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Research Article

Factors Influencing the Formation of Teacher Professional Identity in Technology Integration

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Abstract

The roles of teachers in the classroom include ensuring that learning objectives are met when teaching and learning activities are implemented. Technology allows teachers to achieve their teaching goals, as well as support and enable students to engage in any teacher-planned activity actively. Many studies have identified factors that influence teachers to integrate technology into the classroom. Therefore, this study reviewed the literature on factors that influence the formation of teacher professional identity in integrating technology into teaching and learning. Several databases were searched to find relevant, accessible literature published between 2016 and 2019. The study found that internal and external factors, specifically, individual, technology and environmental factors, do influence the formation of teacher professional identity. This study also discusses the challenges faced by teachers in using technology in the classroom. It is hoped that this study will help researchers understand the factors that influence the formation of professional identity and the challenges encountered by teachers. These factors must be identified to ensure that technology integration can be effectively implemented for students in pursuing education in the 21st century.

Keywords: identity, professional identity, technology integration

1. Introduction

The education system nowadays demands teachers to be well versed with technology. Technology has become part of life and is a key component of education (Cener et al., 2015). The emergence of various educational tools and resources that can be used in the teaching and learning process allows teachers to be able to integrate technology in the classroom. Teachers must equip students with skills, which are 1) creativity and innovation, 2) communication and collaboration, 3) information research and efficiency, 4) critical thinking, problem-solving and decision making, 5) digital citizenship, and 6) technology skills. These skills are important for students in 21st-century learning (ISTE, 2007). The students can acquire such knowledge and skills if teachers leverage the use of technology effectively in the classroom. Although technology is seen as a tool for knowledge building, it is highly effective for teaching and learning (Nelson et al., 2019). However, the use of technology in classrooms is still very low and. teachers still practice traditional teaching methods despite the

availability of technology (Bang & Luft, 2013).

Factors such as the lack of adequate computer facilities, poor internet access, time constraints and workloads (Ertmer, 1999) are among the obstacles faced by teachers in integrating technology in teaching and learning. Nonetheless, teachers are the main factor that determines the effectiveness of technology in the classroom (Inan & Lowther, 2010). Teachers' commitment and involvement in technology are determined by how teachers form their identity as the resource person for technology integration in the classroom (Day, 2004). There is a need to examine how teachers shape their identity as such identity not only influences one's personality, but also the aspects of a teacher's responsibilities. In this regard, responsibilities play a key role in developing a teacher's professional identity (Khalid, 2015). Researchers mentioned that identity has an important role in determining how a person learns, communicates, and works (Wenger, 1998) and it affects the self-efficacy, motivation, commitment, job satisfaction and effectiveness of a teacher (Day et al., 2007). Professional identity also influences how teachers react to change; a teacher will resist change if he assumes that his identity is compromised. In today's world, technology integration in the education system is one of the common change that teachers need to go through, and that change should be influenced by many factors. Therefore, the purpose of this study is to systematically review previous research on factors that influence the formation of teacher professional identity in a more specific domain, namely the use of technology. This systematic study employed reporting guidelines (PRISMA). This guide was selected because it provides a clear and comprehensive systematic review report to answer the research questions. Therefore, the research questions are:

1. What are the factors that influence the formation of teacher professional identity in technology integration?
2. What are the barriers faced by teachers in integrating technology in the classroom?

2. The Importance of Integrating Technology in Teaching and Learning

Technology integration is a process where technology is used to support teaching and learning activities both within and outside the classroom (Keengwe & Onchwari, 2009). The advent of various information and communication technology (ICT) tools allows the use of laptops, smartphones, simulation software, electronic spreadsheets, probe ware, calculators, internet, web 2.0 applications, geometry software, multimedia and online interactive applications in teaching and learning as teachers are able to integrate technology with students.

The advantages and potential of technology integration for teachers and students have been discussed in many studies (Ayas, 2015; Hashim et al., 2017; Kesten, 2010). This is because technology is seen as suitable to be used by students at all levels, from pre-school to university students. When used effectively, these technologies could assist teachers to deliver lessons more interestingly and develop cognition of the student (Kurt, 2010), enhance student understanding (Naziri et al., 2019), enhance student's writing skill in language (Yunus et al., 2012) and support students in collecting and analyzing data, thinking critically, and making connections with real life lessons (Niess et al., 2010). Desai (2010) state that the key roles of ICT in education are to 1) help teachers improve their teaching skills and create an innovative classroom teaching, 2) motivate and instil interest in students to learn, 3) support teachers and students to communicate better, 4) support teachers to apply student-centred teaching, 5) help enhance teacher professional development, and 6) help teachers make assessment of learning at a faster rate and effectively. By integrating technology into teaching and learning, teachers can provide students with the space and opportunity to develop the relevant skills needed in 21st century learning (Kurt, 2010).

3. Teacher Professional Identity

Research on professional identity in the context of education is expanding (Akkerman & Meijer, 2011). Thus, the definition of identity must be clearly defined to understand the concept of professional

identity. Identity is defined as characteristics that differentiates one person from another (Deschamp and Devos 1998) and identifies an individual (Beijaard et al., 2000). While some researchers have different interpretation of the concept of identity, in general, the consensus is that identity is not something a person possesses, rather it is a process that can be shaped continuously (Beijaard et al., 2004). In other words, identity is an element that can answer the question "Who am I now?" (Beijaard et al., 2000).

A professional identity is defined as personal qualities, values, roles, interests, and physical characteristics of an individual (Beauchamp & Thomas, 2009). It is also linked to one's sense of belonging to a profession (Tsakissiris, 2015). This identity is constantly evolving, and shaped by beliefs, attitudes, motivations, and experiences (Tsakissiris, 2015) that are influenced by the social and cultural environment the individual is in (Akkerman & Meijer, 2011). In the context of teachers, professional identity is associated with the image of a teacher. This image is related to how a teacher teaches and develops as a teacher. This image is also associated with teacher's acceptance or attitude toward change in education. For (Volkmann & Anderson, 1998), the concept of professional identity is linked to the role of teacher, whereas in another study, professional identity is related to the process of reflection or self-evaluation by teachers for the development of personal professionalism (Darrow-Kleinhaus, 2012). In other words, a teacher's professional identity can be linked with whom and how a teacher is in the profession.

Although the definition of professional identity varies between researchers, Beijaard et al., (2004) states that there are four important concepts in professional identity: 1) It is an unstable and dynamic entity that varies according to the context and environment in which teachers are engaged, 2) It can answer the question "How do I go in the future?" and 3) Professional identity comprises of sub-identities. As these sub-identities often interact with each other and must be balanced as the balance between these sub-identities determines whether the professional identity formed by a teacher is positive or negative and lastly, 4) it requires the involvement of the teacher in the professional field.

4. Methodology

This systematic review was conducted using the PRISMA guideline. There are five steps in the PRISMA guide, which are 1) determining eligibility criteria, 2) determining the source of information, 3) selecting relevant studies, 4) data collection, and 5) the selection of items. Figure 1 describes the steps in conducting this systematic study.

Identifying Criteria Eligibility: The selection of the articles is based on a few criteria. First, the studies must be published between 2016 and 2019. Second, the studies examined only the factors that influence teacher professional identity in integrating technology at school or university level. Third, the studies discuss the challenges faced by teachers in using technology in classroom. These criteria were defined to answer the research questions. The studies on technology integration by in-service and pre-service teachers were also selected for review.

Identifying Source of Information: Literature search was conducted in established online databases, namely Elsevier (SCOPUS), Emerald and Science Direct. While the preliminary search resulted in proceedings, thesis research and books, only journal articles were derived from the databases for the review.

4.1 Study Selection

The selection of the study was done using several steps: Keyword search was employed to search for literature from the databases. The keywords include "professional identity", "identity", "teacher identity", "factor", "barrier", "challenge", and "technology integration". These keywords were searched individually, and the search, selection of titles, abstracts, and keywords of the identified articles were conducted based on the eligibility criteria. The articles were conducted to ascertain whether the articles should be included in the study selection based on the criteria set.

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4.2 Data Collection Process

Data collection was conducted manually using the extraction data form in Excel spreadsheet. The data extracted include topics, years, respondents, the research methodology used and factors influencing teachers' professional identity in using technology.

4.3 Item Selection

The information reviewed in each article include:
1. Respondents
2. Research method used
3. Factors that influence teacher professional identity in integrating technology
4. Obstacles faced by teachers in integrating technology.

5. Results and Discussion

Table 1 shows the findings of past studies that fulfil the selection of items, in terms of the respondents involved, the methods used, the factors that influence the formation of professional identity and the obstacles faced by the teachers in technology integration.

5.1 Factors that influence the formation of teacher professional identity in integrating technology

In order to ensure that the integration of technology in teaching and learning is effective and meaningful, it is important to consider the factors that influence teacher professional identity formation in integrating technology. In this study, the factors are categorized as internal and external factors.
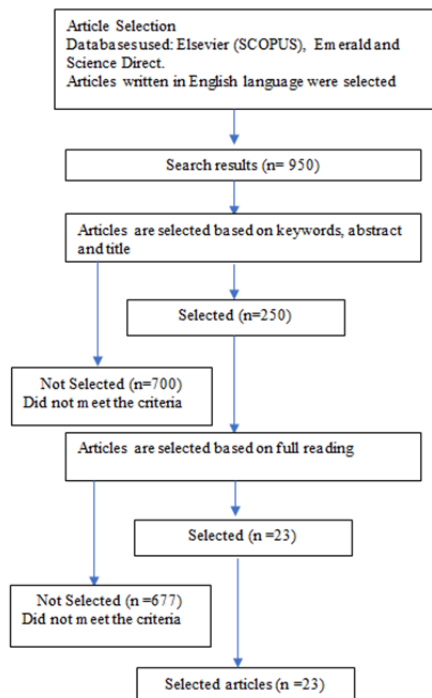

Figure 1: Selection of relevant studies

5.1.1 Internal Factor

The Internal factors discussed are divided into personal factor and professional knowledge.

5.1.1.1 Personal Factor

Based on the articles selected, personal factors that form professional identity include teachers' perception, believes and attitudes (Avidov-Ungar & Forkosh-Baruch, 2018; Gavaldon & McGarr, 2019; Greene-Clemons, 2016; Hartman et al., 2019; Hsieh & Tsai, 2017; Jonker et al., 2018; Tsybulsky & Levin, 2019; Van Den Beemt & Diepstraten, 2016). These factors form teachers' personal view towards technology. Therefore, perceptions, beliefs and attitudes toward technology are among the reasons that determine the use of technology by teachers in the classroom.

The selection of technology and ways to use the technology correlate with teachers' belief about technology. Moreover, teachers' beliefs are also influenced by the value or benefits obtained after using technology. Thus, if the technology assists teachers to achieve the desired results in their teaching, their confidence in technology will increase. Studies also discussed the efficacy factor (Alt, 2018). Self-efficacy, which is the ability to use technology, also influences teachers' confidence and motivation to conduct teaching and learning using technology. This reflects that teachers must have high degree of confidence to use technology in the classroom.

Other aspects of life beyond school hours, such as family time, as discussed by (Matewos et al., 2019), also play a role in influencing teachers' choice to integrate technology in their teaching process. Often, family responsibility is viewed as a hindrance for teachers in giving commitment to work outside of school hours, specifically in designing technology-based teaching. Khalid (2018) also stated that participation of teachers in online learning is influenced by their personal traits, such as their age, marital status as well as their responsibilities towards their children. Lifestyle and demographic characteristics were also discussed by (Moon, 2018; Li & Huang, 2016) as factors influencing teachers' use of technology for learning activities using technology. In addition to the above factors, researchers (Matewos et al., 2019) stated that teachers' self-reflection or self-assessment of the teaching and learning process influences the formation of a teacher's professional identity in making changes in teaching strategies. For instance, after going through the process of self-reflection, a teacher changed his teaching approach from teacher centred to student centred by incorporating technology.

5.1.1.2 Professional Knowledge

Professional knowledge is an important factor for the integration of technology in the classroom. Several studies mentioned that teachers must possess content, pedagogical and technology knowledge or better known as the TPACK framework (Taimalu & Luik, 2019). Teachers must not only be competent on the content taught, but also on strategy or method employed in teaching, and having technological knowledge when teaching using technology. Teacher training programme should focus on aspects pertaining technology as pre-service teachers have the potential to integrate technology in future as they are more likely to use technology for their personal benefit (Khalid et al., 2018).

Studies have also discussed how the formation of a teacher's professional identity is influenced by the level of his/her competence in technology and pedagogy (Jonker et al., 2018; Almerich et al., 2016; Nousiainen et al., 2018). As technology competency is strongly linked to influence teachers' pedagogical competency, teachers must have the knowledge and skills in technology to ensure that the technology selected enables learning. Moreover, teachers not only need to have the skills to use technology, but also the knowledge and skills of how to teach using the technology. These skills are needed to achieve the goals and objectives of learning.

In addition to being technologically and pedagogically competent, a study conducted by (Makki

et al., 2018) stated that teachers must also acquire design thinking skill. This skill is important to build lesson plans when integrating technology in classroom activities. This skill ensures that the activities planned are in accordance with the curriculum specifications, improves problem-solving skills and the teacher can determine appropriate strategies / methods for students to apply when using technology. Thus, by focusing on design thinking skill, teachers can address problems such as of the lack of resilience. Studies have also advocated teachers should also increase their creativity in planning lessons. (Makki et al., 2018).

5.1.2 External Factor

The external factors discussed by past researchers include the factor played by leaders within the school (Hsieh & Tsai, 2017; Hartman et al., 2019). Technology leadership is one of the determinants of success in implementing technology in schools. This is because leaders who create a technology-driven environment will influence teachers to inculcate teaching technology to students. Leaders who support the use of technology in the classroom will also influence teachers' attitudes towards technology. Studies have also discussed by Implementation of policies (curriculum, evaluation, and assessment) set by the ministry, which could also influence the formation of teachers' professional identity (Khlaif et al., 2019; Palaigeorgiou & Grammatikopoulou, 2016). Therefore, if the curriculum devised does not support teachers' integration of technology, it will become a barrier for teachers to teach with technology. Another external factor discussed by (Khlaif et al., 2019) is student's needs. The study stipulated that teachers will use technology as long as it meets the needs and wants of students. Furthermore, students with relevant technology skills and access to facilities influence teachers to use technology in their teaching activities.

In addition to the factors discussed above, other factors that influence the formation of teachers' identity were also discussed by researchers. These factors include the attitude of local community that interacts with teachers such as co-workers and parents (Palaigeorgiou & Grammatikopoulou, 2016) and is often perceived as the barrier for teachers to use technology. Unfavourable attitudes among colleagues which do not cooperate and show negative support towards the use of technology also influence the professional development of teachers. The study also found that culture of working as an individual and avoiding group work, is deemed as a factor that leads to the failure of using technology in school. This is similar to the finding that parents does not encourage students to use technology as they feel that technology has more negative impacts on their children (Palaigeorgiou & Grammatikopoulou, 2016).

5.2 Challenges faced by teachers in integrating technology

Besides the advantages of using technology in teaching and learning, there are also some obstacles and challenges identified in the studies. Some of the obstacles faced by teachers are discussed below.

5.2.1 Technical factor

Technical factor was discussed in (Palaigeorgiou & Grammatikopoulou, 2016). The study argued that often times, teachers are not provided with sufficient and latest resources and have limited access to infrastructure like high speed, internet access, technical support and maintenance. Other factors include teaching using mobile phone, specifically small screen size, insufficient memory, battery problems and network reliability (Palaigeorgiou & Grammatikopoulou, 2016). The finding of this study shows that teaching application design, screen design and interface design are some of the technical factors that need to be taken into account to increase teachers' use of technology in teaching and learning.

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5.2.2 Teacher Professionalism Development factor

Another factor considered is teacher professionalism (Hartman et al., 2019; Palaigeorgiou & Grammatikopoulou, 2016). In a study by (Palaigeorgiou & Grammatikopoulou, 2016), researchers stated that teachers do not have sufficient opportunity to participate in technology-related training. This indicates that appropriate training determines the teachers aim to integrate technology in teaching. However, a study by (Christensen & Knezek, 2017) suggests otherwise. The findings of the study suggest that while many teachers undergo technology-related training, the training they received does not provide the relevant information for them to apply technology in the classroom. Teachers need supportive training that focuses on pedagogy and strategies on integrating technological tools in the classroom and training classroom management when implementing technology. Thus, sufficient training could boost teachers' confidence to apply technology in the classroom environment (Christensen & Knezek, 2017). The study also attributes the readiness of teachers to use mobile technologies with the type of training that a teacher will attend. The study also found that older, experienced teachers have lower readiness to use technology are those with great length of teaching experience. Hence, older teachers are more likely to opt for face-to-face professional development while younger teachers, who are more likely to use mobile technology in teaching, are more interested in online training.

5.2.3 Cultural and Social Factors

Cultural and social factors are also one of the challenges faced by teachers in integrating technology in classroom. For instance, teachers in Central Asia (example Kuwait) believe that technology can cause the increase of social problems. They presume that the use of technology increases the likelihood of relationship between male and female students (Al-Hunaiyyan et al., 2018). Concerns over data security and cyber-bullying were discussed in (Al-Hunaiyyan et al., 2018). In this light, teachers do not use technology as they assume that students use technology more to socialise, rather than for learning. Teachers feel that technology can improve internet disease (such as addiction and harassment) when technology is used in teaching and learning.

5.2.4 Other Factors

Other factors that are viewed as obstacle include class situation and the high work burden among teachers. Heavy workload limits teachers' time to plan activities that integrate technology. This shows the longer time taken to develop teaching materials also influences teachers' motivation and desire to use technology in the classroom (Palaigeorgiou & Grammatikopoulou, 2016).

6. Conclusion

In this study, a total of 23 studies were examined. From the studies selected in this study, it is noted that past studies on personal identity employed both qualitative and quantitative methods. Most qualitative studies employed the interview method. This method was chosen because it is appropriate to understand in-depth the aspects that shape a teacher's professional identity. However, the study focused more on in-service teachers compared to pre-service teachers.

This study also concludes that the formation of a teacher's professional identity is influenced by personal factors, competencies, and environment (leaders, students, colleagues, and policies). These factors need to be given priority as the formation of professional identity influences teachers' reactions to change. Teachers will resist changes if they consider it clashes with their identity. The primary role of teachers is to engage students in learning activities which enhance their learning outcomes while the integration of technology into the teaching and learning process is a pedagogical practice that can support the curriculum.

Moreover, leadership and lifelong learning play a key role in shaping professional identity of teachers. In this sense, the use of technology in a classroom requires the support of school leaders. Thus, school leaders are one of the determinants of the success of technology implementation in schools. Teachers are encouraged to constantly improve their knowledge and technology skills obtained formally and informally at training centres or workshops conducted face-to-face or online. By understanding the factors influencing the formation of professional identity and the obstacles faced by teachers, it is hoped that everyone will play their part in shaping a positive teacher identity. For instance, the district education office should provide the appropriate training for teachers to enhance their personal development, especially in technology skills. Increased teachers' knowledge not only enhances the development of professionalism as a teacher, but also creates a positive teacher identity. Therefore, establishing a positive teacher identity can determine a teacher's commitment and resilience in coping with challenges and changes in the education world.

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Appendix

Table 1: summary of research articles included in review

Study	Aim	Responden	Method	Findings
Zuheir Khlaif, Fatih Gok & Bochra Kouraïchi (2019)	1. to explore the process of designing mobile technology-integrating activities 2. Factors influencing the design process.	In-service teachers	Qualitative-observation, semi-structured interviews and focus group discussion	1. Cultural and religious factors were important factors 2. beliefs, experience, and the policy influenced the technology integration
Tuula Nousiainen, Marjaana Kangas, Jenni Rikala Mikko Vesisenaho	1. to explore teachers' competencies, need in using game-based pedagogy (GBP)	In-service teachers	Qualitative and quantitative Interviews and documents	1. Four main competence areas were identified: pedagogical, technological, collaborative, and creative.
Ananya M. Matewos, Julie A. Marsh, Susan McKibben, Gale M. Sinatra, Q. Tien Le & Morgan S. Polikoff (2019)	1. How did teachers engage with the process of implementing a new supplementary curricular unit and to what extent did it shape teacher learning and instructional change? 2. What factors mediated possible learning?	In-service teachers	Multiple case study - semi-structured interviews and classroom observations	1. Shows different learning trajectories, wherein teachers either moved towards student-directed instructional roles or maintained teacher-directed roles. 2. Doubt and self-questioning appear to be important mediating aspects of teacher self-reflection, which then impacts instructional role change
Dina Tsybulsky & Ilya Levin (2019)	1. What kind of worldviews do contemporary science teachers demonstrate in the context of the digital revolution?	In-service teachers	Qualitative - in-depth interview	1. three different categories of the way teachers perceived their own place and role 1) outside observers; 2) circumspect participants; 3) conscientious participants.

Study	Aim	Responden	Method	Findings
Khalid Arar & Ruth Abramovitz (2017)	1. Explores teachers' attitudes toward the implementation of new computer technology to improve teaching and learning	In-service teacher Seior managemant	Mixed-methods – in-depth interviews	1. Teacherc factor (Techer's perception and attitutes) are related factors in assimilation of technological change in schools.
Rita J. Hartman, Mary B. Townsend & Marlo Jackson (2019)	1. To explore educators' values, beliefs and confidence changing from a traditional learning environment to a learning environment integrating technology.	In-service teacher	Survey Open-ended questions	1. Level of confidence, professional development and training, self-motivation, and excitement about the way technology can enhance the learning are the factors to integrating technology
Moon, E. C. (2018)	1. Explore the changes in K-12 educational delivery methods	In service teachers	Survey	1. School districts are responsible for providing a remedy to close knowledge gap and mitigate risk by developing learning content resources for teachers.
Palaigeorgiou, G., & Grammatikopoulou, A. (2016)	1. to identify the learning benefits and the challenges of Web 2.0 educational activities	In service teacher	Semi-structured interview	1. colleagues' attitude, the educational environment, the parents' attitude, the amount of time and effort required, the unpredictable activities, the limitations imposed by the curriculum, the overestimation of students' skills and the lack of training opportunities are the challenges faced by teachers to use technology in classroom
Avidov-Ungar, O., & Forkosh-Baruch, A. (2018)	1. to explore changes in teachers' professional identity of demands for pedagogical innovation in education	Teacher educators	Qualitative Semi-structured interview	1. Three main teachers' perception of pedagogical innovation; being modes, doing moves and having modes.
Jonker, H., März, V., & Voogt, J. (2018)	1. to explore teachers' professional identity changed from teachingf2f to a blended curriculum	In-service teacher	Qualitative Semi-structured interview	1. Daily routines, knowledge/skill and belief were identified as a factor to implement blended learning
Alt, D. (2018)	1. assessing science teachers' conception teaching and learning, their sense of efficacy, ICT efficacy, and ICT professional development, as precursors to their use of ICT practices	In-service teacher	Survey	1. teachers' conception of teaching and learning, sense of efficacy, ICT efficacy and ICT professional development are factors for teachers enact ICT practices in their classrooms.
Gavaldon, G., & McGarr, O. (2019)	1. to explore pre-service teachers' attitudes and future intentions to use digital technologies	Pre-service teacher	Mixed method	1. Pre-service teacher's attitude and perception are factors to intense to use technologyto use technology
Tsybulsky, D., & Levin, I. (2019)	1. to gain teacher's worldviews related to the digital revolution	In service teacher	Qualitative - Interview	1. three different categories teachers perceived their place and role 1) outside observers; 2) circumspect participants; 3) conscientious participants
Nelson, M. J., Voithofer, R., & Cheng, S.-L. (2018)	1. to explore mediating factors, influence a teacher educator's TPACK and ISTE standard alignment 2. to explore the factors, vary across subject areas and levels of experience	In-service teacher	Quantitative survey	1. technology knowledge and institutional support are important mediators, institutions should provide targeted support to teacher educators across
Almerich, G., Orellana, N., Suárez-Rodríguez, J., & Díaz-García, I. (2016)	1. to establish a basic framework that shapes the subsets of ICT competences 2. to determine how various personal and contextual factors influence ICT	In service teacher	Survey	1. The study results indicated that teachers' ICT competences form a unique set composed of two subsets, technological competences, and pedagogical competences. 2. the technological competences

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Study	Aim	Responden	Method	Findings
	competences			influenced the pedagogical competence. ones. We also found that personal and contextual factors have a relevant. 3. The influence of personal and contextual factors must be considered when designing training plans.
Hsieh, W.-M., & Tsai, C.-C. (2017)	1. To explore teacher's conception of mobile learning	In service teachers	Qualitative-semi-structured interview	1. teachers' conceptions of mobile learning were identified 1) meeting student preferences, 2) conducting classes with efficiency, 3) invigorating and enhancing learning, 4) parting from traditional teaching, 5) focusing on student ownership and 6) extending learning beyond school
Van den Beemt, A., & Diepstraten, I. (2016)	1. to explore social-cultural factors influencing teacher professional development (TPD) on ICT	Pre-service and in-service teachers	Qualitative	1. beliefs and attitudes, and relevant others influencing TPD on ICT
Li, S.-C. S., & Huang, W.-C. (2016)	1. to understand the factors that affected teachers' adoption of game-based learning (GBL)	In-service teachers	Mixed method - Interview survey	1. lifestyles, perceived attributes of GBL, and demographics are factors to use GBL in teching and learning activities
Ahmed Al-Hunaiyyan, Rana A. Alhajri, Salah Al-Sharhan	1. to investigate students' and instructors' perceptions toward the use of mobile devices in learning, and to understand the challenges that affect its implementation	Student Instructors	quantittive	1. Management, design, technical, evaluation and cultural and social challenges are the challenges faced by teachers in integration technology.
Taj W. Makkia, LaToya J. O'Neal, Shelia R. Cotton, R.V. Rikard	1. to examines the role of second- and third-order barriers in in a classroom computing intervention	In-service teachers	Quantitative survey	1. the relationship between computer feature comfort and intention to use computers in the classroom was significant and po- sitive 2. 'design thinking' motivates teachers to overcome obstacles stemming from limited resources.
Merle Taimalu, Piret Luik	1. to examine teacher's belief and knowledge influence the technology used by teachers.	In-service teachers	Quantitative	1. knowledge of technology and its integration had a direct effect on technology integration. 2. Beliefs the value of technology influenced technology integration indirectly. 3. pedagogical knowledge had a significant total effect on technology integration
Cheresa Denae Greene-Clemons	1. to investigates the perceptions of pre-service teachers in technology engagement	Pre-service teachers	Mixed method	1. positive correlation between education preparation program and the ability to utilize technology with the future students
Rhonda Christensen, Gerald Knezek	1. to examined teachers' readiness to integrate mobile technologies into the classroom.	In-service teachers	Quantitative	1. High scores on F1 Possibilities and F2 Benefits of mobile learning are associated with high levels of technology integration. 2. high ratings on F2 Benefits and F3 Preferences are associated with desiring online and blended professional development, rather than face-to-face instruction 3. Greater numbers of years of teaching are negatively correlated with perceived benefits of mobile learning.