (s) / Themes	Refining perceptions and unpacking the affordances about the use of mobile technologies in ITE program	Effective professional training on the use of mobile technologies	Technical support during the integration process	Creating motivating environment for the use of mobile technologies	Collaborative environment within and outside the training institutions	Corporate issues on mobile technologies; effective policies and financial support
(Tsai & Tsai, 2019)	√	√	√		√	
(Xue & Churchill,	√		√	√		
(Jie & Sunze, 2021)	√	√	√	√		
(Biddix et al., 2016)	√		√			

(Hamzah & Muchlis, 2018)	√	√	√			√
(Sebbowa & Muyinda,					√	√
(Xue & Churchill,	√		√	√	√	
(Qarkaxhja et al., 2021)	√		√	√		
(Handal et al., 2013)		√	√			√
(D. Churchill & Wang, 2014)	√			√	√	√
(Baran et al., 2017)		√	√			
(Kearney et al., 2012)	√				√	
(Baytiyeh, 2018)	√	√		√		√

Table 3. Key themes in relation to each study

III. Results

a. Overall features of the study

Thirteen studies were involved in this study and achieved to unpack the approaches towards transforming initial teacher education program with mobile technologies. Through the adoption of meta-ethnography via synthesis of qualitative evidences, we included preservice teachers, teacher educators or faculty members from different countries; United State of America, China, Korea, Indonesia, Australia, Russia, Turkey, United Kingdom, Lebanon, Taiwan and Uganda, full details included in Appendix.

b. Synthesis qualitative findings

Six key themes were unpacked from selected studies regarding to approaches for transforming initial teacher education program with mobile technologies. The themes were categorized into three levels, micro; preservice teachers and teacher educators' conceptions about mobile technologies, meso; organizational levels and macro; corporate issues on mobile technologies related to policies and financial support as shown in Fig. 2. The first level consists of one key themes; 1. Refining perceptions and unpacking the affordances about the use of mobile technologies in ITE program. While the second level consists of four key themes 2. Effective professional training on the use of mobile technologies 3. Technical support during the integration process 4. Create motivating environment for the use of mobile technologies 5. Collaborative environment within and outside the training institutions and the third level consists of one key theme 6. Corporate issues on mobile technologies; effective policies and financial support. Table 3 presented key themes related to this study

Key theme related to teacher educators' and preservice teachers' conceptions about mobile technologies

Key theme 1. Refining perceptions and unpacking the affordance of mobile technologies.

Out of thirteen studies selected, nine studies highlighted the needs for refining preservice teachers and teacher educators' perceptions about the use of mobile technologies in initial teacher education program. For instance; Tsai & Tsai, (2019) found four levels of conceptions of teacher educators on the use of mobile technologies in teaching; learning facilitation, knowledge transmission, technology support and students' support. However, these conceptions characterized with traditional-oriented conceptions about the use mobile in their teaching. These findings are similar with Jie & Sunze, (2021) who found teacher educators lack the confidence to use mobile technologies in their teaching "When I used mobile technology, I found I was slower than the students" (Pg. 6).

From the other hand, preservice teachers expressed their perceptions on mobile technologies use on their learning and highlighted "we grow in a digital age, the use of mobile technologies simplified learning process" (Pg.7). While Biddix et al., (2016) showed preservice teachers use their devices to attend sessions and watching videos "I can watch the videos and downloading lecture supporting materials through a smart-phones" (Pg. 379). At the same time, they reported negative impacts of using mobile technologies; affects time to be used in research (e.g., Qarkaxhja et al., 2021) limiting social interaction between teachers and students (e.g., Biddix et al., 2016; Kearney et al., 2012)

Furthermore, eight out of thirteen studies mentioned "affordances" via showing the opportunities and logic behind the use of mobile technologies and argued that, this is vital for refining educators' perceptions about adopting mobile technologies. Xue & Churchill, (2020) reported that, the use of mobile technologies simplifies assessments and evaluations, and students can extend their learning outside the classroom environment (Pg. 13). According to Biddix et al., (2016) the faculties in selected countries reported to use mobile technologies for easily content delivery and supporting student learning, but the only difference was the instructor approaches in archiving the planned goals. The same results highlighted by Sebbowa & Muyinda, (2018) showed mobile technologies improve the interaction between students-lecturers, students themselves and strengthening the collaboration in learning processes.

In addition, Qarkaxhja et al., (2021) extended the affordances of mobile technologies and reported, it provides the access of the quick information on time and contributing to the expansion of research skills through offering the rich resources. On other hand, it increases students' motivation on the subject matter (Xue & Churchill, 2020), knowledge transmission and supporting students learning (Baytiyeh, 2018). However, faculty members (see Hamzah & Muchlis, 2018; Handal et al., 2013) expressed their concern on the risk of revealing preservice teachers to mobile learning experience with little or poor design which leads to distraction of students learning. These results create the necessity of the next key theme.

Key themes related to organization level

Key theme 2. Effective professional training on the use of mobile technologies.

Six studies out of thirteen mentioned "professional training" as essential approach toward transforming initial teacher education program with mobile technologies. Teacher educators acknowledged the importance of professional trainings on the use of mobile technologies in their teaching. To illustrate, Handal et al., (2013) stressed that, professional training on the use of mobile technologies is inevitable, teacher educators reported "there is a need for training on how to use and apply mobile technologies in everyday teaching" (Pg. 367). "The training should focus

on how to use mobile technologies and cater students need and making learning more interesting" (Pg. 368).

Based on collected evidences, the results from Baran et al., (2017) indicated both teacher educators and preservice teachers needs the professional training on using mobile technologies based on the following aspects; content, pedagogy, technical, contextuality and connectivity. Jie & Sunze, (2021) showed teacher educators lack the required skills "I am not skilled enough to use mobile technologies and other similar devices in teaching and learning, it is time consuming and difficult to use" (Pg. 6). However, preservice teachers reported that, there is a need of professional training for the new platforms "I can use my smart-phone for attending session, but I do not understand how to use some important features within the platform" (see Baytiyeh, 2018) (Pg. 80)

Key theme 3. Technical support during the integration process.

Another key issue reported in eight studies was the needs of technical support when using mobile technologies. Tsai & Tsai, (2019) showed, preservice teachers reported unstable network and Wi-Fi which limit using mobile technologies in their learning. Also, teacher educators stressed "we can't guarantee the use of mobile technologies in teaching and learning, these devices are subjected to change" (Pg. 621). In addition, the results from Baran et al., (2017) indicated both teacher educators and preservice teachers lack technical usability of mobile apps interaction; user control, visibility, visual design, recognition and error prevention (Pg. 13). From this study, one preservice teacher reported "I do not know what to do here. It does not state the next step and how to get further information" (Pg. 14). Other studies highlighted connectivity issues (see Baran et al., 2017; Churchill & Wang, 2014) access to mobile devices and its operations (Handal et al., 2013). Thus, these technical issues created the essential of the next key theme.

Key theme 4. Create motivating environment for the use of mobile technologies.

Six studies out of thirteen mentioned the term "motivation" as the approach and catalysts towards transforming initial teacher education program with mobile technologies. Xue & Churchill, (2020) indicated the essential of motivation when using mobile technologies. Based on the interview with teacher educators, one was asked "what is most condition for your teaching with mobile technologies?" He replied "nothing more than motivating environment which support the use of mobile technologies" (Pg. 216). In addition, other replied "these conducive environments, provide students with enough opportunities to generate new ideas and facilitate the learning process" (Pg. 217).

Also, Tsai & Tsai, (2019) showed, the use of mobile technologies not only helped students in learning the subject matter but also motivation and interest of the course through the use of designed activities; games-based learning, eBooks and other interesting videos and images (Pg. 620). On other hand, Jie & Sunze, (2021) indicated the risks associated with mobile technologies and highlighted "I know preservice teachers are concentrating on the entertainment than on learning when using mobile technologies; watching video, music and chatting. Thus, self-discipline should be emphasized when using these devices" (Pg. 8)

Key theme 5. Collaborative environment within and outside the training institutions.

Five out of thirteen studies indicated the importance of collaboration and adoption of community of practices when learning about mobile technologies in initial teacher education program. Sebbowa & Muyinda, (2018) indicated whilst teachers working together in learning about mobile technologies, they become more actively engaged and easily accomplish their shared goals (Pg. 29).

While Xue & Churchill, (2020) designed flipped classroom teaching with mobile technologies for preservice teachers which aimed at promoting social interaction and strengthening collaboration with peers and teacher educators. At the same time, Churchill & Wang, (2014) indicated the

collaboration with other training institutions is imperative for promoting learning process with mobile technologies (Pg. 215). Moreover, Kearney et al., (2012) identified collaboration within and with other institutions as a pedagogical perspective and central feature of mobile learning.

Key theme 6. Corporate issues on mobile technologies such as effective policies and financial support.

The issues related to policies and financial support were mentioned by five studies out of thirteen. Handal et al., (2013) highlighted "we do not have mobile technologies strategies across different universities, and the policy support during the implementation and the usage" (Pg. 370). During the interview teacher educator reported "I can't exclude preservice teachers because they don't have mobile devices" (Pg. 371). And suggested students should be given mobile devices during the training process. Again, Qarkaxhja et al., (2021) showed policy support about mobile technologies is the precondition for the adopting mobile technologies in initial teacher education program. While Baytiyeh, (2018) indicated policies and curriculum support were the key successful to adoption of mobile technologies in initial teacher education program.

c. Model for transforming ITE program with mobile technologies.

From the findings in the above section, we created the model for transforming initial teacher education program with mobile technologies (see Fig. 2). The first level entails the teacher educators' and preservice teachers' conceptions adopting mobile technologies in ITE program while the second level consists of institutional or organizational approaches towards transformation process. However, the third level does not only depend to organizational level, comprises of corporate issues; policies and financial support.
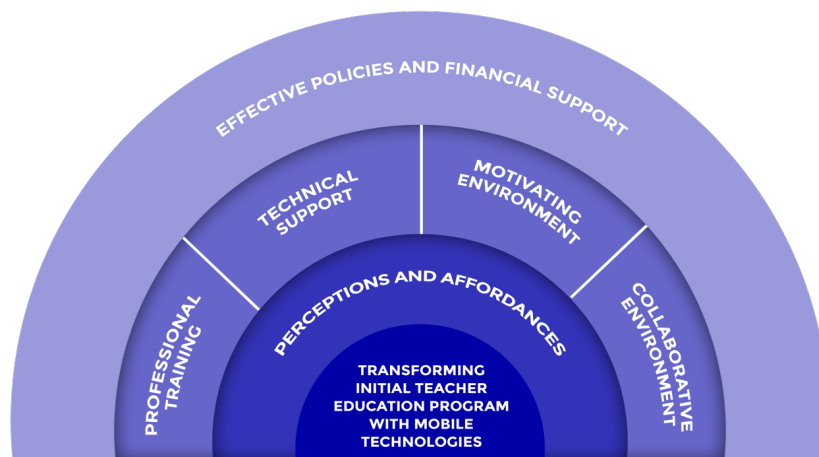

Fig. 2. Model for transforming initial teacher education program with mobile technologies

The model explained clearly that, in order to transform initial teacher education program with mobile technologies, refining perceptions on the use of mobile technologies through unpacking the affordance of mobile technologies in ITE program is inevitable (Key theme 1). The linkage between perceptions and affordances at the micro-level, cannot be separated to each other. Within the second level (Key theme 2, 3, 4, and 5) shows the approaches at the meso-level for successful transforming ITE program with mobile technologies which cannot be separated to each other. However, the corporate issues (Key theme 6) at the macro-level related to policies and financial support, were the catalysts for transformation process.

IV. Discussion

The purpose of this review focused on approaches towards transforming initial teacher education program with mobile technologies. The synthesis qualitative evidences from this study, resulted into creation of model showing the conceptions and approaches for transforming ITE program (see Fig. 2). In the current section, the findings were discussed and categorized into four parts. 1. Analysis of micro-approaches towards transforming ITE program with mobile technologies 2. Training institutional and Its mechanisms towards transforming ITE program with mobile technologies 3. Aligning policies in transforming ITE program with mobile technologies and 4. The limitation of the study and areas for future researches.

a. Analysis of micro-approaches towards transforming ITE program with mobile technologies

The model (see Fig.2) highlighted approaches to be considered when transforming initial teacher education program with mobile technologies. The first issue depicted at the micro level related to refining educators' perceptions about the use of mobile technologies in their teaching and learning (Jie & Sunze, 2021; Qarkaxhja et al., 2021; Sebbowa & Muyinda, 2018). Based on the collected evidences, it seems teacher educators and some preservice teachers have negative perceptions about the use of mobile technologies in ITE program (e.g., (Biddix et al., 2016; Tsai & Tsai, 2019). Majority reported mobile technologies limit social interaction between teachers-students and students-students (Biddix et al., 2016). Also, with abundant of information at a time, affect students critical thinking (Kearney et al., 2012) and time consuming (Qarkaxhja et al., 2021). Researches have recommended that, the mobile technologies used, should be friendly to the users and the professional training on how to use these devices is inevitable (see Baran et al., 2017; Baytiyeh, 2018; Qarkaxhja et al., 2021). In additional, teacher educators recommended to assist preservice teachers to refine their conceptions such as constructivist-oriented about the mobile technologies in learning processes (Tsai & Tsai, 2019).

Furthermore, it seems exposing the affordances and opportunities offered using mobile technologies in ITE program is necessary for teacher educators and preservice teachers to understand the logic behind. The collected evidences show majority do not understand the opportunities offered with these mobile devices (Biddix et al., 2016; Xue & Churchill, 2020). Price et al., (2018) indicated, mobile technologies used as the means to share, releasing and searching of materials during teaching and learning process, which enrich the subject matter and learning experience. Similarly, it has been shown that the use of mobile technologies can promote students' interactions and motivating environment (Xue & Churchill, 2020).

However, these findings were contrary to Jie & Sunze, (2021) who identified the risks associated with the use of mobile technologies while the content not well prepared and organized, they showed preservice teachers concentrating on entertainments rather than on learning when used mobile devices. Researches recommended that, self-discipline should be emphasized when using mobile technologies (Jie & Sunze, 2021; Xue & Churchill, 2020). Additionally, teacher educators and preservice teachers should be well informed on the logic behind when using mobile technologies thru showing them opportunities and affordances offered with mobile technologies.

b. Training institutional and Its mechanisms towards transforming ITE program with mobile technologies

Understanding the mechanisms taken by the training institutional towards transforming ITE program with mobile technologies is crucial, and should be seen as a source of development of the

entire teacher education program (Kearney et al., 2015). This leads to the identification of specific approaches to be adopted in ITE program at the institutional level. The approaches as explained in the model, includes "effective professional training on the use of mobile technologies", "technical support during the integration process", "create motivating environment for the use of mobile technologies", "collaborative environment within and outside the training institutions" and "corporate issues on mobile technologies; effective policies and financial support". These key themes accentuated that for the effective transforming initial teacher education program with mobile technologies, the training institutional have a greater role of ensuring conducive environment for technologies integration (Churchill, 2016; Tavernier & Hu, 2020). For instance; Baran et al., (2017) reported teacher educators lacking professional training on the use of mobile technologies items of content, pedagogy, technical, contextuality and connectivity.

Similarly, Baytiyeh, (2018) indicated that preservice teachers lacking skills on how to use their smart-phones for attending classes and accessing learning materials. The same results reported by Baran et al., (2017) who showed both preservice teachers and teacher educators lacking technical usability of the mobile technologies in terms of in interaction; user control, visibility, visual design, recognition and error prevention. Thus, teacher educators and preservice teachers should be provided with the training on how to use these devices to enhance their learning. Moreover, it seems to be essential for the institutional to create motivating environment and strengthening the collaboration within and outside the institutional (see Sebbowa & Muyinda, 2018; Tsai & Tsai, 2019; Xue & Churchill, 2020). These approaches help to increase learning experience with mobile technologies to both teacher educators and preservice teachers.

c. Aligning policies in transforming ITE program with mobile technologies

It should be noted that policies support is the vital components for effective implementation of mobile technologies in initial teacher education program (see Baytiyeh, 2018; Handal et al., 2013; Qarkaxhja et al., 2021). These studies indicated that, universities are stressed on how to implement mobile technologies policies in teaching and learning. According to Tindell & Bohlander, (2012) showed the universities and instructors have the autonomy to create their own technology policies based on nature of the subject matter, environment, type of students and resources available. For this situation, teachers can decide whether to encourage or discourage the use of mobile technologies in their classroom. Ledbetter & Finn, (2013) categorized these policies into three main groups; encouraged policies, discouraged policies and laissez-faire policies whereby teacher has no formal policy on how students can use mobile technologies. Hoffmann, (2017) indicated that teacher make these decisions based on the past experiences or individual competences on how to use mobile technologies in teaching and learning. Furthermore, students seem to be more reactive and sensitive to the policies related to the use of mobile technologies, since these devices looks to be fundamental to enhance learning process (Finn & Ledbetter, 2013).

For that reason, Morris & Sarapin, (2020) on their studies on preservice teachers, revealed that students complained on the use of mobile technologies policies as contradicting to their efforts of using mobile technologies to enhance their learning activities. It seems when the instructors prohibit students from using mobile technologies for their learning, students professed them to be more orally belligerent (Tatum et al., 2018). At the same time, students expecting to use these devices to enhance their learning experiences. In this respect, there should be a collaboration when creating mobile technologies policies between students and teachers in order to ensure compliance (Baytiyeh, 2018; Morris & Sarapin, 2020). In addition, the policies used to support the use of mobile technologies should be free from ambiguity via highlighting the plans and strategies for effective implementation.

d. Limitations of the study and future research

Our review has various limitations. First, the number of studies included in this evaluation is relatively small, due to limited number of qualitative evidences based on the context of this study. This may lead to some gaps in the results which limit generalization of this findings. Second, the constraints associated with the use of mobile technology in initial teacher education programs are less considered in our synthesis, which could have an adverse effect on the adoption of mobile technologies. This is due to lack of reliable evidences from the previous studies regarding to constraints of mobile technologies in initial teacher education programs. Finally, the study used synthesis of qualitative evidences to study the research problem which may lack the formal methodological evidences (France et al., 2019). By comparing and contrasting the methods, we were able to critique them and reflect on our logical reasoning.

These findings build foundations and provide important directions for future researches. First, this study shows that, there is limited number of qualitative evidences which could limit the generalization of this findings. Future studies should employ another approach, such as meta-analysis for quantitative evidences or narrative review for qualitative and quantitative evidences. Second, the current study failed to address constraints for adoption of mobile technologies in initial teacher education programs due to limited evidences from the previous studies. Hence, the future studies could further explore the challenges of adopting mobile technologies in initial teacher education programs. In addition, transforming initial teacher education with mobile technologies also deserves further investigation because of the influence of cultural and contextual factors on the mobile-phone use. As the results shows some training institutional belief using these devices is illegal to preservice teachers.

V. Conclusion

The study used meta-ethnography via synthesis of qualitative evidences to unpack the approaches towards transforming initial teacher education programs with mobile technologies. In this study, the experience from teacher educators and preservice teachers were gathered in order to understand the complex process of transforming initial teacher education program with mobile technologies. The results of this approach spawned six key themes: the first theme related to micro-level about conceptions on the use of mobile technologies and the next four themes related to meso-level based on institutional approaches towards transforming initial teacher education programs. The last theme concerned with macro-level such as policies and financial support. As a way to clarify how these key themes are related and works, we developed the model for transforming initial teacher education programs with mobile technologies (see fig. 2). The model merged with the findings and illustrates the overall picture from micro to macro-level. These findings contribute to existing knowledge and inform practices when it comes to transforming initial teacher education programs with mobile technologies.

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Appendix. Descriptive information of the included articles

Author/date	Title	Country	Method	Participants
(Tsai & Tsai, 2019)	Preservice teachers' conceptions of teaching using mobile devices and the quality of technology integration in lesson plans	Taiwan: China	Open-ended questions/interview	47 preservice teachers
(Xue & Churchill, 2020)	The Educational affordances of mobile social media for language teaching and learning: a chinese teacher's perspective	China	Case study: observation, interviews, documents and artifacts	1 teacher and 1 classroom of 50 students
(Jie & Sunze, 2021)	Investigating pedagogical challenges of mobile technology to English teaching	China	semi-structured interviews	28 university lecturers
(Biddix et al., 2016)	Attitudes Faculty use and perception of mobile information and communication technology (m-ICT) for teaching practices	Korea and US	Open-ended questions	59 faculty members
(Hamzah & Muchlis, 2018)	The Exploration through the Factors Affecting Students' Adoption on m-Learning Technologies	Indonesia	Open ended questions and interview	32 preservice teachers
(Sebbowa & Muyinda, 2018)	The Utilisation of a Mobile Phone Forum on the Winksite application in the teaching and learning of History	Uganda	Case study: interview and observations	15 preservice teachers
(Xue & Churchill, 2020)	Teachers' private theories and their adoption of affordances of mobile social media	China	Mult-case study: observations, interviews and documents	4 university lecturers from 4 universities

(Qarkaxhja et al., 2021)	Digital Transformation in Education: Teacher Candidate Views on Mobile Learning	Russia	Open ended questions and interview	61 teacher-candidates
(Handal et al., 2013)	Adopting Mobile Learning in Tertiary Environments	Australia	Open ended question	177 university lecturers
(D. Churchill & Wang, 2014)	Teacher's use of iPads in higher education	Hong Kong: China	Interviews and observations	9 University Professors
(Baran et al., 2017)	Examining Preservice Teachers' Criteria for Evaluating-Educational Mobile Apps	Turkey	Case study: Open ended questions and Interview	19 preservice teachers
(Kearney et al., 2012)	Viewing mobile learning from a pedagogical perspective	United Kingdom	Open ended questions and interview	3-Professors and 10 preservice teachers
(Baytiyeh, 2018)	Students' Use of Mobile Technologies: motivational factors	Lebanon	Interview, FGD and observation	138 preservice teachers

Transformant un programa de formació inicial docent amb tecnologies mòbils. Una síntesi d'evidències qualitatives

Resum

Les tecnologies mòbils s'han utilitzat cada cop més en l'educació per millorar l'ensenyament i l'aprenentatge entre els estudiants. Els autors han revisat estudis qualitatius que se centraven en enfocaments per transformar els programes de formació inicial de docents amb tecnologies mòbils. Amb l'ús de l'enfocament metaetnogràfic, comparem, contrastem i interpretem la síntesi d'evidències qualitatives a través de nombrosos estudis. En aquesta revisió es van analitzar 13 estudis elegibles de Web of Science realitzats a diferents països entre el 2012 i el 2022. Les troballes s'han dividit en tres seccions: (1) tema relacionat amb les concepcions sobre l'ús de tecnologies mòbils a nivell micro (per exemple, percepcions i possibilitats).), (2) temes relacionats amb enfocaments institucionals al nivell meso (per exemple, formació professional, suports tècnics, entorn motivador i col·laboratiu) i (3) tema relacionat amb polítiques i suports financers al nivell macro. Amb base a aquestes troballes, s'ha desenvolupat un model per transformar els programes de formació inicial docent amb tecnologies mòbils. Mitjançant debats intensius sobre els resultats, s'han obtingut conclusions factibles i es proporcionen orientacions per a futures investigacions sobre tecnologies mòbils.

Paraules clau

Tecnologies mòbils; programa de formació inicial del professorat; transformant; síntesi d'evidència qualitativa

Transformando el Programa de Formación Inicial Docente con Tecnologías Móviles. Una síntesis de evidencias cualitativas

Resumen

Las tecnologías móviles se han utilizado cada vez más en la educación para mejorar la enseñanza y el aprendizaje entre los estudiantes. Los autores han revisado estudios cualitativos que se centraban en enfoques para transformar los programas de formación inicial de docentes con tecnologías móviles. Con el uso del enfoque meta-etnográfico, comparamos, contrastamos e interpretamos la síntesis de evidencias cualitativas a través de numerosos estudios. Esta revisión analizó 13 estudios elegibles de Web of Science realizados en diferentes países entre 2012 y 2022. Los hallazgos se han dividido en tres secciones: (1) tema relacionado con las concepciones sobre el uso de tecnologías móviles a nivel micro (por ejemplo, percepciones y posibilidades).), (2) temas relacionados con enfoques institucionales en el nivel meso (por ejemplo, formación profesional, apoyos técnicos, entorno motivador y colaborativo) y (3) tema relacionado con políticas y apoyos financieros en el nivel macro. Con base en estos hallazgos, se desarrolló un modelo para transformar los programas de formación inicial docente con tecnologías móviles. Mediante debates intensivos sobre los resultados, se derivaron conclusiones factibles y se proporcionaron direcciones futuras para futuras investigaciones sobre tecnologías móviles.

Palabras clave

Tecnologías móviles; programa de formación inicial del profesorado; transformando; Síntesis de evidencia cualitativa

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