Evaluation of digital competence level among educators in UAE Higher Education Institutions using Digital Competence of Educators (DigComEdu) framework

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Abstract
Digital competence has become an important issue in academia owing to the advent of various communication tools. This study used a standardized questionnaire based on the Digital Competence of Educators (DigCompEdu) framework, which is a validated comprehensive framework, and its associated assessment tool. This tool was designed to assess professional skills of faculties in higher education institutes in United Arab Emirates (UAE) in terms of their abilities to use information and communication technology (ICT) and current digital competences in their teaching and educational practices. We conducted an online survey to help participants reflect on their strengths and weaknesses while using digital technologies in education to find correlation between them, thus helping teachers determine their relative strengths and identify areas that need more attention.

Keywords Digital competences · E-learning · Digital technologies · Higher education · DigComEdu Framework

Abbreviations
DC Digital competence
UNESCO United Nations Educational, Scientific and Cultural Organization
DigCompEdu European Digital Competence Framework for Educators

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1 Introduction

Technologies have become part of our daily lives. It is predicted that most future jobs will require digital skills (Cabero-Almenara et al., 2020) and many international institutes predict that in the next 20 years, almost half of the work globally will be automated (Yelubay et al., 2020). For example, acquiring information nowadays, and analyzing it to build knowledge would be difficult without digital technology (Banerjee, 2021). Information and communication technologies (ICTs) have transformed the literacy practice (Cabero-Almenara et al., 2020). Due to the COVID-19 pandemic, most educational institutions have shifted to online platforms and the use of technology has intensified and become a compelling aspect of future education (Bakator & Radosav, 2020). The transition to the competency-based approach in higher education also required the development of digital literacy of educators in higher education institutions (Trubavina et al., 2021).

The arrival of ICT into the educational landscape has led to the development of teachers’ digital literacy, which is one of the pedagogical challenges that must be addressed (Garzón Artacho et al., 2020). Since the digital transformation of education and learning, educators (a broader term referring to a person who teaches students in formal education) face new challenges in using and adapting to new technologies to meet new demands, and require an increasingly broad and sophisticated range of skills than before (Redecker, 2017). The transition from physical to virtual teaching is fraught with challenges, as new technologies need to be used to communicate, deliver lectures, and prepare for exams in a secure way. Educational institutions are currently facing the challenge of finding new ways to conduct their educational work (Cabero-Almenara et al., 2020). To deliver online education, teachers need to learn to use new software and online platforms, convert course materials into electronic versions and adjust the pace of teaching (Feng et al., 2020).

A chaotic and uncertain scenario, to which no one can provide realistic answers, offers academic tested solutions in a new, changing environment to uncover the great upcoming dilemma of digital transformation in education (Fenández, 2020). Communication between teachers and students is more important than ever in the COVID-19 era. Some educators have started to improve communication between instructors and students, focusing particularly on how to improve two-way communication (Martin, 2020).

Researchers emphasize that the Generation X factor has an impact on adoption and use of technology. Traditional teachers—who were exposed to technology at a later stage in their lives—differ from modern teachers who are more familiar with digital educational resources as they use different types of teaching resources such as electronic textbooks, Internet technologies, testing programs, and delivery of lessons (Yelubay et al., 2020). Even among users of the same age, the level of knowledge varies widely (Nyikes, 2017). Moreover, there is a lack of digital culture that leads to ignorance of digital technologies, creating big knowledge gaps of these technologies in the education system (Fenández, 2020). Thus, the problem of preparing teachers better to use digital technologies effectively and productively in school is an ongoing issue (Falloon, 2020).
Since the end of the 20th century, digital literacy has become increasingly important in society (Nyikes, 2017). Educators are required to remain digitally literate. Searching, gathering, and critically processing information, as well as the ability to design tools and use a variety of web-based services, are important (Yelubay et al., 2020). In addition, basic information technology skills are necessary owing to the proliferation of digital devices and availability of the Internet (Nyikes, 2017).

The evolving nature of technologies requires educators to constantly develop their skills and digital competences to respond to rapidly changing educational environments (Falloon, 2020). One of the most important questions to be formulated and empirically investigated concerns teacher preparation: how can teachers prepare themselves to teach new content and integrate computer and digital literacy in different subjects into their daily teaching practice? (Nordén et al., 2017).

A review of existing literature on online learning in United Arab Emirates (UAE) revealed that there are several studies investigating the adoption and use of technologies by students and educators in educational institutions. Salloum et al. (2019) used an online questionnaire survey to investigate the factors affecting university students’ acceptance of e-learning systems since it would be more useful to provide better services. Abulibdeh and Syed Hassan (2011) used a model of student interactions, information technology self-efficacy, and student performance in an e-learning environment to determine the relationships between these factors. With regards to personality understanding of students and their IT learning, Al-Qirim et al. (2018) investigated personality characteristics of computer science students at the United Arab Emirates University (UAEU) and the way these traits influence their IT learning.

Most studies on the topic of e-learning in institutions in UAE are attitudinal and seek to explore the perception of lecturers and students towards the adoption of online learning and identify challenges faced by participants (Hussein et al., 2020). To fill the gap of limited studies on abilities of faculty members, this exploratory study investigates the level of digital competencies among educators in higher education institutions in UAE. Other regions such as Germany (Ghomi & Redecker, 2019), Spain (Cabero-Almenara et al., 2020), Morocco (Benali et al., 2018) and the Kingdom of Saudi Arabia (Al Khateeb, 2017) have studied teachers’ digital literacy levels; still, this has not happened in UAE. Understanding this level of competency is important as it helps to identify the level of digital competencies of educators and specify digital competencies that should be taught and are needed to effectively address the challenges of using digital technologies in teaching and learning processes. Furthermore, the continuous measurement of digital competences can help educators define their training needs for continuous professional development. Our research focuses on answering the following two research questions: (1) to what extent is the level of digital competencies of educators in UAE?, and (2) what is the relation among digital competences and other demographic information?

The rest of this paper is structured as follows. First, we discuss education in the online era, and specifically education in the COVID-19 period; then, we review theoretical perspectives of digital competences, followed by implementation of digital competence frameworks in education (globally). In Subsection 2.4, we introduce the Digital Competence of Educators (DigCompEdu) framework, and justify the reason
behind choosing it among others. This is followed by the methodology and data collection from a survey of educators in higher educations in UAE in Section 3. After analyzing our research findings in Section 4, we conclude with the research results and contributions in Sections 5 and 6.

2 Literature review

2.1 Towards online education using digital technologies

With the spread of Spanish flu in 1918, most schools and universities in Europe and USA closed their doors and studies were interrupted for several weeks. After more than a century since that pandemic claimed 10 million lives, the world is now witnessing the COVID-19 outbreak in the early 2020s, affecting all aspects of life including the education sector, as most schools and universities around the world have closed; however, studies have not been suspended. According to United Nations Educational, Scientific and Cultural Organization (UNESCO), the pandemic has caused the largest disruption to education systems in recent history. School closures affected 1.6 billion learners (94% of the global student population) in over 190 countries. Thankfully, the digital technology revolution has enabled distance learning. COVID-19 changed the landscape of teaching and learning in higher education, and forced educators to teach online. With the advancement of modern ICT, educators face challenges and they are under increasing pressure when it comes to a broader view of digital learning, which may include blended learning, e-textbooks, and virtual classrooms (Bakator & Radosav, 2020).

During the last decade, an increase in the number of new technologies in education that improve teaching and learning processes has occurred (Guillén-Gámez & Mayorga-Fernández, 2020). Teachers’ attitude and perception towards technologies are crucial factors for appropriate integration of digital technologies in the teaching and learning process (Guillén-Gámez & Mayorga-Fernández, 2020).

Considering the evolving nature of technologies that can be used in education, it is a major challenge for educators who need to develop their digital skills required in teaching and support their students in using digital resources more effectively (Falloon, 2020). Digital literacy is one of the key skills required of teachers in today’s information society (Caena & Redecker, 2019; Käck et al., 2019). Recent studies have suggested abandoning the current focus on digital literacy in favor of a broader model that recognizes more diverse knowledge, skills, and dispositions required of future teachers (Falloon, 2020). As educators face rapidly changing demands, they need an increasingly broad and sophisticated range of competencies than before. Digital literacy knowledge and skills are becoming a critical factor in successfully performing a wide range of professional tasks, from communication to interaction with other partners (Kotlyarova et al., 2019). To do so, they need to be up to date with technologies needed to communicate, collaborate and design lessons, and help students become digitally literate as well. Thus, assessing educators’ digital proficiency is important to support digital competence in a professional way.
2.2 Overview of digital competence

Digital competence (DC) is one of European Union’s eight key competences for lifelong learning (Yelubay et al., 2020). Tretinjak and Andelić (2016) concluded that there are five digital competence areas, including information, communication, security, problem solving, and content creation; all teachers should become familiar with them in order to make learning and teaching effective.

Digital literacy is broadly defined by Redecker (2017) as “the confident, critical, and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion, and/or participation in society.” In particular, Falloon (2020) mentioned that DC encompasses more than just knowing how to use devices and applications, but it is also the knowledge and attitudes related to legal, ethical, and digital security aspects. A systematic literature review was conducted by Spante et al. (2018) to discuss how the DC concept is used in higher education research. In this review, the following three definitions of DC were used:

1. The teacher’s ability to use ICT in a professional context with good pedagogical-didactic judgment and his/her awareness of its impact on learning strategies and digital literacy of students.
2. The ability to explore and manage new technological situations flexibly, analyze, select, and critically evaluate data and information, use technological potentials to present and solve problems and build shared and collaborative knowledge, fostering awareness of one’s own personal responsibility and respect for each other’s rights/obligations.
3. Values, beliefs, knowledge, skills, and attitudes to use technology appropriately, including the computer, various programs, and Internet that provide the means to research, access, organize, and use information to generate knowledge.

After combining the above definitions of DC, we can conclude that it represents a set of skills and abilities that enable educators to evaluate and use current technologies, data, and information in teaching, learning, and collaborating with others, as well as explore new information technologies when necessary, taking into account obligations, privacy, and security issues.

2.3 Implementation of DC frameworks in education

Similar studies have been conducted worldwide using different frameworks to measure the level of DC among educators, students, and individuals. Table 1 presents a summary of these studies.

2.4 Overview of DC frameworks

There are various competency frameworks, assessment tools, and models from different national and international contexts that have similar and
| Country              | Author(s)                                                                 | Frameworks used                              | Research methodology                                                                 | Finding(s)                                                                                     |
|---------------------|---------------------------------------------------------------------------|----------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Portugal            | Sara Dias-Trindade, José António Moreira, António Gomes Ferreira          | DigComEdu & self-assessment tool            | - Quantitative method<br>- Participants: faculty members of Portuguese University   | The level of DC among faculty members in the study should be improved                         |
| Ukraine             | Olena Kuzminska, Mariia Mazorchuk, Nataliia Morze, Vitaliy Pavlenko, and Aleksander Prokhorov | Digital Competence of Citizens (DIGCOMP) & self-assessment tool | - Quantitative method<br>- Participants: Teachers and students of Ukrainian higher educational institutions | Both educators and students have an above average level of DC. However, students are more digitally competent compared to educators |
| Kingdom of Saudi Arabia | Ahmed Abdulteeef M. Al Khateeb                                             | DIGCOMP                                      | - Quantitative method<br>- Participants: English teachers in schools                | The participants are less digitally competent (as expected)                                    |
| Morocco             | Mourad Benali, Mehdi Kaddouri, Toufik Azzimani                             | DigComEdu & self-assessment tool            | - Quantitative and descriptive methods<br>- Participants: Moroccan English teachers | The level of DC among participants is moderate and there is a strong relationship between DC and years of teaching experience |
unique characteristics used to define and specify the competencies that educators need to successfully cope with the challenges of learning and teaching with digital technology (Tiede & Grafe, 2020). Among them, there are the framework of technology, pedagogy, and content knowledge (TPACK), European Digital Competence Framework for Citizens (DigComp 2.1) (Käck et al., 2019), European Digital Competence Framework for Educators (DigCompEdu), International Society for Technology in Education (ISTE) Standards for Educators, UNESCO Framework of ICT Competence for Teachers, Spanish Common Framework of Digital Teacher Competence, British Framework for Digital Education (Cabero-Almenara et al., 2020), European e-Competence Framework for ICT Professionals, ICT Literacy Competencies, and Global Media and Information Literacy Assessment Framework (Kuzminska et al., 2018).

From the aforementioned frameworks, we will adopt DigCompEdu. This framework is considered as a comprehensive framework that shares characteristics with other frameworks used internationally (Cabero-Almenara et al., 2020) and it is generic enough to be applied to different educational settings (Caena & Redecker, 2019). Especially, it can be relevant to countries outside the EU (Nordén et al., 2017; Al Khateeb, 2017). At the end of 2017, the Joint Research Centre (JRC) published the European DigCompEdu to describe 22 digital competences specific to educators (Ghomi & Redecker, 2019). The main purpose of this framework is to help educators assess their DC, and identify their training needs, by proposing 22 elementary competences organized in six areas, as shown in Fig. 1 (Redecker, 2017). Finally, it can support guidance for the continuous professional development of educators (Caena & Redecker, 2019).

![Fig. 1 Six areas of DigCompEdu (Redecker, 2017)](image-url)
3 Methodology

First, this study followed a quantitative methodology using a questionnaire as a research tool to collect information about digital competences among faculties in UAE. Based on our reviews and by comparing different DC frameworks, we used the DigCompEdu and its associated assessment tool (https://ec.europa.eu/eusurvey/runner/DigCompEdu-S-EN) as the research basis to construct our survey. It contains seven sections, and six of them are the main areas of DC to be sent to faculties in the UAE to reflect on the extent to which they use technology in teaching, communication, and learning processes.

3.1 Research questionnaire

The questionnaire was designed and distributed using Google Forms as a web-based survey tool. In addition to sending the survey invitation by email, we used LinkedIn to obtain more responses. The questionnaire contained 30 questions divided into seven sections. The first section dealt with demographic profile (gender, age, work experience, etc.) and Sections 2, 3, 4, 5, 6 and 7 represent the six main areas of digital competences, namely professional engagement, digital resources, teaching and learning, assessment, learner empowerment, and learner facilitation. Under each of these areas, there are 22 questions representing the sub-digital competencies (22 competencies). Google Forms is used as the web authoring tool to create, design, publish, and disseminate the survey. The spreadsheet application and Google Colab were used to code, analyze, and present the data collected from respondents in a form that gives a clear idea of the relationship between competences.

3.2 Data collection and coding

The survey link was sent via email and LinkedIn to approximately 2500 respondents working in higher education institutions in UAE. The survey was sent to faculties from 19 different universities including UAE University, Zayed University, Khalifa University, University of Sharjah, Abu Dhabi University, and Ajman University, with a focus on universities offering science, IT, or engineering courses. A reminder message was sent to surveyed candidates one month after the survey was sent, and we received 51 responses from participants (Fig. 2).

Figures 3, 4 and 5 show the statistics on position, years of experience, and age of the 51 respondents, respectively. From the total number of participants, the responses were from varying academic rank professors (11.5%), associate professors (25%), assistant professors (44.2%), and lecturers (19.2%). The majority (34.6% + 32.7%) was between 30 and 49 years old. Regarding the years of teaching experience, 28.8% have more than 20 years, 19.2% of them between 6–9 and 10–14 years, 17.3% of them have 4–5 years of experience, 11.5% between 1–3 years, and 4% preferred not to give any information.
In the UAE Higher Education Faculties’ DC questionnaire, there are five response options for each of the questions listed under the six competency areas (Sections 2, 3, 4, 5, 6 and 7), which reflect the level of the faculties’ DC. The
response options for each question are worded in such a way that participants can select only one option that reflects the extent to which they interact with and use technology in different perspectives of teaching. An example is provided below.

“Question: I use digital technologies to work together with colleagues inside and outside my educational organization.

A. I rarely have the opportunity to collaborate with other teachers.
B. Sometimes, I exchange materials with colleagues, e.g., via e-mail.
C. Among colleagues, we work together in collaborative environments or use shared drives.
D. I exchange ideas and materials with teachers outside my organization, e.g., in an online teacher network.
E. I jointly create materials with other teachers in an online network.”

Participants had to choose one of five options to answer these 22 questions, with option A indicating that there is very little interaction with technology, and option E indicating that each of the digital skills plays an important role. To be more specific, the response options for the four questions listed under the professional engagement competency (Section 2) are ordered by the increasing level of engagement with digital technologies. For the three questions listed under Section 3 (digital resources), the response options are ordered by the level of engagement with digital resources. For the questions on teaching and learning (Section 4), the response options are ordered by the level of engagement with digital technologies in teaching and learning. For assessment literacy, the response options are ordered by the level of engagement with digital assessments. For learner empowerment, the answer choices are ordered by the degree of focus on individual student learning needs; for learner facilitation, the answer choices are ordered by the degree of engagement in promoting student digital literacy. Thus, we have used the same number scale of 1–5 as a code, with the number 1 representing option A and number 5 representing option E.
4 Data analysis

4.1 Results based on six competences of DigComEdu

To answer the first question of this study (i.e., “To what extent is the level of digital competencies of educators in UAE?”), we analyzed the responses of each question listed under the six main digital competences as follows.

4.1.1 Professional engagement

In the four questions representing the digital sub-competences listed under the competence "Professional engagement,” the answer options are ordered according to the increasing degree of engagement with digital technologies. The majority (i.e., 41.18% of respondents) indicated that they use different technologies, such as email and blog, to communicate with others, and systematically select, adapt, and combine different digital solutions to communicate effectively (question 11). As seen in Fig. 6, most of the respondents also chose option 3, 4, or 5 to indicate that they use digital technologies to collaborate with colleagues inside and outside their educational organization (question 12) and actively develop their digital teaching skills. More than half of the participants (25.49% + 25.49%) take part in online training.

4.1.2 Digital resources

For the three questions listed under digital resources, the response options are ordered according to the increasing level of engagement with digital resources. As shown in Fig. 7, 35.29% of respondents use different websites and search strategies to find and select a range of different digital resources by comparing them against a set of relevant criteria (question 15). 64.71% of respondents create their own digital resources and modify existing ones to suit their needs. Respondents differ significantly when answering question 17 on whether they effectively protect sensitive content (e.g., exams, students’ grades, and personal data). 27.45% said that they do not have to do so because the school takes care of it, while 27.45% protect personal data comprehensively.

4.1.3 Teaching and learning

For teaching and learning, the response options are ordered according to the degree to which digital technologies are used in teaching and learning. Most respondents chose the fourth option for the three questions; 37.25%, 37.25%, and 41.18% use digital tools to systematically improve teaching, regularly monitor and analyze their students’ online activities, and require from students to work in
teams to use the internet, find information, and present their findings in a digital format, respectively (Fig. 8).

4.1.4 Assessment

For the assessment competence, the response options are ordered by the level of engagement with digital assessment. As shown in Fig. 9, 39.22% of participants use a variety of digital tools that enable learners to plan, document, or
reflect on their learning. Most respondents use digital assessment formats to monitor student progress, except for 3.92% of respondents who monitor student progress but not with technology. Regarding question 23, the responses vary in terms of analyzing all available data to identify students who need additional support in a timely manner. While 31.37% indicated that they only analyze academically relevant data, such as performance and grades, 31.37% regularly review all available evidence to identify students who need additional support. In addition, most respondents (41.18%) used a variety of digital ways to provide feedback (question 24).
Fig. 8  Three questions related to teaching and learning

| Question                                                                 | Percentage |
|--------------------------------------------------------------------------|------------|
| I do not or only rarely use technology in class                          | 3.96%      |
| I make basic use of available equipment, e.g. digital whiteboards or projectors | 3.96%      |
| I use a variety of digital strategies in my teaching                      | 19.01%     |
| I use digital tools to systematically enhance teaching                    | 33.25%     |
| I use digital tools to implement innovative pedagogic strategies         | 37.75%     |
| I do not use digital environments with my students                       | 1.96%      |
| I do not monitor student activity in the online environments we use      | 13.73%     |
| I occasionally check on them and their discussions                       | 25.46%     |
| I regularly monitor and analyse my students’ online activity             | 37.75%     |
| I regularly intervene with motivating or corrective comments             | 37.75%     |
| My students do not work in groups                                        | 5.88%      |
| It is not possible for me to integrate digital technologies into group work | 7.94%      |
| I encourage students working in groups to search for information online or to present their results in digital format | 27.46%     |
| I require students working in teams to use the internet to find information and present their results in a digital format | 41.18%     |
| My students exchange evidence and jointly create knowledge in a collaborative online space | 17.66%     |
4.1.5 Learners’ empowerment

To empower learners, the answer options are arranged to focus increasingly on students’ individual learning needs. For questions 25, 26, and 27, as shown in Fig. 10, the majority of respondents focus on students’ individual needs of learners. 27.45%
of them discuss possible obstacles with students and outline solutions, and the same percentage of respondents use digital technologies for students' active participation in class and engage their students with digital media in their classes (e.g., electronic worksheets, games, and quizzes).

![Fig. 10: Three questions related to empowering learners.](image-url)

| Question                                                                 | Percentage |
|--------------------------------------------------------------------------|------------|
| I do not create digital assignments                                       | 3.0%       |
| My students do not have problems with using digital technology           | 21.57%     |
| I adapt the task so as to minimize difficulties                          | 17.65%     |
| I discuss possible obstacles with students and outline solutions          | 17.65%     |
| Whenever possible, I use digital technologies to offer differentiated learning opportunities | 25.49%     |
| I allow for variety, e.g., I adapt the task, discuss solutions and provide alternative ways for completing the task | 25.49%     |
| In my work environment, all students are required to do the same activities, irrespective of their level | 43.14%     |
| I do provide students with recommendations for additional resources       | 17.65%     |
| I provide optional digital activities for those who are advanced or lagging behind | 17.65%     |
| Whenever possible, I use digital technologies to offer differentiated learning opportunities | 25.49%     |
| I systematically adapt my teaching to link to students' individual learning needs, preferences and interests | 25.49%     |
| In my work environment it is not possible to actively involve students in class | 0.00%      |
| I do involve students actively, but not with digital technologies        | 13.73%     |
| When instructing, I use motivating stimuli, e.g., videos, animations, cartoons | 13.73%     |
| My students engage with digital media in my classes, e.g., electronic worksheets, games, quizzes | 13.73%     |
| My students systematically use digital technologies to investigate, discuss and create knowledge | 13.73%     |
For facilitating learner competence, the response options are ranked according to the level of engagement in fostering students’ digital competence, as shown in Fig. 11.
The majority of respondents (45.10% + 15.69% = 60.79%) indicated that they teach students how to judge the reliability of information and identify misinformation and bias. 45.10% of students use digital communication and cooperation mainly among each other (question 28). In addition, 56.88% (37.25% + 19.61%) of respondents set up assignments and encourage students to use digital ways to communicate and cooperate with each other and external audiences, and 35.29% with each other (question 29). 35.29% of respondents set up assignments requiring students to create digital content (question 30). For question 31 ("I teach students to behave safely and responsibly online"), the answers are different as 13.73% stated that this is not possible in their subject or work environment, while 11.76% systematically encouraged the use of social rules by their students in different digital environments. For the last question (question 32), as shown in Fig. 11, they encourage students to use digital technologies creatively to solve concrete problems, but only occasionally when an opportunity arises.

### 4.2 Correlation between DC and faculty members’ demographic attributes

To answer the second question (i.e., “What is the relation among digital competences and other demographic information?”) of this study, we found the correlation between competences as follows. A correlation matrix is a table that contains the correlation coefficients between variables. Each cell in Fig. 12 represents the relationship between two variables that are assessed using a series of multiple-choice questions (from question 2 to 32). A correlation matrix is used to summarize data, and can be used as input and diagnostic tool for further analysis. The coefficient ranges from 0 to 1, with 0 indicating no relationship and 1 indicating a perfect relationship.

Figure 13a shows the correlation between General Questions (Q2 – Q10) and Area 1 Questions (Q11 – Q14). From Fig. 13a, it can be seen that the correlation between Q7 and Area 1 Questions Q11, Q12, and Q13 is greater than 0.42. Similarly, the correlation between General Question Q9 and Area 1 Questions Q11 and Q13 is greater than 0.47. Figure 13b shows the correlation between General Questions (Q2 – Q10) and Area 3 Questions (Q18 – Q21). From Fig. 13b, it can be seen that the correlation between General Questions Q6, Q7, Q8, Q9, and Area 2 Question Q18 are greater than 0.43. Similarly, the correlation between Q10 and Area 2 Question Q20 is greater than 0.5. Figure 13c shows the correlation between General Questions (Q2 – Q10) and Area 2 Questions (Q15 – Q17). From Fig. 13, it can be seen that the correlation between Q6 and Q15, and Q7 and Q15 are greater than 0.42. Similarly, the correlation between Q8 and Area 2 Questions Q15 and Q16 are greater than 0.5. Finally, the correlation between Q9 and Q15 and Q16 is also greater than 0.48.

Figure 13d shows the correlation between General Questions (Q2 – Q10) and Area 4 Questions (Q22 – Q24). Figure 13d shows that all correlation values between General Questions and Area 4 Questions are below 0.4. The highest correlation value between
Fig. 12 Correlation between questions

General Questions and Area 4 Questions is 0.36 for the correlation between Q7 and Q22. Figure 13e shows the correlation between General Questions (Q2 – Q10) and Area 5 Questions (Q25 – Q27). Figure 13e shows that all correlation values between General Questions and Area 5 Questions are below 0.35. The highest correlation value between General Questions and Area 5 Questions is 0.31 for the correlation between Q9 and Q25. Figure 13f shows the correlation between General Questions (Q2 – Q10) and Area 6 Questions (Q28 – Q32). From Fig. 13f, it can be seen that all correlation values between General Questions and Area 6 Questions are below 0.35. The highest correlation value between General Questions and Area 6 Questions is 0.33 for the correlation between Q8 and Q32.
The aim of this research was to investigate the level of digital competences of educators in universities in UAE. To answer the research questions about the level of digital competencies of educators in UAE and the relationship between digital competencies and other demographic information, we conducted an online survey to create a questionnaire based on the DigCompEdu framework and its assessment tool. The

**Fig. 13** Correlation between general and various area questions

### 5 Discussion

The aim of this research was to investigate the level of digital competences of educators in universities in UAE. To answer the research questions about the level of digital competencies of educators in UAE and the relationship between digital competencies and other demographic information, we conducted an online survey to create a questionnaire based on the DigCompEdu framework and its assessment tool. The
results show that the majority of faculties are digitally competent in terms of “professional engagement,” “digital resources,” “teaching and learning,” “assessment,” “learner empowerment,” and “learner facilitation,” which are the six DC mentioned in the DigCompEdu framework.

In terms of professional engagement, educators can use digital technologies to communicate and interact with colleagues and students, as well as for the collective good and continuous innovation in the organization and teaching profession. The majority of participants “systematically select, adjust, and combine different digital solutions to communicate effectively and exchange ideas and materials, also with teachers outside their organization” (e.g., in an online teaching network). In addition, they “use a range of resources to develop their digital teaching skills and discuss with peers how to use digital technologies to innovate and improve educational practice and develop digital teaching skills.” In terms of participation in online training opportunities such as online courses and webinars, the majority “have participated in online training at least once or twice and tried out various different online training opportunities.”

For digital resources and in terms of using “different Internet sites and search strategies to find and select a range of different digital resources,” many participants compare resources using a range of relevant criteria (e.g., reliability, quality, fit, design, interactivity, and appeal) and create and modify different types of resources. On the other hand, it was found that responses to the question of “how effectively they protect sensitive content (e.g., exams, students’ grades, and personal data)” varied. 27% of participants said that they do not have to do this because the school takes care of it, while the same percentage of participants protect personal data comprehensively (e.g., by combining hard-to-guess passwords with encryption and frequent software updates).

For teaching and learning, the majority of respondents “use digital tools to systematically enhance teaching” and employ a variety of digital strategies in the classroom to “ensure that they are used with added value.” They regularly monitor and analyze their students’ online activities and require students to use Internet in teams to find information and present their findings in a digital format.

For assessment, the majority of respondents use a variety of digital tools to monitor student progress and analyze all available data, such as student engagement, performance, grades, and attendance, to identify students who need additional support on a regular basis in a timely manner. However, in terms of feedback to students, some respondents do not provide feedback in digital form, while others systematically use digital approaches.

Regarding learner empowerment, and specifically considering possible digital problems of students when creating digital assignments for them, the majority of participants indicated that “they discuss possible obstacles with students and outline solutions”. The majority also “uses digital technologies to provide students with personalized learning opportunities tailored to their needs and enable them to actively participate in the classroom.”

Regarding the last competence of learners’ facilitation, and to improve students’ digital competence, the majority of participants “discuss with students how to verify the accuracy of information, and set up assignments that require
students to use digital means to communicate with others,” create digital content such as videos as an integral part of their studies, and “teach students how to behave safely and responsibly online” by discussing rules of conduct with them. They also “encourage students to use digital technologies to solve problems” and often experiment with technological solutions to problems.

6 Conclusions

Digital competence has become an important issue in academia owing to the advent of various communication tools. In this study, a standardized questionnaire based on a validated comprehensive framework was used. This tool was designed to assess professional skills of faculties in higher education institutions in UAE in terms of their readiness to use ICT and their current digital competencies in their teaching and educational practices. This survey aims to help participants reflect on their strengths and weaknesses in using digital technologies in education by answering 22 questions that represent 22 digital competencies that educators should possess in order to teach effectively and communicate with partners in the educational process. This survey has also allowed us, as academic researchers, to shed light on the DC of teachers in education in UAE and present it in this article. In this way, we can help teachers determine their relative strengths and focus more on the areas that need more attention, such as effectively protecting sensitive content like exams, and providing effective feedback to students in a timely manner. The limitation of this study was that we did not consider clustering between faculties based on their majors in order to generalize the result, and the number of responses to the survey was less than 100. In terms of future work, this study could be extended by collecting more responses and considering the clustering method to segment the group of participants according to their background, as well as investigate the relationship between the teachers’ level of competence and their specialization.

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Data availability The datasets built and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests The authors declare that they have no competing interests.
References

Abulibdeh, E. S., Syed Hassan, S. S. (2011). E-learning interactions, information technology, self efficacy and student achievement at the University of Sharjah, UAE. Australasian Journal of Educational Technology, 27(6). https://doi.org/10.14742/ajet.926

Al Khateeb, A. A. M. (2017). Measuring digital competence and ICT literacy: An exploratory study of In-Service language English teachers in the context of Saudi Arabia. International Education Studies, 10(12), 38. https://doi.org/10.5539/ies.v10n12p38

Al-Qirim, N., Rouibah, K., Tarhini, A., Serhani, M. A., Yammahi, A. R., & Yammahi, M. A. (2018). Towards a personality understanding of information technology students and their IT learning in UAE university. Education and Information Technologies, 23(1), 29–40. https://doi.org/10.1007/s10639-017-9578-1

Bakator, M., Radosav, D. (2020). Analyzing the digital education revolution. In: International Conference on Information Technology and Development of Education-ITRO, October 2020. Zrenjanin, Republic of Serbia.

Banerjee, S. (2021). To capture the research landscape of lecture capture in university education. Computers & Education, 160, 104032. https://doi.org/10.1016/j.compedu.2020.104032

Benali, M., Kaddouri, M., & Azzimani, T. (2018). Digital competence of Moroccan teachers of English. International Journal of Education and Development using Information and Communication Technology, 14(2), 99–120.

Cabero-Almenara, J., Gutiérrez-Castillo, J.-J., Palacios-Rodríguez, A., & Barroso-Osuna, J. (2020). Development of the teacher digital competence validation of DigCompEdu check-in questionnaire in the university context of Andalusia (Spain). Sustainability, 12(15), 6094. https://doi.org/10.3390/su12156094

Caena, F., & Redecker, C. (2019). Aligning teacher competence frameworks to 21st century challenges: The case for the European Digital Competence Framework for Educators (Digcompedu). European Journal of Education, 54(3), 356–369. https://doi.org/10.1111/ejed.12345

Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. Educational Technology Research and Development, 68(5), 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

Fenández, C. J. O. (2020). Special Session—XR Education 21st. Are we ready for XR disruptive ecosystems in education? In: vol 2020 6th International Conference of the Immersive Learning Research Network (iLRN 2020 Virtual Conference).

Feng, X. H., Hu, X. C., Fan, K., Yu, T. (2020). A brief discussion about the impact of coronavirus disease 2019 on teaching in colleges and universities of China. In: vol 2020 International Conference on E-Commerce and Internet Technology (ECIT). https://doi.org/10.1109/ECIT50008.2020.00044

Garzón Artacho, E., Martínez, T. S., Ortega Martín, J. L., Marín Marín, J. A., & Gómez García, G. (2020). Teacher training in lifelong learning—The importance of digital competence in the encouragement of teaching innovation. Sustainability, 12(7), 2852. https://doi.org/10.3390/su12072852

Ghomí, M., Redecker, C. (2019). Digital competence of educators (DigCompEdu): Development and evaluation of a self-assessment instrument for teachers’ digital competence. In: 11th International Conference on Computer Supported Education. https://doi.org/10.5220/0007679005410548

Guillén-Gámez, F. D., & Mayorga-Fernández, M. J. (2020). Quantitative-comparative research on digital competence in students, graduates and professors of faculty education: An analysis with ANOVA. Education and Information Technologies, 25(5), 4157–4174. https://doi.org/10.1007/s10639-020-10160-0

Hussein, E., Daoud, S., Alrabaiah, H., & Badawi, R. (2020). Exploring undergraduate students’ attitudes towards emergency online learning during COVID-19: A case from the UAE. Children and Youth Services Review, 119(C), 105699. https://doi.org/10.1016/j.chylsre.2020.105699

Käck, A., Barbutiu, S. M., & Fors, U. (2019). Migrant teachers’ self-estimated digital competence: A study within Swedish teacher education. Contemporary Issues in Technology and Teacher Education, 19(2), 256–278.

Kotlyarova, I. O., Volchenkova, K. N., Semenova, Y. V., Chuvashova, A. D., Lyashenko, M. V. (2019). Домашняя работа 8928400 Development of digital competence of technical specialists in the electronic information and education environment. In: Proc. 2019 IEEE international conference; quality management, transport and information security, information technologies& IT and QM and IS, volume (September), p 617–621.
Kuzminska, O., Mazorchuk, M., Morze, N., Pavlenko, V., Prokhorov, A. (2018). Digital competency of the students and teachers in Ukraine: Measurement, analysis, development prospects. In: Proc. 14th international conference ICTERI. Proceedings, 2104, vol II: Workshops. CEUR workshop. Kyiv, Ukraine, May 14–17, 2018, p 366–379.

Martin, A. (2020). COVID notes from the field: Transitioning to digital learning. Georgia Educational Researcher, 17(2), 1–14. https://doi.org/10.20429/ger.2020.170207

Nordén, L.-Å., Mannila, L., Pears, A. (2017). Development of a self-efficacy scale for digital competences in schools. In: IEEE frontiers in education conference (FIE) Proc. 47th ASEE/IEEE frontiers in education conference, volume, vol 2017. IEEE Press

Nyikes, Z. (2017). Creation proposal for the digital competency framework of the Middle-East European region. Key Engineering Materials, 755, 106–111. https://doi.org/10.4028/www.scientific.net/KEM.755.106

Redecker, C. (2017). European framework for the digital competence of educators: DigCompEdu. En: Print. https://doi.org/10.2760/159770. Online, JRC107466 EUR 28775. Publications Office of the European Union, Luxembourg, ISBN 978–92–79–73718–3, p 978–92–79–73494–6 (pdf). https://doi.org/10.2760/178382

Salloum, S. A., Al-Emran, M., Shaalan, K., & Tarhini, A. (2019). Factors affecting the e-learning acceptance: A case study from UAE. Education and Information Technologies, 24(1), 509–530. https://doi.org/10.1007/s10639-018-9786-3

Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. Cogent Education, 5(1), 1519143. https://doi.org/10.1080/2331186X.2018.1519143

Tiede, J., Grafe, S. (2020). International perspectives on the media-related educational competencies of teacher educators. A systematic category-based comparison of competency frameworks. In: Society for information technology & teacher Education International conference, Apr 07, 2020.

Tretinjak, M. F., Andelić, V. (2016). Digital competences for teachers: Classroom practice. In: vol 2016 39th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO). IEEE Publications, p 807–811.

Trubavina, I., Dotsenko, S., Naboka, O., Chaikovskyi, M., & Meshko, H. (2021). Developing digital competence of teachers of Humanitarian disciplines in the conditions of COVID-19 quarantine measures. Journal of Physics: Conference Series, 1840(1), 012052. https://doi.org/10.1088/1742-6596/1840/1/012052

Yelubay, Y., Seri, L., Dzhussubaliyeva, D., & Abdigapbarova, U. (2020). Developing future teachers’ digital culture: Challenges and perspectives. IEEE European Technology and Engineering Management Summit (E-TEMS). https://doi.org/10.1109/E-TEMS46250.2020.9111827

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