Digital Competence and ICT Literacy of School Teachers: In the Context of Schools in Nintavur, Sri Lanka

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Abstract---The goal of this study is to look at the digital competence and ICT literacy of school teachers in Sri Lanka's Nintavur division. Information and Communication Technology (ICT) knowledge is now considered to be a vital skill for teachers at all levels, in addition to their knowledge of their subject. Recently, there has been a lot of attention paid to digital competence and ICT literacy because it is seen as a way to improve society's level of knowledge and, in turn, the country's knowledge index. When teachers evaluate their own digital competence, they need to think outside of the box and look at things as to how they can get information on the internet, use digital devices and apps, share content on the internet with other people, and how well they can manage information using different digital sources. In light of this, this preliminary study looks into what extent school teachers in the Nintavur division are digitally competent and how well they use ICT. This study employed a questionnaire to look at teachers' willingness, readiness, and ability to use ICTs and their current digital competence in teaching and education, as well as how they use these

skills in their work. Results of a statistical analysis show that the teachers who took part in the study have considerable level of digital competence and ICT literacy while few of the participant teachers assessed themselves as less competent in several aspects of digital competence.

Introduction

Digital Competence is a collection of knowledge, abilities, and attitudes necessary for effectively utilising Information and Communication Technologies (ICT) and digital media to accomplish activities and acquire knowledge (Ferrari, 2012). On the other hand, Karsenti et al. (2020) defines the term as "a set of abilities necessary for the confident, critical, and creative use of digital technology to accomplish goals in the fields of study, job, recreation, and social inclusion or participation in the society". There is widespread consensus that in order for graduates to possess the necessary digital competencies and to be prepared as global citizens, these competencies and ideals must be instilled in them beginning in primary school and continuing throughout their education. This is when teachers come into play. Without the involvement of teachers, it is impossible to integrate ICT skills and digital competences into school curriculum. It is therefore critical for teachers to possess these abilities prior to being expected to utilise and teach them in schools. Thus, teachers play a critical role in introducing students to these competencies in preparation for higher education and the future job market (Aguti, 2016).

The majority of digital technology is used to promote industry level competencies and has received far less attention from the education sector (Astuti et al.,2021). Additionally, it has been said that teachers still lack maturity when it comes to mastering digital technology (Astuti et al.,2021). Attitude and competency of a teacher regarding computer technology may play a significant role in the educational use of computers. Individuals who are computer literate will benefit more than those who are not. At the moment, a country's development is mostly focused on knowledge-based economies. In this regard, ICT is critical as it necessitates the development of an ICT-literate workforce and the incorporation of ICT into educational curricula (Fernando & Ekanayake, 2010).

"A person (aged 5-69) is considered computer literate if he/she can use a computer on his/her own," according to the definition (DoCS,2020). For example, if a 5-year-old child can play a computer game, he or she is considered computer literate. Similarly, digital literacy is defined as "A person (aged 5-69) is considered digitally literate if he/she can use a computer, laptop, tablet, or smartphone on his/her own" (DoCS,2020). As such, ICT literacy is the ability to access, manage, integrate, evaluate, and create information using digital technology, communications tools, and/or networks in order to function in a knowledge society (Panel,2002).

The Sri Lankan Ministry of Education has taken several steps to improve the quality of ICT education, including the use of ICT in school administration and the integration of ICT subjects into the school curriculum. As a result, ICT is now a part of the GCE (O/L) and GCE (A/L) school curricula. ICT was introduced into Sri Lankan schools in 1982 (Fernando & Ekanayake, 2010), making Sri Lanka one of the first countries to introduce computer education into the school system. Although there was a slow growth, a significant quantitative improvement emerged later. The government has made a significant effort to improve the quality of ICT education through the use of public funds and loan grants such as General Education Project (GEP) II, Secondary Education Modernization Project (SEMP) I and II (Fernando & Ekanayake, 2010). It was critical to determine whether the return on investment was worthwhile.

It is believed that a decline in IT or ICT literacy among rural people is a critical factor that contributes to a rural society's socioeconomic development. Most people believe that introducing an ICT culture into the Sri Lankan educational system as an initial driving force can close this gap (Fernando & Ekanayake, 2010). According to a statistical report from the Department of Census and Statistics in 2006, computer and digital literacy in the Ampara district was comparatively low (See Figure in Page 3 Satharasinghe,2006). However, according to the DoCS (2020) report, there is a significant literacy rate in the Eastern province in Sri Lanka, where the Ampara district is located. Computer literacy has increased from 14.1 % in 2018 to 17.2 % in 2020, (DoCS, 2020). However, when compared to the growth rate of ICT literacy in other provinces in Sri Lanka, the rate is purely slow (See Table 2 in DoCS, 2020). As a result, it is critical to conduct a comprehensive exploratory study to thoroughly investigate the level of digital competency and ICT literacy of teachers in a provincial or district context. As a result, new bespoke strategies and frameworks can be proposed to apply within the area in order to accelerate the growth rate of ICT literacy and digital competency among both teachers and students. Therefore, this preliminary exploratory study is conducted with school teachers from Nintavur division in Ampara District to gain a basic understanding of their digital competency and ICT literacy.

Research problem

Rapidly evolving technologies, as well as the need for acquisition of those technologies at the school level, necessitate sufficient digital competency in teachers. The primary issue identified for this study is the need to assess the level of digital competency and ICT literacy among Sri Lankan school teachers. In that vein, this preliminary level study narrows the scope to answer the following research question by focusing on answering the following focal question.

Research Question

To what extent are Nintavur division school teachers digitally competent and have adequate ICT skills?

Research Objectives

This study outlines the research objective as follows in order to answer the formulated research question:
To investigate the digital competency and ICT literacy of Nintavur division school teachers.

Literature review

Many research projects exist in the literature that have evaluated ICT skills and their impact on workforce readiness (see Bollier, 2000). Researchers worldwide are increasingly interested in digital competency and ICT literacy. The concept of ICT literacy considerably intersects with the underlying assumptions of digital competency. Digital competence is not just being able to exploit the wealth of new potentials offered by digital technology, but also being able to participate meaningfully in the emerging knowledge society of the twenty-first century. Certain technologies (e.g., computers, interactive boards, apps) can benefit the learning and teaching process by boosting access to educational resources and providing new opportunities for collaboration and problem-solving. In general, digital competence entails understanding, awareness, and attitudes toward ICT ideals, as well as the capacity to work with cutting-edge technologies and digital information (Ferrari & Punie, 2013), where users have the freedom to create, modify, design, and self-actualize.

In recent years, a variety of notions connected to the mastery of technology-related skills, including both digital competence and digital literacy, have been studied in the literature on the subject of adeptness of technology-related skills. It is widely recognised that digital literacy is the primary driving force behind digital competence. A typical definition of literacy is the capacity to read and write text using traditional paper-based literacy and related literate behaviours, as well as the ability to communicate effectively in written form (Belshaw, 2011). However, as a result of new digital technologies, a new form of literacy has emerged, one that requires users to combine knowledge by integrating sound and moving images, oral and written language, as well as 3D objects and, by understanding their specific affordances, uses, and constraints, among other things (Leu, et. al., 2007).

Recent studies in developing framework for digital competency and ICT literacy in teachers

As technology continues to evolve and become more accessible to students and teachers, an increasing number of frameworks, models, and literacies have been developed to guide teachers in their efforts to develop digital capabilities in their students, which will support them in using new and emerging technologies to teach in the future (Falloon,2020). For example, Falloon (2020) presented a conceptual framework that goes beyond the current technical and literacies conceptualizations of Teacher Digital Competence (TDC), advocating for more comprehensive, multidisciplinary, and broader-based understandings that recognise the increasingly complex knowledge and skills that young people require in order to function ethically, safely, and effectively in a variety of

digitally-mediated environments. Similarly, Joshi et al. (2021) created the "DEPSWALIC Digital Competency Framework" for teachers based on the literature and the digital abilities required by teachers to accomplish all of their activities digitally. According to the framework, teachers should have twenty-seven sub-skills organised into six key skills: (1) writing and presentation tools, (2) internet surfing and communication tools, (3) course management and evaluation tools, (4) learning and sharing tools, (5) related applications, and (6) audio and visual document development tools. In addition, the framework proposed that instructors be sensitive to policy and ethical principles while using such resources in professional activities. This framework's new features include LMS abilities, audio and video development tools, subject-related web resources, software, and mobile application skills for creating digital games, creating personal blogs, a digital library, and result analysis skills and resources.

On the other hand, Howard (2021) insisted that multi-directional and dynamic relationships in strategies to implement digital competency in teachers especially pre service teachers training are needed to improve teachers' experiences in developing digital competencies. According to Astuti et al. (2021), the maturity level of digital technology for teachers and students is sequential. It begins with concern, literacy, capacity, creativity, and a critical attitude toward the use of digital technology. Furthermore, Atusti et al. (2021) emphasized the importance of different training and learning innovations related to digital technology mastery abilities that must be developed among school teachers and students. Karsenti et al. (2020) developed a framework that is intended to serve as a basis for the development of digital competency in the workplace and beyond. The framework was comprised of a continuum of 12 dimensions that defined the extent of the development of digital competency for the organisation. Karsenti et al.(2020) contends that as competency levels progress, individuals become more independent in their use of digital technology in a variety of situations, including educational, professional, and ordinary life settings. When doing certain activities, individuals can, for example, choose the most appropriate digital tool for the job.

Similarly, Kuzminska et al. (2018) provided explanations on how to determine the degree of digital competence for teachers and students in Ukraine, based on their research. On the basis of their own self-evaluations, Kuzminska et al. (2018) identified the primary characteristics that represent the degree of preparation of teachers and students for digital education. The findings of the study by Kuzminska et al. (2018) as well as those of Kuzminska et al. (2018), offer future research directions and suggestions for the development of digital competency in educational institutions throughout Ukraine. In that vein, Reddy et al. (2020) examined the digital literacy of Fijian college freshman. Reddy et al. (2020) used a newly constructed Digital Literacy Scale to assess the freshman's digital literacy (DLS). The DLS computed each student's digital literacy score for media, information, technology, computer, visual, and communication literacy, as well as total digital literacy of each of the students. Reddy et al. (2020) found that the freshman were highly digitally literate, and that their overall digital literacy was reliant on their individual scores for each component of digital literacy.

Using document analysis, Jafar et al. (2020) compiled a list of professional competency constructs, which included technical and non-technical skills and

qualities, as well as personal, mental, and physical characteristics, motivation and self-concept. When broken into various connected sub-constructs, Jafar et al. (2020) offered a framework for establishing technical and vocational education and training (TVET) professional competency in the era of Industry 4.0. Jafar et al. (2020) also pointed out that non-technical competency is just as essential as technical competency in the TVET teaching profession, and that it is strengthened by the teacher's personal traits, motivation, and physical condition. To tackle the problem of the quick change in professional competences required for TVET teachers in this digital era, TVET institutions must open lines for technological adaption, lifelong learning, and the development of a future set of capabilities. It is possible for other sorts of instructors in other countries to include and modify the findings from the study of Jafar et al. (2020).

Recent studies related to digital competency and ICT literacy in teachers in Sri Lanka

The above discussed previous studies were based on various country's scenario. There exist a significant number of studies on the topic related to the context in Sri Lanka. The Ministry of Education, Sri Lanka has taken many initiatives to improve the quality of ICT education, including the use of ICT in school administration and the incorporation of ICT courses into the school curriculum. As a result, ICT is now part of the GCE (O/L) and GCE (A/L) school curricula. Hewagamage. C & Hewagamage. K. P (2015) highlighted the current state of ICT Competency in Sri Lankan Universities in terms of both the knowledge and skill needs of knowledge workers in the labour market, as well as the current state of ICT Competency in Sri Lankan Universities. Hewagamage. C & Hewagamage. K. P (2015) pointed out that there exist a number of difficulties that are impeding the progress into great length on the qualitative assessment of these hurdles. Accordingly, a new framework for boosting ICT Competency among a large number of undergraduates in the university system, which consists of two primary components, namely Infrastructure Development and Virtual Learning Environment, has been proposed to address these issues.

At the moment, a country's development is mostly focused on knowledge-based economy. As a result, timely access to and proper application of credible information is critical. In this sense, ICT becomes more critical (Fernando & Ekanayake, 2010). This necessitates the development of an ICT-literate workforce as well as the incorporation of ICT into the educational curriculum. Fernando and Ekanayake (2010) reported the outcomes of a study conducted to better understand the current state of ICT education in Sri Lanka. It presents a suitable methodology to handle these concerns based on the identified limitations and strengths. In that vein, a framework for encouraging digital education for lifelong learning is provided through the Commonwealth Digital Education Leadership Training in Action (C-DELTA) initiative, which trains digital education leaders from across the Country. The Faculty of Education at the Open University of Sri Lanka carried out an action research project to encourage the adoption of C-DELTA among secondary school instructors and students in Sri Lanka, as well as to assess the influence of C-DELTA on the teaching-learning process in secondary schools. Karunanayaka and Weerakoon (2020) did a study with a group of 41 teachers who participated in the intervention and put C-DELTA into practice in

their respective schools. Despite challenges such as inadequate ICT facilities, time constraints, and limitations in English language competencies, according to Karunanayaka and Weerakoon (2020), the adoption of C-DELTA has assisted in improving digital literacy, enacting changes in thinking and digital behaviour among teachers and students, as well as developing teachers' digital education leadership abilities.

Relatedly, Lim et al. (2020) provided an assessment of the potential and existing limitations of leveraging ICT to improve access to excellent education in the Global South. Lim et al. (2020) identified and analysed the important characteristics that enable or hinder the realization of possibilities via a case study of Sri Lanka. With the promising practices and lessons learned, six methods that might assist policymakers and education leaders in Global South nations have been generalised. Lim et al. (2020) thought that by considering these solutions, ICT for access to excellent education will be improved. The extensive usage of e- learning platform by university students is a very good example for proving the digital literacy which they got from their school level education (Gunawardhana,2020; Gunawardana ,2017; Marikar & Jayarathne,2016; Samsudeen & Mohamed,2019, Shafana & Musfira, 2021 a,b).

Materials and Methods

A quantitative research design was approached for this study, which depended entirely on a structured questionnaire for data collection. The total population of school teachers in the Nintavur division of Ampara district, Sri Lanka is 446 (Annual School Census of Sri Lanka Final Report - 2020). Nevertheless, the total number of data collected for the sample is 79. It is justified to be sufficient as per the study of Al Khateeb (2017) where he used a sample 110 for the entire population of teachers in kingdom Saudi Arabia. All the participants were approached in the study to receive as much as higher responses. Each was administered with the study instrument via WhatsApp. Though all the teachers were approached for data collection, 79 responses between May and August 2021 were obtained.

A structured questionnaire was used as a study instrument to collect the information regarding the topic of the study. Questions in the questionnaire were adopted from the questionnaire used by Al Khateeb (2017). In addition, few amendments were made to the questions as per the objectives of the current study. All the quantitative responses obtained were quantitatively analyzed using Excel spreadsheet Descriptive statistics and the One way ANCOVA test were made to further elaborate the findings.

Results and Discussions

As shown in Table 1, the majority of the participants are from the age category of 25 to 35 years, which is 56.96%, followed by 36.70% in the category of 36 to 45 years. Only one category of the participants was over 56 years old. It might be the result of the fact that their generation is quite far away from using technological stuff. This questionnaire was administered online. So, they might be hesitant to fill out the questionnaire, or they might be unaware of the need to do so.

Traditionalists were significantly less positive than those of the three younger generations (Baby Boomers, Generation X, and Millennials) (Nyikes (2017). It is supported by the results from DoCS (2020), the computer literacy of the age group of 50 to 59 is 13.5% and from the 60 to 69 is 6.3% (See Table 6 in DoCS, 2020). Most of the participants were from the discipline of information and communication technology (24.05%), followed by English (13.92%), with a bachelor qualification (57%). More than half the participants teach in secondary schools (60.75%), with the majority having around 15% of teaching experience. There was also a mere balance identified between male (53.16%) and female (46.83%) participants. Surprisingly, 84% of the teachers stated that they have certificates in any information technology course. All of the participants were from government schools.

Table 1
Demographic details of the participants

Question	Choice	Number of Participants	Percentage
Gender	Male	42	53.16%
	Female	37	46.83%
	25 to 35	45	56.96%
Age	36 to 45	29	36.70%
	46 to 55	3	3.79%
	56 to 65	1	1.26%
Level of teaching	Primary	7	8.86%
	Secondary	48	60.75%
	Advanced Level	24	30.37%
	English	11	13.92%
	Tamil/ History/ Literature	5	6.32%
	Information Technology	19	24.05%
Major degree or background	Mathematics	8	10.12%
	Commerce/Economic studies	8	10.12%
	Science and Technology	6	7.59%
	Social science / Social studies	9	11.39%
	Health Science/ Physical Education	2	2.53%
	Other	11	13.92%
Qualification	Diploma	16	20.3%
	Degree	45	57%
	Postgraduate Diploma	17	5.1%
	Postgraduate degree	1	1.26%
Teaching Experience	1 to 5 years	23	29.11%
	6 to 10 years	27	34.17%
	11 to 15 years	25	31.64%
	Above 15 years	4	5.06%
IT related certificates	Yes	66	84%
	No	13	16%

Twenty-eight questions were asked in the questionnaire, including ones about demographic information and digital skills. Respondents were asked to rate their level of digital competency and ICT literacy on a five-point Likert scale with Strongly Agree at the top and Strongly Disagree at the bottom. Many teachers agreed on their level of digital competence and ICT awareness, as well as how ready they were to use more digital oriented applications in the classroom (see Figure 1). However, it is important to note that most of the teachers who took part in the survey said that they agree with their digital competency and ICT literacy.
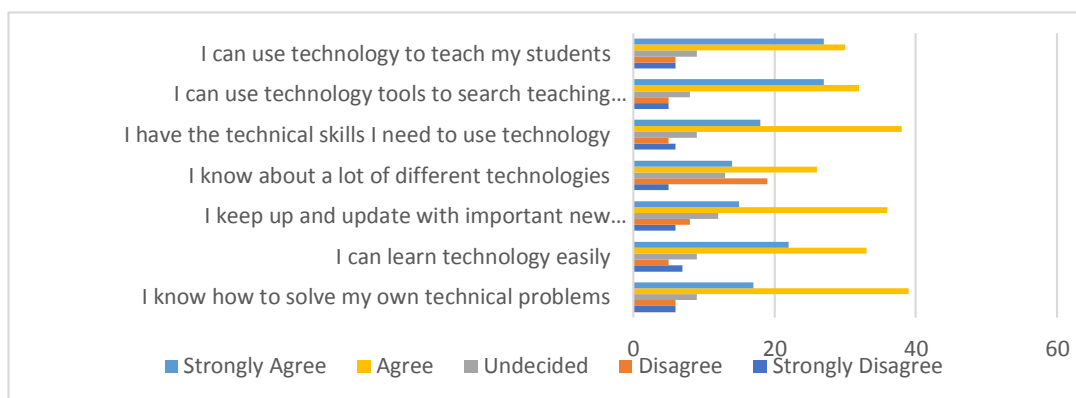

Figure 1. Level of technology knowledge

Similarly, Table 2 illustrates the significance of digital competency and ICT literacy in terms of information processing. A considerable number of participants (41.77%) said that they use search engines to seek for information and 30.38% of participants can use different search engines, while 32.91% of participants can use advanced search strategies to find reliable information on the internet. It is a good indicator of the growing level of digital competency among school teachers. Overall results indicate that around one third of the participants are good at information processing over the internet and the literacy level for verifying the credibility of information is also significant, as per Table 2.

Table 2
Level of Information Processing

Category of Information Processing	Frequency
I can look for information online using a search engine	41.77%
I can use different search engines to find information	30.38%
I can use advanced search strategies to find reliable information on the internet	32.91%
I know not all online information is reliable	26.58%
I use some filters when searching to compare and assess the reliability of the information I find	48.10%
I can assess the validity and credibility of information using a range of criteria	25.32%
I can save or store files or content and retrieve them once saved or stored	40.51%
I classify the information in a methodical way using folders. I	29.11%

backups of information or files I have stored	
I can save information found on the internet in different formats. I	
can use cloud information services storage	29.11%

The literacy of information technology usually starts with operating a computer and the ability of the basic skills in word processing for document creation. In the digital age, almost all jobs require people to be able to write documents, make presentations, and do calculations on a computer. It is usually measured through the skills in Microsoft word, Microsoft Excel and Microsoft PowerPoint. Figure 2 shows that the skills in MS Word, Excel, and PowerPoint were considerably noticed among the participants. More than half of the participants (54.43%) have the advanced skill in MS word and only a least amount of participant (1.26%) has low skills in MS word. Similarly, 58.22% of the participants said that they have average skills in MS Excel and 48.10% of the participants have the average skills in MS PowerPoint.
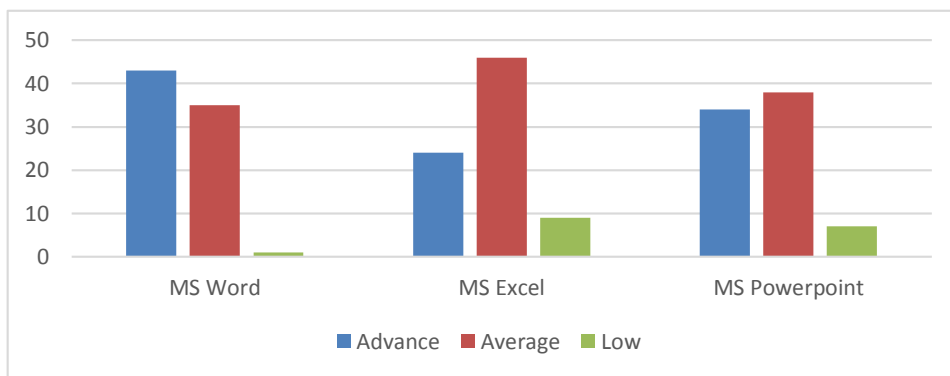

Figure 2. Level of knowledge in Microsoft office

Additionally, participants were asked to identify the communication medium used by the teachers to communicate with their students during pandemic time. The majority of the participants used WhatsApp (82.1%) followed by Zoom (48.7%). It is noted that only ten participants (12.8%) used e-mail for communication. It might be supported by the fact that that the percentage distribution of e-mail is considerably low than the use of internet among the household population in Sri Lanka (See Figure 3 in DoCS, 2020).
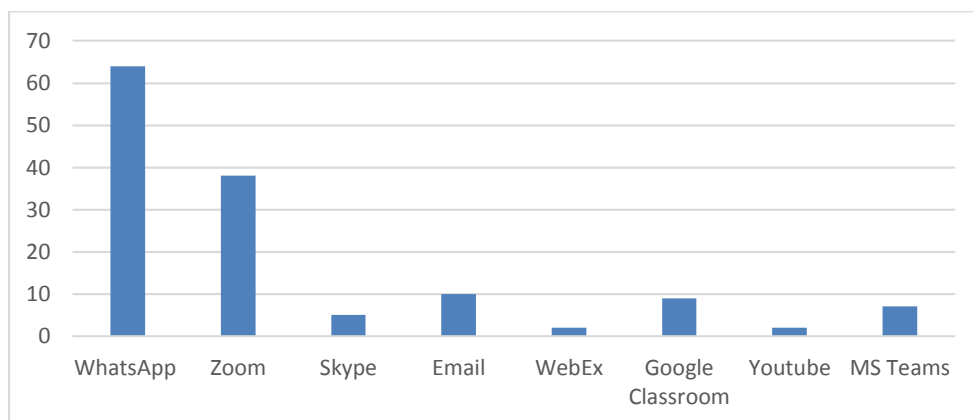
Figure 3. Communication mediums (Digital Applications) used to perform teaching

Accordingly, it is not wonder that the email usage among teachers is considerably low. Other communication applications such as WebEx, Google Classroom, YouTube, and MS Teams were used to the least by the participants. It might be the result that WhatsApp is the most commonly used and widely used communication platform by the majority of the people in Sri Lanka. Other communication platforms are considerably more advanced and cannot be used by all kinds of people when compared to WhatsApp. With 32 million mobile connections in Sri Lanka, WhatsApp has become the most preferred messaging app for the majority of Sri Lankans (Katuwawala, 2021) for its convenience and to avoid the hassle of checking most Sri Lankans are using WhatsApp.

Reading technology-related articles is a helpful way to get updated in technology. More than half of the participants (62%) are interested in reading technology-related articles, and only 15% of the participants were not interested in tech articles. It is a good sign that the majority of the teachers having interested on updating themselves with tech knowledge.
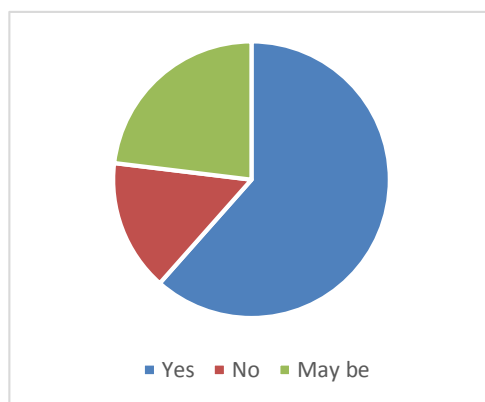

Figure 4. Interest on reading technology related articles

As a summary a One-way ANCOVA was conducted to determine a statistically significant difference between the basic qualification, experience in teaching and

attending an IT-related short courses on ICT Literacy of teachers controlling for gender and age group (Table 3). There is a highly statistically significant effect of the basic qualification (M = 2.227, SD = 1.021) on the ICT literacy of teachers after controlling their gender and age-group, $F(1,70)$ = 8.552, p = 0.005, η^2 = 0.109. On the other hand One-way ANCOVA conducted to determine the statistically significant difference between the experience (M = 2.147, SD = 0.896) on ICT literacy found that there is a significant effect of the experience on the ICT literacy of teachers after controlling their gender and age-group, $F(1,70)$ = 4.830, p < 0.005, η^2 = 0.065. The ANCOVA analysis failed to find a statistically significant effect of IT courses (M = 0.827, SD = 0.381) on the ICT literacy controlling the gender and age-group of teachers, $F(1,70)$ = 1.803, p = $n.s.$, η^2 = 0.025.

Table 3
ANCOVA - ICT Literacy

Cases	$M(SD)$	Sum of Squares	df	Mean Square	F	p	η^2_p
Qualification	2.227(1.021)	8.548	1	8.548	8.552	**0.005****	0.109
Experience	2.147(0.896)	4.829	1	4.829	4.830	**0.031***	0.065
IT Courses	0.827(0.381)	1.802	1	1.802	1.803	0.184	0.025
Residuals		69.973	70	1.000			

Note. Type III Sum of Squares, ** $p < 0.005$; * $p < 0.05$

Conclusion

The aim of this preliminary study is to examine teachers' abilities and skills related to information technology. The preliminary study is chosen to gain a basic understanding of the competence and ICT-related skills, as school digitization cannot be implemented without the participation of teachers. Mastering the ICT skills and professional knowledge related to digital competence and ICT literacy has become necessary for teachers, in particular, in order that they can be integrated into curricula and employed during classes. The outcomes of this study revealed that a significant number of teachers are adequately digitally competent according to the level and standards required to enable them to be good digital teachers in the digital era. Digital competence is associated with three knowledge areas that must be integrated: technology proficiency, pedagogical compatibility, and social awareness (Zhao et al., 2002). Instefjord and Munthe (2016) confirm that teachers' digital competence is based on the knowledge areas suggested by Zhao et al. (2002). In light of that, technological proficiency depends on teachers' technical competence and confidence in terms of employing and utilizing technology. In addition, pedagogical compatibility relates to teachers' understanding of how technology can help in practise in the classroom and contribute to achieving the curriculum's goals. Finally, social awareness refers to teachers' ability to deal with various social aspects of the school or class culture (Instefjord & Munthe, 2016). In accordance with this, this preliminary study focused on analyzing the digital competency and ICT literacy through the lens of technological proficiency only. This study proves that the participant teachers have a expressive level of digital competency and ICT literacy. Furthermore, it was noticed that there is a deficiency in the precise way of information processing on

the Internet as the frequency count for the ability to do information processing in a proper way is less than 50%. Information processing skills on the internet can only be achieved through the continuous use of the internet for information processing and can be achieved through experience.

The findings show that despite the fact that the majority of the teachers had certificates in information technology or information and communication technology, they assessed themselves as less competent in several aspects of digital competence (Table 2). In contrast, participant teachers are confident in their level of knowledge in terms of using technology (see Figure 1). Nevertheless, this does not necessarily mean that the teachers with more or less years of teaching experience are uniquely different in terms of the digital competency and ICT literacy.

Limitations and future work

Being an introductory level study, its own a significant limitation that demands extensive future work. Firstly, the sample size is considerably small compared to the entire population of teachers in the Ampara district. Thus, getting the coverage of more participants from more divisions in the Ampara district would give more extensive and interesting results than this. Similarly, according to Zhao et al. (2002), digital competency is associated with technology proficiency, pedagogical compatibility, and social awareness. However, this study focused on technological proficiency only. Conducting a detailed analysis covering all the three areas for measuring digital competency among teachers would give precise results. In addition to a quantitative study, a phenomenological way of qualitative research would give the results for knowing the reasons and the real experience of attaining the level of digital competency and ICT literacy among the school teachers.

Acknowledgments

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