Teachers in the Twenty-first Century and Challenges of Technological Innovation in Teaching and Learning

Mohammed H. Albahiri[1], Drs. Ali Albashir Mohammed Alhaj[2]

[1]*Professor, Curriculum & Instruction, College of Education, King Khalid University/Abha, Asir Province, Saudi Arabia.*
Email: malqarni@kku.edu.sa
[2]*College of Sciences and Arts. Dhahran Aljanoub, King Khalid University, Kingdom of Saudi Arabia.*
E.mail: alalhaj@kku.edu.sa
Corresponding Author: Mohammed H. Albahiri

Abstract

In the present-day world, technological innovation is increasing the use of online tools and software. These tools have accelerated among academic institutions and teachers for impacting the student's skills and professional development. This study aims to explore differences between male and female teachers concerning their competencies and abilities for using computers and the internet for career development. The study also aimed to find out the competencies of male and female teachers for probing their influence on preparing students for technology integration in education. 768 teachers were chosen randomly from the public schools in the Asir region, KSA. The gathered data was quantitatively assessed by using SPSS, and which results were presented in descriptive and inferential forms. T-test results confirmed that male teachers' skills in using computers for professional development are minimal because the overall mean was 23.1471. The results reveal that the computer competency level among all teachers was higher for males as compared to females. It also indicates the need for a training program for future female teachers at training colleges as gender differences is indicated in terms of instructions, school technical support, and their future development. However, the findings of the study are specific to one region (Asir), which may not be generalized to other areas of the Kingdom of Saudi Arabia.

Keywords: challenges, innovation, teaching and learning, teachers, Technological, Twenty-first Century.

Introduction

Teachers' professional development is considered a crucial aspect of any educational reform. Previous studies have also revealed a positive relationship between teachers' participation in high-quality professional development programs and their performance in the classroom (Archibald et al., 2011). One study on school effectiveness and improvement pointed to teachers' professional development as a fundamental element in supporting education reform and as the most significant factor in explaining how and why some schools achieve better results than others (Cohen and Hill, 2000). The same study also shows that students' performance is positively linked to teachers' quality. In Reimer's words: "If teachers are allowed to learn about and from new educational policies, they can change their practice and indirectly influence students' performance" (2000, p. 12). Cloete (2017) has further highlighted that the competence level of the teacher is directly related to the student's achievement and success.

Various efforts are being made at the global level for enhancing the teaching and learning of educational institutions. Such as, the UK government made an investment of £2.5bn in educational ICT in 2009, which was 4.7 billion in

the US (Nut, 2010). These programs have become the top priority in the core educational agendas globally, particularly for developing countries like Saudi Arabia Saudi Arabia has made a significant investment in ICT for developing its educational level. This is evident from its contribution of 25% of the overall Saudi government budget for education in 2015 i.e., more than £36 billion, aimed towards the incorporation of technology in the school curriculum (Al-Rashidi and Phan, 2015). Despite it, the country still lags in developing the necessary computer literacy among its educational workforce, limiting its reach for reaching the global education level (Ageel 2011; Almadhour 2010).

Studies have noted that teachers generally reject the use of technology in pedagogical education. This may emerge due to two primary barriers; extrinsic (first-order) and intrinsic (second-order). The extrinsic factors include resources, training, learning, practices as well as knowledge (Baturay et al., 2017), while the intrinsic barriers comprise of teacher's vision, characteristics, and beliefs. Most studies confirm that intrinsic factors are difficult to overcome (Baturay et al. 2017; Völkel et al., 2018). Recent research highlights that the use of technology in education provides new developmental avenues as well as challenges (that are linked to two computer competencies) (Sipilä 2014; Howard 2013; Krumsvik et al., 2016), which I comparatively more complex for the teaching profession (Krumsvik et al., 2016). Krumsvik et al., (2016) also showed that teachers who possess computer competence are more inclined toward use. Thereby, it is crucial to identify computer competence among the teachers, which determines its use in pedagogical teaching. Moreover, various studies on Saini Arabia have recommended that Saudi teachers need to involve in continuous ICT education (Alenezi 2015; Alzahrani 2017). One particular factor that previous research has neglected in computer competence is gender, as mostly the focus is towards its adaptation and students (Krumsvik et al. 2016; Teo et al., 2015; Aesaert and Van Braak 2015; Kintu et al., 2017). Moreover, no recent research in Saudi Arabia, mainly Asir, has assessed the difference in the role of computer competence on gender. This study, therefore, bridges this gap and helps enlighten new

insights on computer competence and how it can be collaboratively used for enhancing students' skill sets.

This study is focused on teachers' professional development programs to investigate their readiness to use the internet and their likelihood to benefit from online certified professional development programs. It has been observed that teachers who have been part of academics for over a decade or more, find it challenging to progress. Studies have found that teachers generally cease their actions for indulging in new learning (Strangeways 2017). They also found that new learning does not modify their professional practices. This makes the use of ICT technology integral for professional and pedagogical purposes. Also, various other types of research have supported this stating that the level of digital pedagogical competence for teachers is lower (Guillén-Gámez et al., 2018; Guillén-Gámez et al., 2019).

In this regard, the focus of this study is to delineate the competencies of both male and female teachers for exploring their impact on preparing students for technology integration into education. These roles are relied on fundamental factors in the context of technology inclusion and encompass ICT attitudes, self-efficacy, and competencies of educators for supporting teachers in educational technology use. Better insights into their professional context are required for guiding future studies in the advancement of educational technology use. Particularly, two steps were undertaken for identifying and examining the ICT competencies of teachers. Firstly, the competencies were determined for the overall sample. Secondly, these competencies were validated by testing their comparability across both male and female genders.

Therefore, the present study seeks to answer the following question: Do teachers have computer skills relevant to 21st-century learning, and can they use them for professional development purposes? This study also seeks a deep understanding of any gender-based differences among teachers regarding their competencies in using computers and the internet for professional development. Teachers' aptitude affects the successful use of computers in the classroom and

how they respond to technology. This, in turn, affects the way students use and view the importance of computers in schools and affects their current and future educational computer usage. These are all critical factors in learning success.

Research Questions

This study seeks to answer the following questions:

- **RQ 1:** Do male and female teachers have the computer skills a 21st-century teacher should have, and can they use them for professional development purposes?

- **RQ. 2:** Are there any significant differences between male and female teachers related to computer skills used for professional development purposes?

Literature Review

Among the most significant change in recent years, a primary increase is observed in technological sophistication (Goldin and Katz 2009). This is evident from the exceeding number of users, which in 2018 were 4,208 million as compared to the 1990s when it was 248 million (Internet world stats 2019). Technological growth not only impacts individual life but also still promises for increasing efficiency in education. This has further amplified the use of technological tools in education. However, most technological devices and programs introduced are structured in correspondence to the teachers' needs rather than the students and are employed as teaching aids within the classroom (Wei et al., 2017). This is because, over time, educational environments have undergone various modifications globally, which consequently led to major changes in teachers' responsibilities. Such as, the traditional role of teachers has changed from teaching students to inspiring, with an intent to keep them actively involved in the learning process throughout their lifetime (Sammons et al., 2016).

Studies have shown that the performance of low-achieving students can be improved by 53% when they are taught by qualified, highly effective teachers (Archibald et al., 2011; Cohen and Hill

2000; Goldin and Katz 2009; Haycock 1998). Thus, to improve students' achievement, more attention should be focused on the standard of professional development programs (Archibald et al., 2011). As such, teachers' professional development (e.g., knowing what, how, why, and when to teach) is the key to enhancing students' learning. This is a long-term process that requires not only the acquisition of specific and complex skills but also the promotion of certain ethical values and attitudes; therefore, planning the teachers' professional development programs must consider their professional needs, their interests, and the level of professional development that is required by educational organizations.

Many countries, such as the US, UK, France, Spain, Japan, South Africa, and Namibia, have identified teachers' professional development programs as vital to improving the quality of their national education systems (Al-Zaher 2005). Its significance is based on its increasing capacity to sustain students' attention and promote their engagement in the classroom. This is further supplemented by Wei et al., (2016) stating that there is a narrow scope of interaction when using traditional tools such as Chalkboards, stressing teachers to enhance their skills to more effectively teach digital natives. Teachers will need to re-plan lessons to include online attributes; for example, forums in which students are engaged and encouraged to gather to enhance core skills along with their peers and in concert with their teacher. Smith et al. (2009) confirmed that one of the significant benefits of using online training is the ability for teachers to choose and attend numerous workshops and courses rather than being forced to attend a specific one-day course in person. Because of the enormous advantages of using the internet and advanced technology to facilitate teacher training at a low cost and with little effort, there is clear evidence that there is an increasing demand for using this technology in both developed and developing countries (Anders 2015).

Technology can engender student-centered learning in which students can engage in active learning on their own. The integration of information technology and innovative methods in

the classroom might take on other forms, such as informed writing exercises and the use of text messages, which can enable students to understand the content better (Goldin and Katz 2009; Al-Zaher 2005; Kuznekoff et al. 2015). Integration of innovative methods has great potential for students' benefit and can enable them to build a sense of community in the classroom.

Anticipations that ICT will progress have been expressed for several decades. The expectations, at a policy level, usually seem to be overrated and are further recurrently questioned by scholars in different regions globally (Håkansson 2015). The uptake and use of ICT in K12 education are maintained and can be comprehended from several different perspectives and there is a pre-requisite for educational research, both in theory and practice, for going beyond several smaller case studies of what is ascribed as successful integration activities. To be precise, research needs to advance toward larger longitudinal studies that appropriately undertake the possibility and complexities of using ICT in an educational context. Recommendations as to why ICT has not yet become a developed pedagogical tool in higher education settings have been made in research. For instance, teachers' competence affects their use of ICT for teaching and learning (Sipilä 2014). Montrieux, et al.,(2015) have maintained the ICT competence of teachers influences their possibilities to develop the comprehension of how ICT can be utilized for teaching in educational contexts.

The complexities experienced by teachers were emphasized in recent studies related to the use of ICT in their daily educational practices (Vrasidas 2015; Ward and Parr 2010; Wastiau et al., 2013). Most of these complexities are centered around the different perspectives in which ICT can be utilized (Ward and Parr 2010). They further pointed out that the need for teachers toward ICT in education and their readiness for using ICT is enabled that should be undertaken. Furthermore, research studies indicated that teachers with a positive self-efficacy towards ICT are much more prone to using ICT in their teaching and learning of students since they actualize the pedagogical beliefs of the tool (Howard and Mozejko 2013; Player-Koro 2012).

Moreover, the usefulness of ICT in teaching and their feelings of control are found for the integration of ICT in teaching as compared to the effect of social expectations and norms. Therefore, comprehending the regular practices in which teachers endeavor for practicing between the anticipations of others and their own beliefs, emotions, knowledge, and issues related to the benefits and drawbacks of using ICT for teaching would be essential (Lindberg et al. 2016). In this regard, it is of core importance to act in the best interests of the students and not take risks (Howard 2013; Kreijns et al., 2013). The sense of control of teachers is associated with their ICT competence. For instance, teachers with high ICT competence usually utilize computers and the internet in education, but there are variations concerning gender, the use of ICT in different school subjects, and different forms of ICT (Sipilä 2014). Challenges associated with the use of ICT, according to Vrasidas (2015), are the school curriculum, the need for providing professional and flexible teacher development, and the lack of support, time, and ICT. Similar suggestions were reported by Wastiau et al., (2013) for professional development and ICT support.

ICT-associated university studies have low female participation. Additionally, women are underrepresented among engineering teachers even though the extent of women enrolled in university degrees has been elevating (Ruiz et al., 2016; Jiménez et al., 2019). Since ICT's infancy, new generations of women have been users, but a minority of individuals have emphasized the study, development, and design of new technologies. Garrido et al.,2019) have indicated the differences between men and women in ICT knowledge and management when they commence their university education and thus indicated that female students have less competence as compared to male students concerning ICT programming, spreadsheets, use of collaborative working software and online help manuals, database design, and database design. On the contrary, Garrido et al (2019) have emphasized that these gender differences in the use of ICTs disappear in the domain of fundamental and moderate knowledge of ICT tools even though other research emphasizes how men usually have a more optimistic attitude and

vision as compared to women about the use of ICT (Espinar Ruiz and González Río 2009).

In this regard, women have equal ICT knowledge to that of men at the user level, but they showed a small minority in senior jobs and specialized studies in the ICT arena. The ICT gender gap is considered to as the distance between men and women while using new technologies. Barragán and Ruiz Pinto (2013) pointed out that there have been several technological progressions in society, which lead to numerous technological tools being implemented into the lives of individuals. It is also appropriate that they manifest new risks, and welcome, and reproduce specific social risks even though these technological tools provide numerous benefits. One of these risks is the transmission of gender differences via ICT. The variation in the use of technology between men and women is a social issue that should be mitigated in all social scops and school classrooms at all educational levels.

Methods

Study Design

A cross-sectional descriptive study design was used for assessing computer competence among teachers for their professional development. A quantitative approach was employed for evaluating ICT competence among male and female university teachers. The rationale behind the selection of the design was based on its effectiveness in deriving unbiased results easily and speedily. Accordingly, this design has been employed by similar studies in the researched area; however, the current study differs from them based on its objective, sample size, and scope.

Participants

The study population includes university teachers from the ICT department of the Asir region, Saudi Arabia. A total of 768 male and female teachers were selected based on the inclusion criteria, which required them to be at least 20 years of age. All these teachers were part of different activities designed and implemented for the students in expanding their understanding related to science and engineering concepts.

Data Collection

A survey was performed in two parts. The first part gathered the participants' demographic information, including their gender, qualification, number of years as a full-time teacher, and years of experience. Whereas, the second part of the questionnaire was based on the questionnaire developed by Tınmaz (2004) to evaluate the computer competence of the teachers. The reliability test of the questionnaire, as tested by Tinmaz, was 0.87. A total of 10 items were included, such as basic concepts, hardware, operating system, word processor, spreadsheets, demonstration programs, databases, web page development, internet, and e-mail. Also, demographic details were collected. The questions were based on a 4-point Likert scale (such as from 1 "I have no experience", 2 "beginner", 3 "intermediate", and 4 "expert"). Clear instructions were provided, and each participant was asked to rate his or her experience with each application considering the given measurement (Table 1).

Table 1:

Technology experience scale

Level	Value	Definition
I have no experience	1	You have no experience using a computer
Beginner	2	You know the basic skills only
Intermediate	3	You can do a lot of tasks by computer, but you still need some help

| Expert | 4 | You can do everything that you need to do by computer without any help |

[Table 1]

Ethical Consideration

Before the distribution of the questionnaire, approval was acquired from the university authorities by sending a copy of the sample and a written letter. After it, the participants communicated the study objective. The procedure considering the questionnaire was defined while also communicating the confidentiality and anonymity aspects. Also, a written consent form was acquired from the study participants.

Data Analysis

The Statistical Package for Social Sciences (SPSS) program version 25.0 was used to test the reliability of each part of the questionnaire. A Pearson product-moment correlation coefficient was employed and results showed that the item ranges between 0.652 and 0.865. This reveals that all correlations are significant at the $p < 0.01$ level, showing a high level of concurrent validity for this scale. Cronbach's Alpha Correlation Coefficient was employed regarding the ten items dealing with teachers' competencies in using ICT tools. The Cronbach Alpha was 0.933, which is

considered a good indicator of its reliability.

Results

Participants Demographics

Data from the questionnaires were collected and analyzed to answer the research questions. Participants' demographic details showed that the majority of the participants were male (401) as compared to females (367). Similarly, the majority were aged 20 to 30 years (398), followed by participants with 30 to 40 years (269). The majority of the teachers were graduates (366) while only a few held master's degrees (262), and the remaining were diploma holders (140). The time duration revealed that the majority taught full-time (598) while few worked part-time (170). Teaching experience showed that most had 2 to 5 years of experience (532), while others had 5 years to 10 years (150).

Frequency, percent, mean, and standard deviation for each item related to teachers' computer skills

Computer skills	Frequency and percent				N	Mean	Std. deviation
	No experience	Beginner	Intermediate	Expert			
Basic computer literacy	71	183	303	211	768	2.8516	0.9284
	9.20%	23.8%	39.50%	27.50%			
Microsoft Office	208	148	233	179	768	2.4987	1.1223
	27.10%	19.30%	30.30%	23.30%			
	284	152	165	165	766	2.2755	1.1721

Email management skills	37%	19.80%	21.50%	21.50%		
Computer Accessories	339	145	159	125	768	2.0911	1.1370
	44.10%	18.90%	20.70%	16.30%		
Internet navigation skills	285	153	157	169	765	2.2863	1.2196
	37.10%	19.90%	20.40%	22%		
Web search engines and digital libraries	195	152	201	218	766	2.577	1.1507
	25.40%	19.80%	26.20%	28.4%		
Website design	520	141	81	26	768	1.4961	0.8154
	67.70%	18.40%	10.50%	3.40%		
WebCT or Blackboard teaching	530	125	77	34	766	1.4974	0.8476
	69%	16.3%	10%	4.40%		
Social networking	361	155	124	127	767	2.0222	1.1384
	47%	20.20%	16.10%	16.50%		
File management & computer-related storage devices	347	133	119	128	767	1.9844	1.1527
	50.40%	17.40%	15.50%	16.70%		

[Table 2]

Participants Competence

Data from the questionnaires were collected and analyzed to answer the research questions. Frequency, percentage, mean, and standard deviation were calculated to identify the aptitude of teachers in each item. The maximum anticipated total score was 40, and the minimum was 10; thus, "no experience" was any score between 10 and 17.5, "beginner" was any score between 17.5 and 25, "intermediate" was any score between 25 and 32.5, and "expert" was any score between 32.5 and 40. The findings show that most of the males and females had an intermediate level of computer competence, i.e., 45.4% and 33% for basic computer skills. The hardware knowledge was at the intermediate level for the males (36.9%) while the majority of the females had no experience in it (35.7%). The operating system showed that males and females both had no experience, i.e., 110 and 174, respectively. The word processor skill was found to be at a beginner level (male 132 and female 207), while competence for the demonstration program was better for male participants, while database competence was null between the two (Table 3). Similar was the case with web page development

(male 249, female 281). Email and internet competence were intermediate for both groups (male and female).

Table 3:

Results of the *t*-test regarding teachers' overall computer usage skills for professional development purposes

Part	N	Mean	Std. deviation	Std. error mean	
Aptitude	768	21.5495	8.49803	0.30665	
				Mean difference	95% confidence interval of the difference
	T	df	Sig. (2-tailed)		Lower	Upper
Aptitude	-11.252	767	0.000**	-3.45052	-4.0525	-2.8486

[Table 3]

Differences between male and female teachers' computer skills for CPD

An independent sample t-test revealed that the mean of male teachers' skills in using computers for CPD was 23.1471, while the mean of female teachers' skills for the same purpose was 19.7899. This test also shows that there were significant differences between male and female teachers' skills in using computers for professional development at a 0.01 level of significance, as represented in Table 4.

Table 4:

Frequency, percent, mean, and standard deviation for each item related to male teachers' computer skills

Computer skills	Frequency and percent				N	Mean	Std. deviation
	No Experience	Beginner	Intermediate	Expert			
Basic computer literacy	27	75	182	117	401	2.9701	0.8655
	6.7%	18.7%	45.4%	29.2%			

Microsoft Office	77	83	148	93	401	2.6409	1.0396
	19.2%	20.7%	36.9%	23.2%			
Email management skills	110	86	96	108	400	2.5050	1.1590
	27.4%	21.4%	23.9%	26.9%			
Computer Accessories	132	92	94	83	401	2.3192	1.1370
	32.9%	22.9%	23.4%	20.7%			
Internet navigation skills	114	91	101	95	401	2.4414	1.1367
	28.4%	22.7%	25.2%	23.7%			
Web search engines and digital libraries	75	76	128	122	401	2.7406	1.0852
	18.7%	19%	31.9%	30.4%			
Website design	255	84	44	18	401	1.5636	0.8582
	63.6%	20.9%	11%	4.5%			
WebCT or Blackboard teaching	249	88	42	22	401	1.5935	0.8842
	62.1%	21.9%	10.5%	5.5%			
Social networking	153	98	73	76	400	2.1800	1.1384
	38.2%	24.4%	18.2%	19%			
File management & computer-related storage devices	169	70	73	89	401	2.2045	1.2054
	42.1%	17.5%	18.2%	22.2%			

[Table 4]

Discussion

The results of this study revealed that most teachers in Saudi Arabia have beginner-level competency in using computers and the internet for CPD purposes; as such, most teachers need more training to develop their general computer-use abilities. Additionally, these teachers need to focus on mastering basic applications such as learning and management systems (e.g., operating systems), since these applications are widely used in online CPD. The nurturance of the Learning and management system has also been endorsed by De Smet (2015), which highlights that it allows better management of content.

Further, these results support the findings of previous studies on these competencies among teachers for general educational purposes; for example, several educational studies have mentioned that the use of information and communication technology is increasing in the educational curriculum (Ramos et al., 2019; López Belmonte et al., 2020; Asencio et al., 2017; Schultz-Jones et al. 2017). Such as the results are consistent with Aloyaid's (2009) study, which found that most teachers' technology use in Saudi Arabia is related to lesson preparation which helps in enriching the lesson plans, such as showing videos, pictures, and audio clips. Al-Asmari's (2005) study revealed that most teachers in Saudi Arabia have limited experience in using computers or accessing the internet, which is to the present study findings. The lack of support is also highlighted as another hindrance to teachers' development of computer literacy.

The results of the present study also indicate a shortage of available training opportunities to help teachers develop their skills in using information communication technology (ICT). These results are supported by the findings of other studies, confirming that the majority of teachers still need more help to use computers for educational purposes (Egbert et al., 2002). Fortunately, because of the increasing importance of technology in modern society, the Ministry of Education in Saudi Arabia has begun to focus on teaching computer skills at all levels of education. Accordingly, teachers are also stressed the need to make efforts for becoming more experienced in the use of computers for professional development.

This study's results reveal that gender is correlated with teachers' aptitude in using computers for professional development (at a level of $p< 0.01$ significance). The independent sample's t-test indicated that the overall mean score for male teachers was 23.15, whereas the overall mean score for female teachers was 19.79. This reveals that male teachers, in general, have more advanced computer skills than female teachers.

Although Altowaijri (2004) and Yung (2005) found no significant differences between male and female teachers' capability in using computers and the internet, several other studies have supported a relationship between gender and computer competency. For example, Cowan's study (2006) found significant differences between men and women regarding their ICT competence. This result was also confirmed by Tondeur et al.,2016).

In the context of Saudi Arabia, these results are not surprising, as educational backgrounds and opportunities vary between males and females in this region. For example, computer education was first taught in boys' secondary schools in Saudi Arabia in 2003, and then in boys' intermediate and elementary schools in 2004. It did not start in girls' secondary schools until 2006 when the Ministry of Education started requiring computer education in all schools. The results of the study are more generally related to Sipilä (2014), Howard (2013), and Underwood and Dillon (2011), which demonstrates that demographic characteristics affect ICT use and integration in pedagogical teaching. These findings also complement the digital competence framework of Ferrari (2012). The results suggest that policymakers across different higher education institutes should induce efforts for preservice as well as teaching assistants' ICT competence development. Also, more courses can be used for developing teachers along with the curriculum for the training faculties.

This study has several possible limitations; for example, the teachers who participated in the study were chosen randomly from a sample of various schools in one region (the Asir region) of Saudi Arabia. Although this was in an endeavor to make the sample representative, some unrepresented cities in Saudi Arabia have special religious or economic characteristics; hence, generalizing this study would need to be evaluated carefully. Similarly, different results might be found if a future study was conducted with a sample of teachers other than those teaching in Saudi Arabia and/or other countries. Also, this study was dependent on teachers' assessments to identify their competence level in using computers and the internet for CPD purposes; however, choosing different tools or measures for evaluation (such as computer tests) may lead to different results.

The study suggests that the use of technology in education can vastly improve certain focus areas

for teachers, concerning students, such as their psychological development, learning preferences, and feedback. Also, with the exponential growth of technological media and ease of information flow, new horizons are opening, such as a teacher being able to create a group on messaging platforms with their students and motivating them to ask questions even outside of classroom hours. Besides, message groups that include parents can enable instant feedback on students' overall growth and day-to-day progress.

Conclusion

The study findings conclude that the usage of computers for professional development among teachers is more at the beginner level, which gradually declines over time. The study states that they lack experience in more complex skills such as web design and learning and management systems, which hinders their effort for utilizing them for professional development. This is shown by a correlation between teachers' computer and internet competencies and gender, which indicates that female teachers have a lower level of competence in general computer use in contrast to male teachers. The study also concludes that male teachers have a beginner-level aptitude for using computers for professional development purposes, with most having no experience with learning and management systems such as Blackboard and WebCT, as well as no web designing experience. Despite it, they possess the necessary competence for general computer usages such as email and web-based searching. Similar results were indicated for the majority of the female teachers' professional development at a beginner level related to their competency to conduct general computing tasks. However, it was observed that they generally lack experience in file management and computer-related storage devices, web design, and learning and management systems.

As noted, online CPD can meet the needs of teachers that cannot easily be met otherwise. Based on it, the study suggests that successful CPD must be continuous, content-focused, and lead to positive, identifiable changes in teachers' practices in ways that ultimately expand student learning opportunities. The first step in achieving

this is to explore teachers' competencies in using the internet for CPD. To uncover any barriers that might affect teacher use of online platforms for educational purposes, previous studies were investigated. From this view, no studies were found to have examined specific thoughts, perceptions, beliefs, experiences, or knowledge about the usage of technologies in classrooms related to gender differences among teachers and their competencies in using computers and the internet for CPD. The results further provide a clear image of the level of teachers' experience and skills in computer use, which has been lacking. This study confirms that there is a significant difference between the computer use competencies of male and female teachers. Additionally, it advises educational stakeholders to increase their focus on teachers' computer skills, which needs more consideration, particularly in the context of female teachers' skills development for using technology. Also, the study findings can be replicated by other research that is conducted in other regions, given the present study's limitation to the Asir region.

Acknowledgments

Funding

Declaration of Interest

The authors declare no conflict of interest.

Data Availability Statement

The data will be available for review from the corresponding author, on request.

About the authors

PROFESSOR MOHAMMED H. ALBAHIRI: DEPARTMENT OF CURRICULUM & INSTRUCTION,

COLLEGE OF EDUCATION, KING KHALED UNIVERSITY. PROFESSOR MOHAMMED PUBLISHED A LOT OF PAPERS IN ISI, DOAJ, GOOGLE SCHOLAR, EBSCO, AND SCOPUS. ORCID ID: HTTPS://ORCID.ORG/0000-0002- 8050-1053 ABHA, ASIR PROVINCE, SAUDI ARABI

Drs. Ali Albashir Mohammed Alhaj received his first Ph.D./in English literature/ from the University of Khartoum, in 2003, his second Ph.D., in translation / from Omdurman Islamic University, in 2014, and his third Ph.D. in Applied Linguistics / Sudan University of Science and Technology 2018. His 4th Ph.D. in Pure linguistics from Bahri University in 2021. Drs. Ali published a lot of papers in ISI, DOAJ, GOOGLE SCHOLAR, EBSCO, and SCOPUS Journals, and45 books, and 10 books of his books were translated into ten international languages https://orcid.org/0000-0003-4845-176X

References

[1] Aesaert, K., and J. Van Braak. (2015). "Gender and socioeconomic-related differences in performance-based ICT competencies." *Computers and Education* 84: 8-25. https://doi.org/10.1016/j.compedu.2014.12.017

[2] Ageel, M. (2011). "The ICT proficiencies of university teachers in Saudi Arabia: A case study to identify challenges and encouragements." *Online Submission.*

[3] Al-Asmari, A. (2005). "The use of the Internet among EFL teachers at the Colleges of Technology in Saudi Arabia." *Columbus, OH: The Ohio State University.*

[4] Alenezi, A. (2015). "Influences of the mandated presence of ICT in Saudi Arabia secondary schools." *International Journal of Information and Education Technology* 5 (8): 638.

[5] Almadhour, B. (2010). "The Integration of Information and Communication Technology into Secondary Technology Teachers' Pedagogy in New Zealand". *Unpublished Master's Thesis, Auckland University of Technology, New Zealand.*

[6] Aloyaid, A. (2009). "Education policy in Saudi Arabia and its relation to secondary school teachers' ICT use, perceptions, and views of the future of ICT in education." *University of Exter: Exter, UK.*

[7] Al-Rashidi, O., and H. Phan. (2015). "Education context and English teaching and learning in the Kingdom of Saudi Arabia: An overview." *English Language Teaching* 8 (5): 33. https://doi.org/10.5539/elt.v8n5p33

[8] Altowaijri, A. (2004). "Reforming higher education in Saudi Arabia: The use of telecommunication technology." *Rochester, NY: Rochester Institute of Technology.*

[9] Al-Zaher, A. (2005). "The training needs of teaching staff in Saudi universities." *Makkah, KSA: Umm Al-Qura Press.*

[10] Alzahrani, M. G. (2017). "The Developments of ICT and the Need for Blended Learning in Saudi Arabia." *Journal of Education and Practice* 8 (9): 79-87.

[11] Anders, A. (2015). "Theories and applications of massive online open courses (MOOCs): The case for hybrid design." *The International Review of Research in Open and Distributed Learning* 16 (6). https://doi.org/10.19173/irrodl.v16i6.2185

[12] Archibald, S., J. G. Coggshall, A. Croft, and L. Goe. (2011). "High-Quality Professional Development for All Teachers: Effectively Allocating Resources. Research and Policy Brief." *National Comprehensive Center for Teacher Quality.*

[13] Asencio, E. N., E. J. Garcia, S. R. Redondo, and B. Thoilliez. (2017). "Fundamentals of educational research and innovation." *UNIR Editorial.*

[14] Barragán, R., E. Ruiz Pinto, and E. Ruiz Pinto. (2013). "Gender gap and digital inclusion. The potential of social media in education." *Teach Curr J Teachnol Train* 17: 310–320.

[15] Baturay, M. H., S. Gökçearslan, and F. Ke. (2017). "The relationship among pre-service teachers' computer competence, attitude towards computer-assisted education, and intention of technology acceptance." *International Journal of Technology Enhanced Learning* 9 (1): 1-13.

[16] Cloete, A. L. (2017). "Technology and education: Challenges and opportunities." *HTS Theological Studies* 73 (4): 1-7.

[17] Cohen David, K., and H. C. Hill. (2000). "Instructional Policy and Classroom Performance: The Mathematics Reform in California." *Teachers College Record* 102 (2): 294–343.

[18] Cowan, P. (2006). "Factors influencing Pre-Service teachers' attitudes towards using a Moodle environment for teaching and learning." *In C. M. Crawford, R. Carlsen, K. McFerrin, J. Price, R. Weber, and D. A. Willis (eds.), Proceedings of Society for Information Technology and Teacher Education International Conference 2006* (pp. 2817–2824). Retrieved from https://www.learntechlib.org/p/22507

[19] De Smet, C. (2015). "Using a learning management system in secondary education: Design and implementation characteristics of learning paths." *Doctoral dissertation, Ghent University*.

[20] Egbert, J., T. M. Paulus, and Y. Nakamichi. (2002). "The Impact of CALL Instruction on Classroom Computer Use: A Foundation for Rethinking Technology in Teacher Education." *Language Learning and Technology* 6 (3): 108.

[21] Espinar Ruiz, E., and M. González Río. (2009). "Young people in virtual social networks: an exploratory analysis of gender differences." *Feminismos* 14: 87-105.

[22] Ferrari, A. (2012). "Digital competence in practice: An analysis of frameworks." *Sevilla: JRC IPTS*. https://doi.org/10.2791/82116.

[23] Garrido, L. A., L. R. Rubio, C. D. G. Valle, and C. Dumitrache. (2019). "Evaluation of the use of ICT in students at the University of Malaga: Gender differences." *Innoeduca* 5: 63–71.

[24] Goldin, C. D., and L. F. Katz. (2009). "The race between education and technology." *Harvard university press.*

[25] Guillén-Gámez, F. D., A. Lugones, M. J. Mayorga-Fernández, and S. Wang. (2019). "ICT use by pre-service foreign languages teachers according to gender, age, and motivation." *Cogent Education* 6 (1): 1574693.

[26] Guillén-Gámez, F. D., M. J. Mayorga-Fernández, and F. J. Álvarez-García. (2018). "A study on the actual use of digital competence in the practicum of education degree." *Technology, Knowledge and Learning* 1-18.

[27] Håkansson Lindqvist, M. (2015). "Conditions for technology enhanced learning and educational change: A case study of a 1: 1 initiative." *Doctoral dissertation, Umeå Universitet.*

[28] Haycock, K. (1998). "Good teaching matters... a lot." *OAH Magazine of History* 13 (1): 61-63.

[29] Howard, S. K. (2013). "Risk-aversion: Understanding teachers' resistance to technology integration." *Technology, Pedagogy and Education* 22 (3): 357-372.

[30] Howard, S. K., and A. Mozejko. (2013). "DER-NSW Evaluation: Conclusions on student and teacher engagement and ICT use." *Sydney: New South Wales Department of Education and Communities.*

[31] Internet world stats, Internet Growth Statistics 1995 to 2018 - the Global Village Online. (2019). Available at https://www.internetworldstats.com/emarketing.htm [Accessed 15 Jan. 2019].

[32] Jiménez, C. A., E. A. Jones, and C. L. Vidal. (2019). "Exploratory Study of Factors that Influence the Decision of Women to Study Engineering in Chile." *Technological information* 30 (4): 209-216.

[33] Kintu, M. J., C. Zhu, and E. Kagambe. (2017). "Blended learning effectiveness: the relationship between student characteristics, design features, and outcomes." *International Journal of Educational Technology in Higher Education* 14 (1): 7.

[34] Kreijns, K., F. Van Acker, M. Vermeulen, and H. Van Buuren. (2013). "What stimulates teachers to integrate ICT in their pedagogical practices? The use of digital learning materials in education." *Computers in human behavior* 29 (1): 217-225.

[35] Krumsvik, R. J., L. O. Jones, M. Øfstegaard, and O. J. Eikeland. (2016). "Upper secondary school teachers' digital competence: Analysed by demographic, personal and professional characteristics." *Nordic Journal of Digital Literacy* 11 (03): 143-164.

[36] Kuznekoff, J. H., S. Munz, and S. Titsworth. (2015). "Mobile phones in the classroom: Examining the effects of texting, Twitter, and

message content on student learning." *Communication Education* 64 (3): 344-365.

[37] Lindberg, J. O., A. D. Olofsson, and G. Fransson. (2016). "Contrasting views: Student and teacher perceptions on ICT in education." *In ICICTE 2016, International Conference on Information and Communication Technologies in Education, Rhodes, Greece, 7-9 July 2016* (pp. 1-10).

[38] López Belmonte, J., S. Pozo Sánchez, A. Fuentes Cabrera, and J. M. Romero Rodríguez. (2020). "Learning effectiveness through flipped learning with augmented reality in school health education."

[39] Montrieux, H., Vanderlinde, R., Schellens, T., & De Marez, L. (2015). Teaching and learning with mobile technology: A qualitative explorative study about the introduction of tablet devices in secondary education. *PloS one*, *10*(12), e0144008

[40] Nut, J. 2010. "Professional educators and the evolving role of ICT in schools: Perspective report." Retrieved Jan 15, (2019), from http://www.ictliteracy.info/rf.pdf/ICTinSchools.pdf.

[41] Player-Koro, C. (2012). "Factors influencing teachers' use of ICT in education." *Education Inquiry* 3 (1): 93-108.

[42] Ramos, C., J. Francisco, A. Vásquez, P. Alejandra, A. Alvarez, C. Ramos, and P. Alejandro. (2019). "Barriers to ICT integration in interdisciplinary articulation from physical education." *Journal of Sport and Health Research* 11 (Suppl 2): 1-12.

[43] Ruiz, M. A. O., E. C. Córdoba, B. V. Salas, and M. S. Wienner.(2016). "The motivation of women for careers in engineering and technology." *Entreciencias: Dialogues in the knowledge society* 4 (9): 89-96.

[44] Sammons, P., A. M. Lindorff, L. Ortega, A. Kington, and A. Hargreaves. (2016). "Inspiring teaching: learning from exemplary practitioners." *Journal of Professional Capital and Community*.

[45] Schultz-Jones, B., D. Smith, M. Farabaugh, and R. Jeffers. (2017). "Distance Learning Instructional Design: Assessing Professional Competence with Miller's Pyramid." *In E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education (pp. 459-466). Association*

for the Advancement of Computing in Education (AACE).

[46] Sipilä, K. (2014). "Educational use of information and communications technology: Teachers' perspective." *Technology, Pedagogy and Education* 23 (2): 225-241.

[47] Smith, K., L. Chapman, J. Pedulla, and L. Meeks. (2009). "Online Professional Development: An Examination of Participants' Workshop Content Preference by Teacher Characteristics." *In I. Gibson, R. Weber, K. McFerrin, R. Carlsen, and D. A. Willis (eds.), Proceedings of Society for Information Technology and Teacher Education International Conference 2009 (pp. 1321–1326). Charleston, SC: Association for the Advancement of Computing in Education (AACE).* Retrieved from https://www.learntechlib.org/p/30793

[48] Strangeways, A. (2017). "From assistant teacher to teacher: Challenges and pathways in situated pre-service teacher education." *Asia-Pacific Journal of Teacher Education* 45 (1): 71-85.

[49] Teo, T., X. Fan, and J. Du. (2015). "Technology acceptance among pre-service teachers: Does gender matter?" *Australasian Journal of Educational Technology* 31 (3).

[50] Tınmaz, H. (2004). "An assessment of preservice teachers' technology perception about their subject area." *Unpublished master's thesis, METU, Ankara, Turkey.*

[51] Tondeur, J., S. Van de Velde, H. Vermeersch, and M. Van Houtte. (2016). "Gender differences in the ICT profile of university students: A quantitative analysis." *Digest. Journal of Diversity and Gender Studies* 3 (1): 57-77.

[52] Underwood, J., and G. Dillon. (2011). "Chasing dreams and recognizing realities: Teachers' responses to ICT." *Technology, Pedagogy and Education* 20 (3): 317-330.

[53] Völkel, S. T., W. Wilkowska, and M. Ziefle. (2018). "Gender-specific motivation and expectations toward computer science." In *Proceedings of the 4th Conference on Gender and IT* (pp. 123-134).

[54] Vrasidas, C. (2015). "The rhetoric of reform and teachers' use of ICT." *British Journal of Educational Technology* 46 (2): 370-380.

[55] Ward, L., and J. M. Parr. (2010). "Revisiting and reframing use: Implications for the integration of ICT." *Computers and Education* 54 (1): 113-122.

[56] Wastiau, P., R. Blamire, C. Kearney, V. Quittre, E. Van de Gaer, and C. Monsieur. (2013). "The Use of ICT in Education: a survey of schools in Europe." *European Journal of Education* 48 (1): 11-27.

[57] Wei, L. M., C. Y. Piaw, and S. Kannan. (2017). "Relationship between principal technology leadership practices and teacher ICT competency." *MOJEM: Malaysian Online Journal of Educational Management* 4 (3): 13-36.

[58] Wei, L. M., C. Y. Piaw, S. Kannan, and S. A. Mold. (2016). "Relationship between Teacher ICT Competency and Teacher Acceptance and Use of School Management System (SMS)." *Malaysian Online Journal of Educational Technology* 4 (4): 36-52.

[59] Yung, H. I. (2005). "Factors affecting middle school science teacher's use of distance learning for in-service training as professional development in Taiwan." *In P. Kommers and G. Richards (eds.), Proceedings of EdMedia + Innovate Learning 2005 (pp. 2748–2753). Montreal, Canada: Association for the Advancement of Computing in Education (AACE).*

Appendixes

Table 1. Technology experience scale

Level	Value	Definition
I have no experience	1	You have no experience using a computer
Beginner	2	You know the basic skills only
Intermediate	3	You can do a lot of tasks on a computer, but you still need some help
Expert	4	You can do everything that you need to do by computer without any help

Table 2. demographic details

Variable		Frequency	Percentage
Gender			
	Male	401	52.2
	Female	367	47.7
Age			
	20 to 30 years	398	51.8
	30 to 40 years	269	35.02

	40 years or above	101	13.15
Education			
	Diploma	140	18.22
	Graduates	366	47.65
	Masters	262	34.11
Duration			
	Part-Time	170	22.13
	Full Time	598	77.86
Experience			
	2 years to 5 years	532	69.27
	5 years to 10 years	150	19.53
	10 years and more	86	11.19

Table 3. Participants Computer Skills

Computer skills	Frequency and percent							
	No experience		Beginner		Intermediate		Expert	
	M	F	M	F	M	F	M	F
Basic computer literacy	27 (6.7%)	44 (12%)	75 (18.7%)	108 (29.4%)	182 (45.4%)	121 (33%)	117 (29.2%)	94 (25.6%)
Hardware	77 (19.2%)	131 (35.7%)	83 (20.7%)	65 (17.7%)	148 (36.9%)	85 (23.2%)	93 (23.2%)	86 (23.4%)
Operating system	110 (27.4%)	174 (47.4%)	86 (21.4%)	66 (18%)	96 (23.9%)	69 (18.8%)	108 (26.9%)	57 (15.5%)
Word processor	92 (22.9%)	53 (14.4%)	132 (32.9%)	207 (56.4%)	94 (23.4%)	65 (17.7%)	83 (20.7%)	42 (11.4%)
Spread sheets	114 (28.4%)	171 (46.6%)	91 (22.7%)	62 (16.9%)	101 (25.2%)	56 (15.3%)	95 (23.7%)	74 (20.2%)
Demonstration programs	75 (18.7%)	120 (32.7%)	76 (19%)	76 (20.7%)	128 (31.9%)	73 (19.9%)	122 (30.4%)	96 (26.2%)

Databases	255 (63.6%)	265 (72.2%)	84 (20.9%)	57 (15.5%)	44 (11%)	37 (10.1%)	18 (4.5%)	8 (2.2%)
Web page development	249 (62.1%)	281 (76.6%)	88 (21.9%)	37 (10.1%)	42 (10.5%)	35 (9.5%)	22 (5.5%)	12 (3.3%)
Internet	98 (24.4%)	57 (15.5%)	73 (18.2%)	51 (13.9%)	153 (38.2%)	208 (56.7%)	76 (19%)	51 (13.9%)
E-mail	70 (9.11)	63 (8.25)	73 (9.5)	46 (5.98)	169 (21.8%)	218 (28.3%)	89 (11.5)	39 (5.07)

Table 4. Independent Professional Development Purposes T-Test for Difference in Male and Female Teachers' Computer Skills

Gender	N	Mean	Std. deviation	Std. error mean		
Male	401	23.1471	8.39201	0.41908		
Female	367	19.7899	8.31393	0.44002		
	T	df	Sig. (2-tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Equal variances assumed	5.522	756	0.000**	3.35722	2.16368	4.55075
Equal variances not assumed	5.525	747.425	0.000**	3.35722	2.16431	4.55013