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International Journal of Educational Research

journal homepage: www.elsevier.com/locate/ijedures

The impact of digital leadership on teachers' technology integration during the COVID-19 pandemic in Kuwait

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ARTICLE INFO

Keywords:

Digital leadership
Technology integration
School principals
Kuwait
COVID-19

ABSTRACT

When the education system was overwhelmed by the COVID-19 pandemic, school principals had to take on the mantle of digital literacy by ensuring that teachers and learners attained and utilized digital tools and platforms. This study aims to explore the impact of digital leadership among school principals on teachers' technology integration during the COVID-19 pandemic in Kuwait. This quantitative study used two surveys, the Principal Technology Leadership Assessment, and the Teacher Technology Integration Survey. The sample consisted of 113 school principals and 404 teachers from public elementary schools in Kuwait. The study revealed that digital leadership among school principals had a positive impact on teachers' technology integration during the COVID-19 pandemic. Discussion and implications for policymakers, school principals, and future research are introduced.

1. Introduction

The education system was overwhelmed by the COVID-19 pandemic. According to the [World Bank \(2020\)](#), schools in 180 countries were forced to close due to the global health crisis. Instead of traditional face-to-face learning, online distance learning became the only way to attend school. Along with healthcare professionals, educators were considered to be among the front-line warriors, as they made huge efforts to support students through the pandemic. Educators encountered new challenges that past researchers could not have anticipated ([Zimmer, McTigue, & Matsuda, 2021](#)).

Initially, most governments and institutions predicted that the pandemic would be under control within a few months and that all sectors would go back to normal within a short period of time. However, most countries continued to record high numbers, which necessitated the locking down of economies and stringent measures to control the spread of the virus. One of the ways through which governments sought to do this was by encouraging social isolation. After initial school closures, the education sector was reinstated through the use of digital platforms. For these, educators have had to transform their digital learning skills while acting as users and teachers at the same time ([Botham, 2018](#)).

The COVID-19 pandemic has led to the exploration of new frontiers in the education sector. Technology has been integrated into nearly all classrooms, from elementary school to higher education institutions. More than 128 million learners in over 190 countries have been affected by school closures during the pandemic ([Buchholz, DeHart, & Moorman, 2020](#)). Teachers have had to upgrade their digital literacy skills as both users and educators, playing a primary role in encouraging learners to embrace technological literacy. This has placed a huge burden on school principals in Kuwait, for whom this substantial use of technology was unfamiliar territory.

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<https://doi.org/10.1016/j.ijer.2022.101928>

Received 1 October 2021; Received in revised form 15 January 2022; Accepted 21 January 2022

Available online 9 February 2022

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1.1. Problem statement

To facilitate the transfer of academic knowledge, teachers have had to delve into an area of learning that some had considered too complex. School principals, meanwhile, had to take on the mantle of digital literacy by ensuring that teachers and learners attain and utilize digital tools and platforms. According to Fernández-Prados, Lozano-Díaz, and Ainz-Galende (2021), some principals are reluctant to improve their digital literacy skills and discover social media platforms that could facilitate effective knowledge transfer. Principals are expected to master the necessary competencies in digital literacy to promote focused leadership for students and teachers (Christopoulous, Sprangers, & Wang, 2021). They have a duty to ensure that teachers have the resources needed to deliver high levels of knowledge for the optimum academic performance of learners. Principals also have an obligation to motivate themselves to be visionary leaders in a dynamic digital era, as they stand to empower the key stakeholders in the learning sector for current and future learning.

Research has suggested that the principal's position must evolve to that of a leader in technology if technology is to be integrated as a core teaching practice (Kozloski, 2006). According to Hamzah, Nasir, and Wahab (2021), leaders in the education sector need to demonstrate how to use technology in their daily administrative and professional duties as a means of encouraging its use by subordinates. Despite their increasing emphasis on technology leadership, the role of principals in the effectiveness of technology integration has not widely been researched (Kozloski, 2006). Few studies have dealt with the skills needed by school principals to become digital leaders and for them to have a positive effect on technology integration in schools. The pursuance of technology is a primary objective for Kuwait's Ministry of Education (MOE). However, its plan is still theoretical and remains largely unattained for most schools and leaders. There are various gaps in the integration of principals' digital leadership with the implementation of technology by teachers. According to Raman and Thannimalai (2019), most teachers do not have information and communication technology (ICT) competency, and they enjoy minimal access to ICT resources. Therefore, there could be a loss of knowledge and skills transferred from principals to teachers. As a result of them not getting to acquire critical skills in technology, learners also do not get to benefit from digital literacy that could give them a competitive edge in the global market. According to Ugur and Tugba (2019), the poor integration of technology in schools could be linked to poor leadership. More studies are needed to address why some school leaders fail to understand the contemporary requirement for technology for teachers and learners and its vital benefit for the job market. This study investigates various parameters that are linked to digital leadership associated with principals. These parameters include professional excellence, continuous improvement, digital citizenship, a culture of learning in the digital era, and idealistic leadership.

2. Literature review

2.1. Digital leadership

Digital leadership theory puts great emphasis on the leaders' abilities in developing, managing, guiding, and applying the ICT knowledge to improve the performance of their institutions (Chin, 2010). Digital leadership refers to the implementation and use of leadership approaches that are consistent with the digital age, including reliance on modern technology platforms. Digital leadership requires high standards of innovation.

Sizable studies have claimed that school principals' technology leadership affects educational technology integration, which positively impacts learners' achievement and improvement (Greaves, Wilson, & Gielniak, 2010). Chang (2012) explored the perceptions of 1000 teachers in Taiwan, finding that principals' digital leadership improves teachers' technological literacy and directly encourages teachers to successfully incorporate technology in the classroom. Principals should therefore change their role from that of the traditional administrator to technology- and curricular-based leaders. School principals have a responsibility to serve as technology leaders in their schools by creating and implementing a vision and a technology strategy.

Digital leadership involves the strategic utilization of the IT assets of an entity to maximize its business achievements. Digital leadership ensures that the involved organizations remain competitive in their area of practice to deliver the needed services or commodities to the involved stakeholders (DeLuca, Bolden, & Chan, 2017). The COVID-19 pandemic has created a need for distance and converted traditional learning systems into digital active spaces (Fernández-Prados et al., 2021). The International Society for Technology in Education (ISTE) suggests five aspects of digital leadership:

- (1) Excellence in Professional Practice: Excellence in learning and teaching translates to a strong awareness of the content that needs to be taught and delivered to learners (Christopoulous et al., 2021). Teachers should also bear the needed pedagogical competencies to ensure that skills are conveyed to learners. School leaders should promote a conducive environment for innovation and professional learning, aimed at enabling students to learn through digital and technological resources. Applying IT ensures that students are well informed and updated with the latest trends regarding the use of technology in learning (ISTE, 2014).
- (2) Visionary Leadership: Visionary leadership is one of the main aspects of digital leadership. This focuses on the integration of a clear vision by the digital leader in terms of where they want to direct their organization. One of the main reasons for integrating visionary leadership into the framework of digital leadership is because it enhances the efficiency of decision-making processes. Digital leadership improves school principals' awareness and understanding of existing problems, and this greatly adds to the value of the decision-making process, not only for the short term but also in the long run. This is an integral aspect of success as far as digital leadership is concerned. Educators must stay updated on current technology trends that are currently in use to ensure that they not only communicate, but also articulate the vision of leadership and development with the involved

stakeholders (Botham, 2018). School leaders have to create and maintain the resources and connections that are required in the age of digital age of learning. In addition, they are in charge of leading development and inspiring and implementing the shared vision of integrating technology in view of promoting transformation and excellence in a school setup.

- (3) Digital-age Learning Culture: According to Buchholz et al. (2020), educators now have to strive to introduce and maintain technology use as a major learning resource. School leaders should create, facilitate, and sustain the dynamic digital age through a learning culture that embraces modern digital platforms and developments (Figueiredo, 2021). The extent to which digital leaders embrace the digital age learning culture has an inherent impact on whether they are highly successful. It is incumbent upon these leaders to ensure that they are adequately aware of the strategies that constitute the framework of implementing a digital age learning culture within their respective settings or organizations.
- (4) Digital Citizenship: Digital citizenship reflects the actions and consumption habits that target positive digital communities and contexts. When evolving digital culture and citizenship, principals take responsibility for modeling and mobilizing the understanding of ethical, legal, and social responsibilities. Additionally, leaders must ensure that relevant resources are available to learners to meet their technological needs (ISTE, 2014). Digital citizenship involves embracing computer science, technological platforms, and the different trends that characterize digital development (Mihardjo & Alamsjah, 2019). The integration of digital citizenship into digital leadership improves the extent to which leaders can connect effectively with the needs of different stakeholders while also staying in touch with emerging trends and developments, both from within and externally.
- (5) Systemic Improvement: School leaders strive to create a system of continuous improvement regarding digital learning while equipping learners with the necessary skills to develop their own unique competencies (Štrukelj, Zlatanović, Nikolić, & Zabukovšek, 2019). Systemic improvement provides a platform for making changes without causing instability in the leadership process. Additionally, systemic improvement is associated with the beneficial implication of enhancing the extent to which high standards of efficiency are maintained within the leadership process, in both the short and long term. These are always vital attributes as far as the enhancement of digital leadership is concerned. It is also notable that systemic improvement helps to highlight the various areas of digital leadership that are in need of change or adjustment (Kane, Phillips, Copulsky, & Andrus, 2019). A leader should manage continuous improvement in their school, and to accomplish this, they should manage resources and technological information effectively. School principals must be in charge to ensure that infrastructure fully supports both learning and teaching integration (ISTE, 2014).

2.2. Teachers' technology integration

Teachers can use technology for a range of purposes in both their professional and personal capacity. They can do so for administrative purposes, such as by recording attendance, marking scripts handed in through online platforms, and handing over student details to authorities such as the school administrator. Teachers are also expected to prepare various documents related to their professional capacities, such as lesson plans, notices, and other paperwork. This paper explores how they can use technology in the classroom.

Teachers can use different technological devices, including tablets, computers, and laptops, to access course content and lessons. These devices can be used in further explanation of complex concepts through creative, easy-to-use programs. The answers to quizzes and polls can assist teachers to gauge the level of understanding of taught content. They can then use the information for strategizing the effective methods that they may use to impart the necessary skills to their learners (Harrell & Bynum, 2018). Technology allows teachers to have a high level of engagement in learning because they can implement their literacy skills to grasp the taught content. It eases the workload that teachers have to complete when executing their duties. The literature indicates that the integration of technology can be a challenge for teachers (Khatoony & Nezhadmehr, 2020) since many factors affect it. These include previous online learning experience, knowledge of technology, pedagogical knowledge, and the support system (Tamah, Triwidayati, & Utami, 2020). In the study of Hakim (2020), the most common challenges included a lack of access to modern technology, poor internet connection, low motivation, and attention deficit among learners.

The independent variables in this research are the five aspects of digital leadership, as presented by standards of ISTE (2009), namely visionary leadership, digital learning culture, excellence in professional practice, systemic improvement, and digital citizenship, and the dependent variable is teachers' technology integration. Much of the existing literature claims that the digital leadership of the principal affects the integration of technology in schools (Greaves et al., 2010; Raman & Thannimalai, 2019). However, a limited number of studies have focused on this impact during the time of the COVID-19 pandemic. This research study explores the impact of digital leadership on teachers' technology integration at the time of the pandemic in elementary schools in Kuwait, as shown in the following model.

Research questions:

- 1 To what extent have school principals in Kuwait practiced digital leadership during the COVID-19 pandemic?
- 2 To what extent have teachers integrated technology in classrooms during the COVID-19 pandemic?
- 3 What is the effect of school principals' digital leadership on teachers' technology integration in Kuwait during the COVID-19 pandemic?

3. Methodology

This quantitative study was conducted using a cross-sectional survey to examine the level of school principals' digital leadership

Table 1
Respondent distribution by demographic characteristics.

Variable	N (%)	
	Leaders	Teachers
Gender		
Male	17 (15)	23 (5.7)
Female	96 (85)	381 (94.3)
Years of experience		
Less than 6 years	40 (35.4)	161 (39.9)
6 – 10 Years	24 (21.2)	71 (17.6)
More than 10 years	49 (43.4)	172 (42.6)
Area		
AlAssima	33 (29.2)	137 (33.9)
Aljahra	23 (20.4)	86 (21.3)
Al Farwania	19 (16.8)	87 (21.5)
Alahmadi	15 (13.3)	67 (16.6)
Mobaruk Alkabir	14 (12.4)	14 (3.5)
Hawali	9 (8)	13 (3.2)
Nationality		
Kuwaiti	107 (94.7)	341 (84.4)
Non-Kuwaiti	6 (5.3)	63 (15.6)

practices and their effect on teachers' technology integration at the time of the COVID-19 pandemic.

3.1. Research sample

The target population of this study consists of 197 public elementary schools across six school districts in Kuwait. All targets are public schools that have implemented the unified Kuwaiti national curriculum and follow the regulations of the MOE. The schools are gender segregated, with 99 of them for boys and 98 for girls. Most primary schools in Kuwait have female administrative and teaching staff, and male teachers account for only 7% of all teachers at that stage. This is because a decision was made by the MOE in 2002 to promote the feminization of staff at boys' primary schools due to the large number of female graduates from colleges of education at the time. This explains the high percentage of female participants in the study. Random sampling was used by the researcher to select the participants, as "all participants have an equal opportunity of being selected" (Krathwohl, 2009, p. 164). In total, 517 participated in the study (113 school principals and 404 teachers). According to Krejcie and Morgan (1970), the sample is representative of the given population.

Demographic characteristics including gender, years of experience, area, and nationality were collected from the school principals and teachers. Gender was categorized into "male" and "female"; years of experience was grouped into "less than 6 years," "6–10 years," and "more than 10 years." Area was categorized as "Alahmadi," "Aljahra," "Al Assima," "Al Farwania," "Hawali," and "Mobaruk Alkabir." Nationality was grouped into "Kuwaiti" and "non-Kuwaiti." Respondent distribution by demographic characteristics is shown in Table 1.

Table 1 shows that 85% of the school leaders were female and 15% were male, while 94.3% of the teachers were female. Of the leaders, 43.4% had more than 10 years' experience. Al Assima had 29.2% of the leaders and 33.9% of the teachers in the sample. Finally, 94.7% of the leaders and 84.4% of the teachers were Kuwaitis.

3.2. Instruments

The Principal Technology Leadership Assessment was used to estimate the principals' digital leadership (ISTE, 2009, 2014). This consists of five sections, including visionary leadership (three items), excellence in professional practice (four items), digital-age learning culture (five items), digital citizenship (four items), and systematic improvement (five items). To measure teachers' technology integration, the Teacher Technology Integration Survey was used (Vannatta & Banister, 2009). Although it has six main constructs, only two were used in this study, namely administrative and instructional use (10 items) and communication use (four items). Self-report questionnaires provide a large amount of quantitative data and enabling generalizations, especially when a random sample of respondents is used (Demetriou, Ozer, & Essau, 2015). The researcher used back translation instruments that help to create and modify items of the survey and make it clearer for the participants (Brislin & Freimanis, 2001). All procedures of the study and its instruments were approved by the review board of the MOE. Participation was voluntary, and participants were informed of the research objectives. Surveys were sent using Google Forms.

3.3. Validity and reliability of the surveys

To assess the validity of their content, the surveys were examined by a panel of experts in school leadership. It is worth noting that to examine their reliability, a pilot study was conducted in four elementary schools in Kuwait involving seven school principals and 40 teachers. In addition, the reliability was measured using Cronbach's alpha. For the school principals' survey, this was 0.946; for the teachers' survey, it was 0.887.

3.4. Data analysis

Means and standard deviations (SD) were calculated to determine the level of digital leadership of school principals and teachers' technology integration. Pearson's correlation and multiple regression were performed to assess the impact of school principals' digital leadership on teachers' technology integration during the time of the COVID-19 pandemic. IBM SPSS Statistics 22 was used for all statistical analyses. Statistical significance was defined as $p > 0.05$ (McLeod, 2019).

4. Results

Item scores were categorized into five levels, as follows:

Means and standard deviations for each item of digital leadership are shown in Table 3.

As we can see from Table 3, the leaders had a high level of visionary leadership, digital-age learning culture, excellence in professional practice, systemic improvement, and digital citizenship. There was also a high level of digital leadership, with an average of 4.12 ± 13.1 . We notice that the following had high levels: allocating time, resources, and access to ensure ongoing professional growth in technology fluency and integration; leading purposeful change to reach learning goals using technology- and media-rich resources; and ensuring access to appropriate digital tools and resources to meet the needs of all learners.

Means and standard deviations for each item of teachers' technology integration are shown in Table 4.

As we can see from Table 4, the teachers had a very high level of administrative and instructional use (4.27 ± 6.07) and communication use (3.88 ± 3.02). There was a high level of teachers' technology integration, with an average of 4.15 ± 8.04 . The lowest average was in using email to communicate with students or parents (3.43 ± 1.18). The highest average was in using technology to present information to students.

Pearson's correlation was performed to determine relationships between the variables. Table 5 shows the results.

Table 5 shows the correlation coefficients and p-values between the variables. We can see that all variables are significantly correlated to each other with positive correlation. Digital leadership and teachers' technology integration have a positive significant correlation ($r = 0.309$, $p\text{-value} = 0.001$), which means that teachers' technology integration increases as digital leadership increases. Linear regression was performed to determine the impact of digital leadership on teachers' technology integration. Tables 6 and 7 show the results.

From Table 6 we see the $p\text{-value} = 0.001$, which is less than 0.05, so we can say that digital leadership can play a significant role in teachers' technology integration.

From Table 7, we can see that the beta coefficient is 0.195 and the $p\text{-value} = 0.001$. These results clearly direct the positive effect of digital leadership in teachers' technology integration.

5. Discussion

During the COVID-19 pandemic in Kuwait, the characteristics of digital leadership were implemented by school principals, including visionary leadership, excellence in professional practice, digital-age learning culture, digital citizenship, and systemic improvement. The digital leadership of school principals had a positive impact on teachers' technology integration in classes at the time of the pandemic. This is consistent with the findings of previous studies (Damayanti & Mirfani, 2020; Hamzah et al., 2021; Norakmar, Noor, & Latif, 2019; Tibagwa, Onen, & Oonyu, 2016). According to Ugur (2019), principals bear the responsibility for being leaders in integrating technology into schools. The study showed that school principals as technology leaders had a positive effect on technology integration in their schools. It was established that technical knowledge was achieved by school leaders individually and conveyed to teachers through vision and collaboration. Principals' encouragement and support of teachers in embedding ICT should result in a shift in teaching practices to make them more ICT-connected (Al-Sharija & Al-Qublan, 2019).

Previous studies have also indicated that a lack of ICT preparation and teacher competence in technology, along with inadequate technology resources, have prevented teachers and school leaders from integrating technology into Kuwaiti schools. Kuwait's MOE did not make educational technology necessary in school curriculums before the pandemic. According to Al-Harbi (2012), teachers lacked sufficient training in the use of ICT as a teaching tool. The study noted that elementary school programs in Kuwait were too rudimentary in their use of technology, and that more investment was needed. Al-Sharija and AlQublan (2012) showed that technology leaders faced challenges brought about by insufficient professional development, lack of training resources, and a lack of access to professional training. Failure has been seen to be the result of a variety of obstacles, including cultural, technological, and contextual challenges (Al-Felaj, 2016). This indicates that there has been a great shift towards technology integration and digital leadership, since during the COVID-19 pandemic, teachers used technology to assist their learners in continuing with their studies through various online platforms. The lockdown limited the movement and interaction of individuals due to government and World Health Organization restrictions to restrict public interaction and lower infection rates. Technology was a convenient way to ensure the continuance of learning. This study emphasizes the role of school principals as digital leaders in helping teachers to overcome challenges and hold classes via online platforms and communicate with relevant stakeholders such as parents, state education department members, and school leaders.

The findings of this study indicate that school principals with visionary leadership are able to maximize the use of digital resources and foster the embedding of technology in schools. This is in line with a study by Raman (2019) that showed that principals inspire school vision, in turn fostering effective technology integration and influencing educators to incorporate technology into the classroom.

School principals are influential leaders in the education sector because they not only determine the direction taken by their organization, but they also determine the success with which different changes are implemented. One of the main ways in which digital leadership would impact the role of school principals is by providing them with a strategic approach and understanding the particular components of educational technology that correspond with the specific needs of classrooms in their respective schools. Consistency between needs and the implementation of technology in classrooms is not only associated with improved outcomes for students, but it also enhances the performance of teachers. This is an area that would be greatly promoted as a result of school principals using digital leadership within their various roles and responsibilities.

It is also notable that digital leadership enhances the efficiency with which school principals plan their requirements for the implementation technology in the classroom (Hickman & Akdere, 2018). School principals are important and highly influential in the allocation of resources in schools. The use of digital leadership increases the degree to which they are adequately aware of the resources required for each stage of implementing educational technology within the classroom setting.

Digital leadership provides a reliable platform through which school principals can efficiently communicate with teachers as well as other stakeholders, including policymakers, on the various priorities that should be considered when integrating technology into the classroom (Gonzales, 2020). This is an approach that will not only enhance the quality of outcomes after the integration of technology into classrooms but also significantly enhance the effectiveness with which potential stumbling blocks are identified and overcome. The current study further emphasizes that school principals with high levels of digital leadership can influence teachers to engage more with students through better administrative and instructional use of technology. The findings of the study by Hasin and Nasir (2021) show that the performance of students can be positively impacted by digital teaching and learning. In addition, developing practical teaching strategies can help in making use of digital teaching. Nasir's (2020) study supports this since its findings revealed that online learning increases student satisfaction. An active learning atmosphere can be created among students through digital teaching, consequently enhancing satisfaction.

6. Implications

6.1. Policymakers

One of the many ways in which policymakers can improve and promote the use of digital leadership and technology integration in schools is through the establishment of legislation that provides a framework for sufficient resources to be allocated for such initiatives across the country. The resource allocation framework is heavily influenced in terms of determining whether digital leadership and technology integration within schools is implemented accordingly (Tarabasz, Selaković, & Abraham, 2018). Although some policies can enhance the effectiveness with which aspects of digital leadership and technology are integrated into schools, other policy frameworks are associated with significant stumbling blocks. During the COVID-19 pandemic, school leaders faced many difficulties related to the legal aspects of using technology in Kuwaiti schools, including forcing students to switch on their camera, since there are no clear regulations that could be followed by school leadership. This is an important issue that should be prioritized by policymakers so that they can bring legislation for effective and helpful laws that are consistent with best practices as far as technology integration and digital leadership in schools.

Apart from the establishment of the relevant legal framework, another way in which policymakers can help in promoting digital leadership and technology in schools is through the identification of ways in which the existing legal guidelines can be adjusted (Gonzales, 2020). Such adjustments are not only vital for improving the efficiency of the implementation framework but also for supporting the different stakeholders in terms of embracing digital leadership in the classroom. From another perspective is the role that can be played by policymakers in the improvement and support of digital leadership and technology integration into schools. This can be examined in terms of the involvement of all stakeholders in the policymaking process (Hickman & Akdere, 2018). For many years, important stakeholders have been sidelined from the identification of an approach that should be used for embracing digital leadership and technology integration within schools.

During the pandemic, the decision-making process was centralized within the MOE without consideration being given to the needs of schools and parents, causing many challenges for the educational system. When policymakers integrate the viewpoints of different stakeholders in the policymaking process, a multi-dimensional approach will be used for the implementation framework, and this would help in supporting digital leadership as well as technology integration across schools in Kuwait for many years. Policymakers should also examine the various ways in which existing leadership strategies in schools can be adapted to digital leadership so that the relevant environment is established for the implementation of technology in the classroom (Sterrett & Richardson, 2019). This is not only a highly sustainable approach but also a strategy that is consistent with best practices, as far as legislation in the education sector is concerned, in support of digital leadership and technology integration.

6.2. School principals

School principals are important and highly influential stakeholders in the use of digital leadership and technology in schools. Among the ways they can improve and promote the use of digital leadership in the classroom is by establishing mechanisms that are aimed at empowering and enlightening teachers on matters pertaining to digital leadership and technology. Providing adequate training for teachers would be helpful in terms of increasing the level of competence among teachers within digital leadership strategies and embracing technology in the classroom. Many school principals suffer from poor training in the use of technology. Therefore, the MOE should study their training needs and design in-service programs to meet those needs.

Table 2
Level of mean score.

Score	Level
1.00 – 1.8	Very low
1.81 – 2.6	Low
2.61 – 3.4	Moderate
3.41 – 4.2	High
4.21 – 5.00	Very high

Table 3

Means and standard deviations for each item of digital leadership.

Digital Leadership	Mean \pm SD	Level
First Domain: Visionary Leadership	4.11 \pm 2.34	High
1- Facilitate a change that maximizes learning goals using digital resources	4.08 \pm 0.95	High
2- Engage in an ongoing process to develop, implement, and communicate technology infused strategic plans	4.1 \pm 0.85	High
3- Promote programs and funding to support implementation of technology infused plans	4.1 \pm 0.93	High
Second Domain: Digital-Age Learning Culture	4.04 \pm 3.7	High
4- Continuous improvement of digital learning	4.07 \pm 0.86	High
5- Model and promote the frequent and effective use of technology for learning	4.08 \pm 0.85	High
6- Provide learning environments with technology and learning resources to meet the diverse needs of all learners	3.93 \pm 0.95	High
7- Ensure effective practice in the study of technology and its infusion across the curriculum	4.04 \pm 0.9	High
8- Promote and participate in learning communities that stimulate innovation, creativity, and digital collaboration	4.07 \pm 0.89	High
Third Domain: Excellence in Professional Practice	4.16 \pm 3.5	High
9- Allocate time, resources, and access to ensure ongoing professional growth in technology fluency and integration	4.26 \pm 0.83	Very high
10- Facilitate and participate in learning communities that stimulate and support faculty in the study and use of technology	4.03 \pm 0.88	High
11- Promote and model effective communication and collaboration among stakeholders using digital-age tools	4.19 \pm 0.87	High
12- Emerging trends of effective use of technology and encourage new technologies for potential to improve student learning	4.17 \pm 0.83	High
13- Stay up to date on educational research	4.17 \pm 0.85	High
Fourth Domain: Systemic Improvement	4.16 \pm 3.34	High
14- Lead purposeful change to reach learning goals using technology and media-rich resources	4.25 \pm 0.79	Very high
15- Collaborate to establish metrics, collect, and analyze data, and share findings and results to improve staff performance and student learning	4.17 \pm 0.75	High
16- Recruit highly competent personnel who use technology to advance academic and operation goals	4.16 \pm 0.82	High
17- Establish and leverage strategic partnerships to support systemic improvement	4.09 \pm 0.87	High
18- Establish and maintain a robust infrastructure for technology to support management, operations, teaching, and learning	4.16 \pm 0.9	High
Fifth Domain: Digital Citizenship	4.1 \pm 2.8	High
19- Ensure access to appropriate digital tools and resources to meet the needs of all learners	4.25 \pm 0.84	Very high
20- Promote, model, and establish policies for safe, legal, and ethical use of digital information and technology	4.0 \pm 0.89	High
21- Promote and model responsible social interactions related to the use of technology and information	4.06 \pm 0.9	High
22- Model and facilitate the development of a shared cultural understanding and involvement of global issues through communication and collaboration tools	4.09 \pm 0.88	High
Total	4.12 \pm 13.1	High

Teachers should look up to school principals for inspiration and guidance on the use of digital leadership and technology in their respective duties and responsibilities within the school environment (Sterrett & Richardson, 2020). School principals have a mandate to ensure that they integrate digital leadership strategies into their decision-making processes as well as the strategies they use in the engagement of teachers, so that the latter can be well positioned to use modern technology and digital leadership in the classroom. In addition, school principals have a role to partner with other stakeholders in the education sector, including heads of school districts, so that a coordinated approach can be used in the assimilation of technology in the curriculum. This is an approach that must be implemented in line with the best practices of digital leadership, to help teachers integrate technological tools into their learners'

Table 4
Means and standard deviations for each item of teacher's technology integration.

Teacher's technology integration	Mean \pm SD	Level
First Domain: Administrative and Instructional Use	4.27 \pm 6.07	Very high
1- Use technology to present information to students	4.47 \pm 0.75	Very high
2- Demonstrate computer applications	4.22 \pm 0.82	Very high
3- Use the Internet to gather information for lesson planning	4.4 \pm 0.8	Very high
4- Create electronic templates to guide student computer use	4.15 \pm 0.93	High
5- Use technology to adapt an activity to students' individual needs	4.24 \pm 0.85	Very high
6- Use the computer to create instructional handouts or assessments for students	4.37 \pm 0.79	Very high
7- Provide/create electronic learning centers	4.32 \pm 0.84	Very high
8- Use a handheld device (Palm Pilot) to organize information	4.13 \pm 0.89	High
9- Use spreadsheet (or grading program) to maintain grade book and/or attendance	4.29 \pm 0.81	Very high
10- Prepare or maintain IEPs on the computer	4.07 \pm 0.97	High
Second Domain: Communication Uses	3.88 \pm 3.02	High
11- Use Email to communicate with students or parents	3.43 \pm 1.18	High
12- Post class information (homework, products) on an electronic bulletin board, website, or blog	4.38 \pm 0.78	High
13- Use Email to communicate with colleagues and administrators in your school/district	3.7 \pm 1.13	High
14- Use platforms to communicate with head of departments and school principals and superiors	4.01 \pm 0.98	High
Total	4.15 \pm 0.84	High

Table 5
Pearson's correlation between digital leadership and teachers' technology integration.

Variable		Administrative and instructional use	Communication use	Teachers' Technology integration
Visionary leadership	R	.314**	.430**	.357**
	p-value	.001	.000	.000
Digital-Age Learning Culture	R	.238*	.354**	.281**
	p-value	.011	.000	.003
Excellence in Professional Practice	R	.255**	.380**	.301**
	p-value	.006	.000	.001
Systemic Improvement	R	.267**	.389**	.312**
	p-value	.004	.000	.001
Digital Citizenship	R	.254**	.377**	.299**
	p-value	.007	.000	.001
Digital Leadership	R	.264**	.386**	.309**
	p-value	.005	.000	.001

** Correlation is significant at the 0.01 level (2-tailed).

Table 6
Analysis of variance (ANOVA) for the effect of digital leadership on teacher's technology integration.

Model	Sum of Squares	df	Mean Square	F	p-value
Regression	1040.254	1	1040.254	11.732	.001 ^b
Residual	9842.242	111	88.669		
Total	10,882.496	112			

Dependent Variable: teachers' technology integration.

activities in the classroom.

7. Limitations and future research recommendations

This study was limited to measuring the digital leadership of school principals and its effect on teachers' technology integration during the COVID-19 pandemic in public elementary schools in Kuwait. Additional studies focusing on intermediate and secondary schools would help to support the results of this study. Comparing public schools with private schools would add more depth to the analysis of the use of technology for policymakers. This study was conducted during the COVID-19 pandemic, when schools were closed in Kuwait and students continued taking classes online. This huge dependence on technology may affect school principals and give them more digital leadership. Further studies, once schools re-open, may help to fully understand the digital role of school principals and if a different learning context has an impact on technology integration in their schools. The study was limited to using self-report instruments; thus, using direct observations, checklists, and case studies would be good recommendation for future research. (Table 1)

Table 7

Results of Coefficients of the direct effect of digital leadership on teacher's technology integration.

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	p-value
	B	Std. Error			
(Constant)	40.570	5.244		7.736	.000
Digital Leadership	.195	.057	.309	3.425	.001

Dependent Variable: teachers' technology integration.

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