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Digital divides and bridges: equity implications of EdTech in ESL education

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Despite the increasing integration of technology in education, digital inequities persist among ESL students, particularly in under-resourced academic settings. This explanatory mixed-methods study examined digital equity among undergraduate ESL students in the English Department of an Afghan public university, drawing on data from 78 questionnaires and six in-depth interviews. Thematic and statistical analyses revealed that while students reported high access to personal technological devices for language learning, they faced significant constraints in accessing computer laboratories and developing digital English learning materials. Additionally, limitations were observed in their engagement with technology-enhanced educational research. The findings indicated no statistically significant correlations between digital equity and gender, academic year, or socioeconomic status. Both students and instructors encountered these challenges, underscoring the urgent need for institutional strategies to mitigate digital disparities in higher education. Ultimately, the study concluded with several pedagogical implications.

KEYWORDS

digital divide, digital equity, ESL, higher education, blended learning, e-learning, mobile learning

1 Introduction

Education has been dramatically transformed by the advent of technology (Charania and Davis, 2016), and technology has gained a momentum and pivotal role in ensuring learning success through the integration of digital tools into learning environments (Golzar, 2019). Today, it is difficult to even imagine classrooms without digital tools; Collin and Brotcorne (2019) emphasize their effectiveness in both teaching and learning. However, this rising rate in utilizing modern technology has brought the issue of digital equity to the forefront. Addressing digital equity in education involves ensuring access to modern technologies for learners regardless of their socioeconomic status, race, gender, culture, or language (Solomon et al., 2003). While access to devices and internet connectivity is crucial (Frank et al., 2021; Anderson and Kumar, 2019), achieving digital equity is more than just access (Resta et al., 2018). Although digital technology advancement poses various tensions—mainly in deepening digital inequity—detaching entirely from the digital world leaves students at a disadvantage in an increasingly interconnected society (Laskar, 2023). Despite its importance, digital equity in higher education remains understudied (McLean et al., 2020), particularly in Afghanistan. This study, as a result, aims to assess the digital equity status of ESL students at an Afghan public university and investigate strategies for improving digital equity to optimize learning outcomes.

1.1 Conceptualizing digital equity

Drawing on findings by Yang et al. (2018) and Golley and Kong (2016), it can be inferred that indirect factors like socioeconomic status and the provision of educational services along with direct factors like human and technological resources are the two primary mechanisms that affect education quality. Correspondingly, many studies have been conducted to express the efficacy of deploying technology in learning environments, like improving students' motivation (Putra et al., 2025), outcomes (FutureSource, 2016; Nagel, 2016; Putra et al., 2025), and engagement (Ma et al., 2024; Putra et al., 2025), particularly, engaging students to enhance their functional and practical skills (Qizi, 2021). Namely, Yousofi (2022) investigated the efficacy of Grammarly in English as a Foreign Language (EFL) classrooms, demonstrating that technology tools can considerably enhance writing skills, especially in contexts like Afghanistan where access to educational resources is limited. Likewise, Ma et al. (2024) inspected on the impact of integrating technology on students' learning outcomes in Shenzhen, China, resulting in engaging students and acquiring skills, though limited digital infrastructure and a paucity of professional teacher training were reported as hindrances. Besides, Lo and Chan (2024) examined the potential effects of game-based learning (GBL) in Hong Kong higher education, discovering that it positively influenced student engagement, motivation, and learning outcomes compared to traditional methods. Moreover, integrating technology in schools exponentially influenced learning and teaching practices (Papendieck, 2018), and it was reported that the educational technology industry invested $8.4 billion or so in schools (Davis, 2019).

Although a myriad of studies investigated the educational technology area, little is known about digital equity (Tawfik et al., 2016). Digital equity is a multidimensional complicated notion (Willems et al., 2019), comprised of the followings: access to hardware, software, and internet connection; access to meaningful culturally high-quality content; access to creating, sharing, and exchanging digital content; access to trained digital educators; and access to high-quality research of technology use in developing students' learning (Resta et al., 2018). Some researchers critically studied the abovementioned dimensions separately (Foulger et al., 2017; Leibowitz and Bozalek, 2016; Willems and Bossu, 2012; Warschauer et al., 2004).

Research on technology and equity originally focused on unequal physical access to computers and Internet at home and workplaces (Warschauer et al., 2004). Leibowitz and Bozalek (2016) also stated that accessing the internet and digital knowledge is crucial for both educators and students in higher education. Foulger et al. (2017) expressed their concerns about the lack of adequate digital educators to implement technology in learning environments. Willems and Bossu (2012) argued that the role of language instruction and the relationship to context and localization of content are all critical as equity entails inclusive learning and teaching. Besides, Yuen et al. (2017) argued that students' access is exclusively linked to their cultural capital, indicating that access to technology has a direct relationship with culture.

Solomon et al. (2003) studied digital equity in education, and they found out that the main purpose of digital equity is to ensure that people of all socioeconomic backgrounds, races, genders, cultures, and languages have access to digital technologies. This view of digital equity is broader since it considers classism, linguicism, racism, and sexism (Gorski, 2009). As a result, it does not limit digital equity to computer access in the learning environment (Warschauer, 2003). Furthermore, the issues of socioeconomic status, gender, and geographical areas are constantly up for debate (Lambert, 2020). However, gender and socioeconomic status are not regarded as critical variables in terms of digital equity (Xie et al., 2021).

1.2 Digital equity in higher education

Even though digital access and equity have been addressed many times by various educational institutions, technology access in higher education has received little attention (McLean et al., 2020). The issue of technology and internet, in higher education, is highly important (Leibowitz and Bozalek, 2016; Selwyn, 2016). Therefore, the complicated and multifaceted issue of equity is expanding (Willems et al., 2019). Frank et al. (2021) counted digital equity, in higher education, as a critical factor for learners' success.

To support the argument, Nagle and Vitez (2021) added that not having adequate access to technological content negatively influenced students' academic achievements. According to Robinson et al. (2015), digital equity is pivotal since access to technology in higher education is extensively connected to students' achievements and prospects. To share their perspectives and beliefs, it is necessary for all learners to learn how to deploy new technologies (Alexander et al., 2016). Finally, higher education institutions should be included in the discussion on the need of obtaining the appropriate digital skills and equipment to attain greater achievements and performance (McLean et al., 2020).

1.3 Bridging the digital equity gap

Despite various positive perspectives concerning digital equity, some gaps have been reported. In 2020, the COVID-19 pandemic became a global crisis, and the digital divide was greatly felt in different contexts (Frank et al., 2021; Young and Noonoo, 2020). The major concern for technology and equity research was unequal physical access to computers and internet, categorized under the "Digital Divide" topic (Warschauer et al., 2004). The digital divide is known as an enlarging concern in education (Aguilar, 2020), recognizing significant correlation between education and socio-economic development (Resta et al., 2018; Hohlfeld et al., 2017). This is a result of the influence of economic, cultural, and linguistic contexts on the use of educational technology (Warschauer et al., 2004).

Roth (2020) and McLaughlin (2016) also addressed the barriers created due to technology integration for low-income students. Submitting homework assignments online was a new challenge for those not accessing technology—no computer at home—(Warschauer and Matuchniak, 2010) and infrastructure—inadequate high-speed internet (Frank et al., 2021; Anderson and Kumar, 2019; McLaughlin, 2016; King County, 2015). Namely, Kinnard and Dale (2020) stated that nearly 3 million students

struggled to do their assignments due to not having internet access at home, making students utilize parking lots to use schools', libraries', or restaurants' Wi-Fi to complete their learning tasks (as cited in Roth, 2020, p. 15).

The other challenge is that some instructors do not have enough knowledge to teach through technology (McLean et al., 2020; Golzar, 2019; Kurt, 2018; Koh, 2018; Warschauer et al., 2011; Hohlfeld et al., 2008). Lo (2023) found that although online education improved accessibility, encouraged flexibility for certain instructors, and supported blended learning, it also created issues like less interactivity, technical constraints, work-life imbalance, and conflict with communicative language teaching—emphasizing the need for more pedagogical support and ICT training. As inequalities at schools still exist due to the quality and quantity of computer equipment (Cuban, 2001), Warschauer et al. (2004) argued that inequity would be addressed by distributing well-experienced instructors among Low-SES schools and High-SES schools. Additionally, Roth (2020) expressed that not only high-speed internet access, but also competent instructors are necessary for quality education and improving digital equity. Correspondingly, Amirova et al. (2023) recommended the provision of professional development for untrained educators as a means to reduce digital inequity.

In highly developed societies, efforts to overcome the digital divide have been undertaken. For example, research conducted by Middleton and Chambers (2010) introduced Wi-Fi utilization to resolve the problem. Frank et al. (2021) recommended supporting digital requirements in public libraries to provide opportunities for all learners despite their socio-economic conditions to use technological equipment. However, the digital divide is still a prominent and concerning issue in higher education in under-resourced contexts, like Afghanistan (The Ministry of Communication and Information Technology, 2018). Namely, Sarwari et al. (2021) reported that a great number of Afghan students do not have access to fundamental technological tools, including internet connectivity. To overcome the digital divide in education, providing computers for both High-SES and Low-SES is an important issue (Warschauer et al., 2004). Therefore, the current study offers a critical investigation of digital equity in higher education in Afghanistan. As technology integration increases equity through technological skills and collaborative support development in addition to technological instructing skills (Davies and West, 2014), Roth (2020) strongly believes that our education system must encourage the idea of technological equity. If it does not, pedagogical outcomes could not be achieved (Doepke and Zilibotti, 2020).

Since little is known about digital equity in higher education in Afghanistan, this study examines ESL students' digital equity status at one of the public universities in the western part of Afghanistan. We explore ways to enhance digital equity and improve relevant instructions to maximize students' learning outcomes. This study is guided by the following research questions:

1. How is digital equity employed for ESL students at the collegial level?
2. What strategies support the development of digital equity in university-level ESL education?

We also test these three null hypotheses:

H1: Digital equity does not differ by gender.

H2: Digital equity does not differ by years of schooling in the university?

H3: Digital equity does not differ by students' socioeconomic status?

2 Materials and methods

The current mixed-methods study investigated the digital equity status of ESL students at an Afghan public university. Both teachers' and students' voices have been utilized to explore the means of reinforcing digital equity and advancing related instructions of enhancing students' learning. An explanatory mixed-methods design was employed to congregate the data set via both quantitative and qualitative approaches. Our mixed methods approach offers a thorough investigation of the case and provides rigorous findings (Creswell, 2012).

2.1 Context and participants

Technological advancements have been revolutionizing education and the way students learn, and they may assist teachers in taking students beyond their classes (Golzar, 2019). However, Afghanistan's digital divide has been multifaceted (The Ministry of Communication and Information Technology, 2018). The majority of students in Afghanistan have not had access to digital tools along with internet connectivity (Sarwari et al., 2021). Technology integration has been challenging in the Afghan context due to limited access to digital tools (Golzar, 2019). This is influenced by several factors, including living in remote areas and a lack of awareness about how to use digital technologies (The Ministry of Communication and Information Technology, 2018). Along the same line, Ehsan and Faqiry (2021) addressed a set of challenges Afghan public universities encountered in integrating ICT in the process of teaching and learning. They particularly reported scarcity of training, weak infrastructure, and teachers' and students' limited knowledge of ICT deployment. Also, students' low access and teachers' average access to ICT resources were noted coupled with the least possible of purposeful ICT use. Furthermore, Hashemi (2021) asserted some challenges that higher education institutes of Afghanistan struggled with deploying technology in online teaching, highlighting shortages of internet, electricity, skills, and technological tools. Thereupon, this study took place in the English Department, College of Letters and Humanities, at a public university in Afghanistan, examining the digital equity status of ESL students and empowering their voices to address the equity issues and possible implications to enhance students' learning.

TABLE 1 Questionnaire participants' demographic information.

Gender	Qty	Years of schooling	Qty	Socio-economic class	Qty
Male	30.8%	Sophomore	35.9%	Upper class	15.5%
Female	69.2%	Junior	20.5%	Average class	55.1%
		Senior	43.6%	Working class	25.6%
				Under class	3.8%
Total	100%	Total	100%	Total	100%

TABLE 2 Interview participants' demographic information.

Participants	Name	Age	Gender	School's year
Students	Narges	20	Female	Sophomore
	Negar	23	Female	Junior
	Sina	25	Male	Senior
	Ayda	23	Female	Senior
	Name	**Age**	**Gender**	**Degree**
Teachers	Ahmad	32	Male	MA in TESOL, USA
	Zahra	29	Female	MA in TESOL, USA

Two hundred college students majoring in English Language and Literature made up the entire target population. The online questionnaire was sent out to the whole population; however, only 78 students agreed to participate in the study and completed the survey. The participants were from various years of schooling: sophomores, juniors, and seniors of the English Department. There were 69.2% female students and 30.8% male students who completed the questionnaire. Distinctively, 35.9% sophomores, 20.5% juniors, and 43.6% seniors. Our participants came from different socioeconomic statuses, consisting of 15.5% upper class, 55.1% average class, 25.6% working class, and 3.8% underclass (Table 1). Concerning the use of digital devices in completing learning activities in the university, most participants, about 71.8%, responded using a smartphone, whereas some of them, about 26.9%, answered laptop, and a few of them, about 1.3%, responded desktop. They had different sources of internet connectivity at home and university. They had access to internet at home; 66.7% by cellular (SIM card), 26.9% by Wi-Fi and 6.4% by mobile hotspot. They also had access to internet at the university: 48.7% by cellular (SIM card), 23.1% by Wi-Fi, 7.7% by mobile hotspot, and 20.5% by none. Most participants, about 59%, considered the cost as the main barrier to internet access, 32% noted limited availability and 9% mentioned none of the two reasons.

Researchers first recruited three student participants (one sophomore, one junior, and one senior) from questionnaire's respondents through simple random sampling in which all the individuals had an equal chance to take part in semi-structured interviews (Noor et al., 2022). To ensure data saturation, the researchers randomly recruited another senior student since the former one did not offer adequate data. Moreover, two teachers (one novice and one experienced) from the English Department

were selected purposefully for having a better understanding of digital equity in the target institution. It must be noted that prior to conducting the study, we obtained students' and teachers' approval. Table 2 presents demographic information about interview participants.

2.2 Data collection

The data for this study was collected via two instruments, resulting in comprehensive findings. Initially, a Likert-scale questionnaire was sent out to the target population to examine the five digital equity dimensions proposed by Resta et al. (2018) (see Figure 1) along with the relevant barriers they have encountered when learning the English language. The questionnaire consisted of demographic information (gender, college year, socioeconomic class, etc.), 18 Likert-scale questions based on five dimensions of digital equity (Resta et al., 2018), with options from 1 (strongly disagree) to 5 (strongly agree), and five open-ended questions, consisting of barriers they encountered with the five dimensions of digital equity. The questionnaire's five constructs contained 18 items, which were formed as follows. The first construct included items pointing out access to device, internet, software, computer lab, and distributed devices. The second construct comprised items asking about accessing content, particularly high-quality and culturally relevant content. The third construct consisted of items requiring students to reflect on creating, sharing, and exchanging digital content. The fourth construct contained items related to accessing teachers' guide or instruction. The fifth construct focused on accessing high-quality research or scholarly papers. The questionnaire was designed via Google Forms and was individually distributed to participants through the Telegram application. It is worth mentioning that a bit of information concerning digital equity coupled with the aim of the study was dispatched with the questionnaire to the participants.

To meticulously explore the findings, face-to-face interviews were scheduled with six participants (two lecturers and four students). The interviews consisted of inquiries about participants' biography, their personal experience of deploying digital devices, their opinions and suggestions regarding technology use and digital equity in developing and maximizing students' learning. Through the interview process, follow-up questions were asked by the interviewers, as needed. Upon completion of students' interview and initial analysis, the need of taking some lecturers' perspectives was identified to add more valuable insights into the concepts covered by the two aforementioned instruments; investigating students' results and aligning the answers with the gaps raised up by the students.
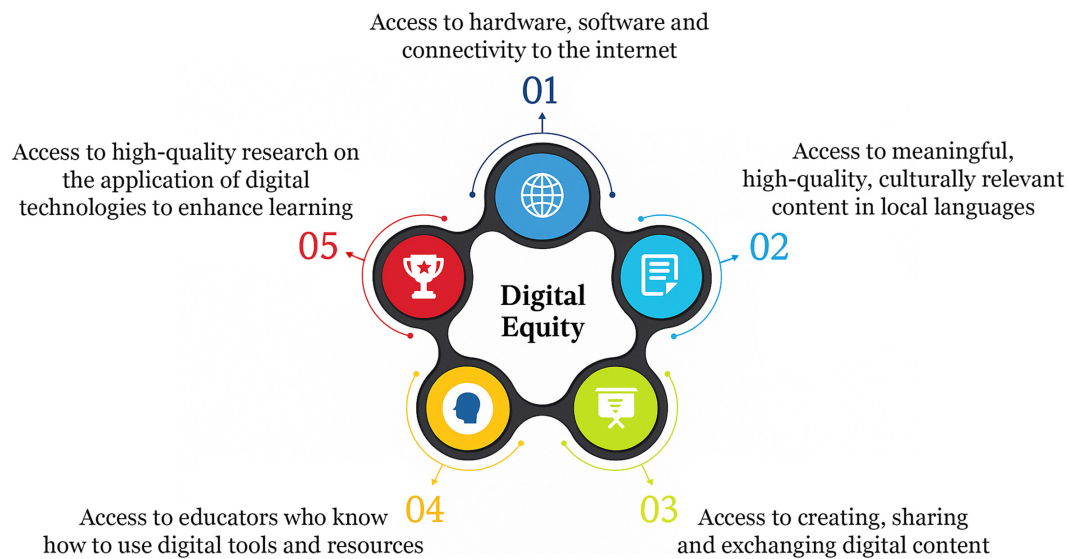
FIGURE 1
Digital equity dimensions proposed by Resta et al. (2018).

2.3 Data analysis

In this study, we utilized the five dimensions of digital equity (Resta et al., 2018) to investigate ESL students' equity status at the university. The aim of using this proposed framework was to simplify the data analysis process and focus on specific aspects of digital equity, leading to detailed results. The quantitative data from the questionnaire were analyzed through the Statistical Package of Social Sciences (SPSS) to obtain descriptive and inferential statistics. Independent sample t-test was run to examine whether a significant relationship exists between gender and digital equity across two groups. Subsequently, one-way ANOVA test was run to check the relationship between school's year and digital equity since there were three groups: sophomore, junior, and senior students. Moreover, a similar test was run to measure the associations between socio-economic status and digital equity across four groups: upper class, average class, working class, and under class. The questionnaire also passed the reliability test where the alpha coefficient for the 18 items was 0.906, suggesting that the items have relatively high internal consistency.

After conducting the interview, the qualitative data were analyzed via thematic analysis, which is "systematically identifying, organizing, and offering insights into patterns of meaning (themes) across a data set" (Braun and Clarke, 2012, p. 57). We first transcribed the interviews verbatim and read the transcripts frequently to understand the nature of the data. Subsequently, we identified codes across different data sets such as "internet connectivity," "inaccessibility due to internet," "prohibited from using digital tools due to cultural views," "digital utilization unawareness," "hardware and/or software problems," "inadequacy of well-versed educators," and the like. Through constant-comparison of codes, we identified the significant relationship between them, recognized the patterns and then categorized the codes into overarching themes. To ensure validity, we conducted the analysis individually once; we cross-examined various data sets

and shared their findings through a number of joint discussions. A rating agreement also applied to minimize subjectivity, with codes averaging above 4.8 on a 0–7 scale being selected. The final codes and themes were shared with interview respondents to check for accuracy. The themes are as it follows: technological accessibility hurdles, cultural content restrictions, creation and allotment content barriers, educators' unawareness in digital deployment, research article as the last means, and collegial digital equity impediments.

3 Results

3.1 Descriptive findings

The analysis of quantitative data revealed that the five dimensions of digital equity have gained varied descriptive statistics. These are *access to hardware, software, and connectivity to internet* (D1), *access to meaningful high-quality and culturally relevant content* (D2), *access to educators who know how to use digital tools and resources* (D3), *access to creating, sharing and exchanging digital content* (D4), *and access to high-quality research on the application of digital technologies to enhance learning* (D5). Digital equity obtained an average score ($M = 3.06$). See Table 3 for more information. Analysis of the individual variables indicated that ESL students had a low degree of access to computer labs and to high-quality research on learning technology. However, they reported a high degree of access to digital devices for English language learning ($M = 4.05$).

All three null hypotheses have come to be true. After running the t-test, the inferential statistics revealed that no significant difference existed between male and female students in terms of digital equity as p-value was above 0.05 (see Supplementary Table 1). Therefore, gender was not a robust factor to predict the level of digital equity among ESL students. Running one-way

TABLE 3 Descriptive statistics for digital equity dimensions.

Digital Equity Dimensions	N		Mean	Median	SD
	Valid	Missing			
Access to hardware, software, and connectivity to the internet	78	0	3.07	3.10	0.72514
Access to meaningful, high-quality, and culturally relevant content in local languages	78	0	3.17	3.00	0.82824
Access to creating, sharing, and exchanging digital content	78	0	2.85	3.00	0.95444
Access to educators who know how to use digital tools and resources	78	0	3.36	3.60	0.93424
Access to high-quality research on the application of digital technologies to enhance learning	78	0	2.87	3.00	0.94469
Composite value	78	0	3.06	3.27	0.70667

ANOVA, the results indicated that there was also no significant statistical difference between ESL students' years of schooling in the college and the digital equity (see Supplementary Table 2). It means digital equity did not increase as students went to a higher course level. Surprisingly, inferential statistics indicated that no relationship existed between the students' socioeconomic status and digital equity (see Supplementary Table 3).

3.2 Interviews' findings

Some teachers and students were asked to engage in thorough interviews to address the digital equity status of ESL learners in the English department; they pointed out challenges and obstacles plus some recommendations (see Table 4).

3.2.1 Technological accessibility hurdles

Most of the interviewed participants asserted that they employed both smartphones and laptops while learning English. However, they were inclined toward "smartphones over laptops because they are more transportable and accessible" (Ayda). To fulfill their English learning needs, they used technologies, "notably social media platforms such as Facebook, Telegram, WhatsApp, and YouTube, which give beneficial information" (Sina). However, challenges have begun while users start using the technology. Most participants indicated the "internet connectivity and accessibility to be a critical problem" (Negar). Similarly, Ayda said:

> I use the internet to help me learn English. Telegram, YouTube, and Facebook are some of my favorite apps. However, there are two major drawbacks of utilizing the internet. The first is internet speed and quality, while the second is internet cost.

Besides, some participants claimed that unstable electricity was another challenge as Negar asserted that "unstable electricity occasionally disrupted our studying sessions since we utilized digital tools—computers and projectors— in our classroom."

Along with the challenges they have shared, several recommendations were noted to tackle a few of the challenges. As the first and most serious problem was internet connectivity, they thought that "the government and higher education should provide free Wi-Fi on university campuses so that students can use the internet from everywhere on campuses" (Sina). Also, they

TABLE 4 Interviewed participants' views on challenges and solutions of digital equity.

Themes	Barriers	Recommended solutions
Technological accessibility hurdles	Internet connectivity Unstable electricity	Free Wi-Fi in campus Special SIM card for students Setting aside computer laboratories
Cultural content restrictions	Inaccessibility due to internet Prohibited from using digital tools due to cultural views	Consulting with parents Promoting digital utilization
Creation and allotment content barriers	Digital utilization unawareness Hardware and/or software problems	Consulting with classmates and instructors
Educators' unawareness in digital deployment	Inadequacy of well-versed educators	Holding seminars and workshops on digital utilization Exchanging their knowledge of digital utilization
Research article as the last means	No interest in research articles	None
Collegial digital equity impediments	Variety of socio-economic classes No free internet for students Low speed; spot-limited internet for teachers Inadequate digital literacy Time-consumption of preparing digital content	Being flexible Internet budget Teacher training on how to use e-learning; watching online content Giving rewards and making digital utilization mandatory

kindly requested from the Ministry of Higher Education and policymakers of Afghanistan to consult with "telecommunications companies about giving free high-quality internet to students or just decreasing the cost of internet for students" (Negar), or "make special SIM cards for students so as they can access the internet for free everywhere not just in university campuses"

(Ayda). Furthermore, to cope with a paucity of digital tools, they suggested that "the government and higher education should set aside certain computer laboratories for students at universities" (Negar). Negar stated that "certain professors should be [also] allocated to educate students how to use digital tools, material, and resources."

3.2.2 Cultural content restrictions

Meaningful high-quality and culturally relevant content has been a tremendous matter for having digital equity. Some participants reported having access to relevant, meaningful high-quality content of English. Others noted that they have not had access as Narges said, "due to internet problems, I am unable to access high-quality content. I can't even get good-quality videos to download." Also, none of them has experienced cultural restrictions banning them to utilize technologies. However, they alluded to some of which they have witnessed people encounter. In this regard, Negar said:

> *I have no cultural boundaries when it comes to utilizing digital technologies. However, I know several women who were not permitted to have or use digital devices, such as smartphones, computers, or the internet, owing to cultural views. They couldn't utilize digital tools at public libraries or internet clubs, either.*

Likewise, Sina asserted that "some girls in my class were unable to access the instructional materials. However, as their educational level increased—freshman to senior—this difficulty became less of an issue."

To deal with such barriers, they have suggested some solutions, resulting in deducting cultural restrictions. Technology deployment is restricted in Afghanistan by a set of cultural barriers in which "television, as a technical device, is inextricably linked to this problem" (Ayda) because TV stations in Afghanistan "do not deliver culturally acceptable programming and entertainment, which drastically alters families' attitudes about technology" (Ayda). One of the recommended solutions was consulting and talking to their parents. Sina thought that "students communicating with their families can help them modify their minds [about technology use]." Similarly, Negar believed that "classmates and friends' interactions with parents of wronged girls can be effective in overcoming the issue of technology access for females based on the culture." Another recommendation was promoting the concept of technology use as an effective way of hastening people's progress. Negar said, "To resolve this concern, an extensive program should be implemented to persuade people that technology has numerous advantages and is beneficial to community improvement."

3.2.3 Creation and allotment of content barriers

All students are notified that they have created and shared digital content in English. They have been created for a variety of purposes: namely, writing projects, scholarships, response assignments, and other projects. To illustrate, Negar described the process of her digital content creation:

> *As an assignment, in a group of three students, we had to compose a short tale. To create our story, we had to*

read a lot of other works. The major difficulty for us was finding relevant information; nevertheless, the technology and internet greatly assisted us in our search. We searched then shared our findings through the Telegram group and wrote the story parts individually. Afterward, we compiled it all together. Additionally, because we lacked appropriate writing skills—common blunders, grammar, word choice, spelling, and structures—, the technology and internet aided us in creating the tale with no mistakes.

Some participants have encountered a few challenges. The main challenge was not knowing how to use technology to resolve their digital-solvable problems. As Negar said, "One problem we had was that we had no idea where to go to rectify writing faults." In addition, some minor challenges have been reported like "the computer hanging and the power going out" (Ayda). In a nutshell, all of the challenges came across the solution Sina recommended: "If I have run into any technical difficulties or have had trouble accessing pertinent data, I would have used the support of my classmates and professors."

3.2.4 Educators' unawareness in digital deployment

Accessing well-trained educators of digital utilization is a conspicuous issue. Fortunately, all participants alleged that they have had access to well-experienced educators, instructing them on using and finding digital tools and resources. However, the number of available educators was controversial; some asserted that they had "access to a few well-versed educators" (Sina), yet others claimed all their professors were well-trained in digital tools deployment. To fill the existed gap, they have shared some recommendations saying:

> *The government and higher education should regularly hold more seminars or academic meetings connected to digital tools and resources for low-experienced teachers till they get more knowledge and experience. In this regard, some attempts have been made so far, such as a seminar for professors on the SPSS software; nevertheless, more attention is necessary.* (Sina)

Along the same line, Negar stated that "instructors can contribute their suggestions for improving the learning environment using digital technologies there [seminars and academic meetings]."

3.2.5 Research article as the last means

With regard to accessing high-quality research article, all participants claimed no interest in reading research articles due to varied impetuses. Sina reported:

> *I have not looked into any research on digital tools and resources since I have not needed them. Our lecturers occasionally provide us with resources related to technology use in education in the classroom, which eliminates the need to seek further information.*

In addition to Sina's response, Ayda affirmed that "I try my hardest to tackle my technological issues on my own." Sina,

however, declared that "students' lethargy and carelessness also contribute to their failure to read scholarly publications about digital technologies and resources."

3.2.6 Collegial digital equity impediments

To look attentively at the notion of digital equity through teachers' eyes, it "means being fair in terms of access to technology" (Ahmad). Ahmed continued stating, "when it comes to incorporating technology in the curriculum, considering the background, interest and needs of students in mind whether students have access to a particular technology or whether they have the knowledge and based on those issues planning something." Thus, the considerations while integrating the technology are the inception of hindrances. First of all, owing to different socio-economic classes, the digital divide happens more than usual.

> *Due to students' various backgrounds [socio-economic classes], students do not have access to basic technologies. For example, there are a lot of students who do not have a laptop. When I ask them to write an essay, they have to either go to a computer lab at university or have to borrow a laptop at home.* (Ahmad)

Second, even though universities can provide digital hardware and/or software for students, there is always inadequacy of internet connectivity. Students do not have access to a free internet connection at university campuses, whereas teachers have access to it; although, the connection is spot-limited with quite a slow speed as asserted by Ahmad:

> *In our institution, we have the devices, such as computers, we can also provide the software by sharing it, but the major problem on our way is the internet access. Most of the students complain about not having enough credits for activating their personal internet.* (Zahra)

Third, as Ahmad claimed, "adequate digital literacy" leads to more issues compared to a paucity of access to digital devices. To illustrate, "there are still some students who do not know how to use Microsoft Word, and they have difficulty preparing PowerPoint" (Ahmad). Fourth, the timing seems to be an issue for teachers since "preparing digital content takes time for teachers" (Ahmad).

The teachers affirmed some deemed solutions to the hindrances mentioned above. To see economic-class variety causing digital divide, they suggested flexibility:

> *In my courses, I try to keep my students' background, skills and economic conditions in mind in order to do something. For example, I never require students that it is a must that you print all your essays and bring them into the class. In Afghanistan, all students cannot follow the same policy since they have come from different backgrounds.* (Ahmad)

Despite the diversity of students' backgrounds, educators strive to organize their curriculum to avoid being culturally irrelevant to students. In this regard, Ahmad stated that "I inspect and care for the materials used in my courses. If the content of my course curriculum is culturally inappropriate, I amend it, and fortunately, the Afghan higher education system allows instructors to do so."

Besides, to cope with internet access issues, "there must be a plan in higher education, providing academic institutions with internet or at least a small budget." (Zahra). In addition, "there should be some training for teachers to learn how to use e-learning for students" (Ahmad), and for students, "we can introduce some foreign educators, so students can watch their content online" to develop their digital literacy (Zahra). To address the time-consuming nature of technology integration—which may discourage teachers from using digital tools in the classroom—the participants suggested that the Ministry of Higher Education offer incentives to those who implement technology and also mandate its use. They argued that such measures could yield numerous benefits, particularly improving the accuracy of student records. As one participant noted, "If everything is done online, each semester, teachers upload the results online in the database and students access their scores, and no one can change them" (Ahmad).

4 Discussion

The findings of this mixed-methods study revealed that ESL students at a public university in Afghanistan demonstrated a moderate level of digital equity. However, this contrasts with Khan et al.'s (2012) assertion that the digital divide remains substantial due to disparities in technology access. Resta et al. (2018) emphasized that well-trained mentors and high-quality research play pivotal roles in mitigating this gap and addressing systemic inequities. These insights align with Khlaif et al.'s (2020) hypothesis—that Afghanistan has issues with digital fairness and access to educational materials—which offers some useful recommendations for improving the digital equity status of students in higher education.

The study also revealed that the majority of ESL students had access to digital devices for studying English. However, some students still have difficulty using digital resources. Collis and Vegas (2020) argued that lower income families do not have access to digital materials. Lambert (2020) stated that concerns of socioeconomic status and gender are very disputed in terms of digital equity. However, Xie et al. (2021) argued that the aforementioned factors are not that significant. Cultural and societal constraints also exist in Afghanistan. Elaiess (2017) argued that females' access to technology is not equivalent to men's (as cited in Mariscal et al., 2019). In terms of digital equity, the study found no significant differences between ESL students' years of studying. It shows the fact that college students acknowledge the importance of educational technologies and digital resources in their learning and build a positive mindset about them.

The lack of significant differences by gender, socioeconomic status, or years in college challenges prevailing assumptions in digital equity literature that these factors are always influential. This may suggest that, within the ESL context of this Afghan university, structural limitations—like shared infrastructure or uniform lack of institutional support—create a leveling effect across demographic lines. Rather than individual background characteristics, it may be systemic factors (e.g., limited institutional investment and unreliable internet) that shape access and engagement most

profoundly. This raises the need to shift digital equity interventions from individual-level solutions to systemic reforms.

Aligned with Nagle and Vitez's (2021) findings, the current study revealed that university students' academic performance is hampered by a lack of access to digital information. It also showed that some students have access to relevant, high-quality, and culturally acceptable content. Similarly, Noorajan (2020) argued that Afghani online learning was extremely impoverished, noting that access to the internet and digital learning tools are still not available in most educational institutions.

The findings suggest that cultural restrictions and infrastructural gaps cannot be addressed in isolation. Cultural attitudes toward technology—particularly toward women using digital tools—are exacerbated by the lack of inclusive digital literacy initiatives at both family and institutional levels. This dual-layer challenge points to the importance of designing digital equity strategies that are both socially embedded and context-sensitive. A top-down provision of tools without addressing community beliefs may be insufficient. Thus, culturally aware outreach—such as including parents in awareness campaigns—may serve as a critical component of digital equity efforts in conservative contexts. Yet, focusing too heavily on technological fixes—such as providing devices or connectivity—without attending to the pedagogical and social structures surrounding their use risks falling into a form of technological solutionism (Selwyn, 2016). This can mask deeper issues of teacher workload, curricular relevance, or cultural alignment. Digital equity must be understood as a complex, ongoing process rather than a checklist of tools provided.

Willems and Bossu's (2012) study also corroborate our findings. They found that learning material and activities should be culturally relevant to enhance equality. The teacher participants respected community values and designed their activities and programs so that they did not contradict those values. In a similar vein, Yuen et al. (2017) argued that access to appropriate digital tools is connected to a student's culture. When it comes to using digital tools, none of the students confront any cultural restrictions. They found that only some female students faced constraints, but this will become less of a problem in the future. The major cause has been identified as inappropriate televised programs, which create a negative attitude toward technology in the minds of parents. Yuen et al. (2017) proposed that the government and policymakers should monitor what content and programs are broadcasted and provide technology capacity-building initiatives for the entire community.

Despite completing a range of digital tasks, students faced persistent difficulties such as limited access to digital sources, tools, academic applications, and the ability to troubleshoot technological glitches. However, Saay and Norta's (2018) argued that higher education institutions have made progress in developing a reliable and effective e-learning system. Students interact with professors via social media and face-to-face meetings during office hours to gain access to relevant information, websites, and technical support. Our findings support the recommendation of Kshema (2016) that digital literacy programs can be tailored because it is important for both students and instructors (Leibowitz and Bozalek, 2016), and learners should be taught how to collaborate, communicate, create, and design using new technologies in order to exercise problem solving skills.

However, the data suggest that access alone does not translate into transformative learning. Many students engage with digital tools at a surface level, using them to complete assignments rather than as platforms for critical inquiry or knowledge production. This points to a hidden layer of inequity—where digital participation lacks depth or agency—echoing Gorski's (2009) critique of tokenistic digital inclusion. To move from mere access to authentic equity, institutions must design experiences that empower students to create, critique, and lead in digital spaces.

While students emphasized the utility of peer and instructor support, the burden placed on instructors—especially without structural backing—risks burnout or passive resistance. The absence of incentives and overreliance on a few digitally literate faculty members can lead to stagnation in broader technology adoption. Addressing this requires not just seminars, but the development of professional learning communities where instructors share innovations and challenges. Institutional commitment to teacher digital development must be framed not as a one-off intervention, but as an ongoing, supported process that values teacher agency and sustainability.

In this study, most teacher participants were technologically savvy. Yet, Foulger et al. (2017) raised serious concerns about a shortage of competent, experienced instructors when it comes to integrating technology into the classroom. Callo and Yazon (2020) and Aboagye et al. (2020) argued that the root cause of many tensions is lack of professional development as some teachers do not possess technological, pedagogical and content knowledge (TPACK). Moreover, Teachers "reported institutional, pedagogical, and sociocultural tensions with varying degrees in context of Afghanistan such as low access to basic infrastructure and professional support, greater responsibility, top-down online policies, [and so on]" (Golzar et al., 2023, p. 1). Ultimately, due to institutional neglect and systemic challenges, students lose interest in engaging with research that could support a more equitable digital learning environment. As a result, Wang et al. (2009) and McLean et al. (2020) call for more technology-related seminars and conferences for teachers, especially novice instructors to develop their skills and knowledge to ensure digital equity. This also raises questions about the role of higher education institutions in reproducing inequity: when technology initiatives are implemented without attention to existing disparities in access, infrastructure, or pedagogical preparation, they risk widening gaps rather than closing them.

In a nutshell, our findings support the assertion of Solomon et al. (2003) stating that the major purpose of digital equity is to ensure that people of all socioeconomic backgrounds, races, genders, cultures, and languages have access to digital technology. Furthermore, policymakers and higher education systems should remove logistical constraints, increase access, provide high-quality digital relevant content and improve college students' and teachers' literacy, knowledge and skills.

5 Conclusion

The findings of the study explore the challenges of ESL students' digital equity along with a range of recommendations. Due to the digital divide's existence in Afghanistan, this study sheds light on

various aspects and suggests meliorations for policymakers and The Ministry of Higher Education (MOHE). This report can serve as a road map for identifying and addressing key aspects of digital disparity in Afghanistan. Furthermore, certain coping measures are revealed, with which policymakers and the MOHE will be able to ameliorate the existing technological imbalance.

The results draw attention to pedagogical implications for advancing digital equity in Afghanistan's higher education system. Overcoming obstacles to technological accessibility calls for actions like offering free Wi-Fi on college campuses and lowering student internet costs by working with telecom providers or governmental programs. The lack of digital resources can also be lessened by setting up computer labs and providing instruction to students on how to use digital technologies. Efforts should be made to enhance internet connectivity and offer high-quality, culturally relevant educational resources. Additionally, cultural barriers preventing some groups from using technology should be addressed. Frequent seminars aimed at improving instructors' digital abilities and knowledge are necessary due to educators' lack of understanding regarding digital deployment. Lastly, barriers to collegial digital equity such as the digital gap and poor internet connectivity necessitate adaptable curriculum design strategies and e-learning methodology training for educators. Reward systems and required digital utilities can encourage the use of technology in the classroom, resulting in better learning outcomes and more accurate student evaluations.

Furthermore, the study suggests that digital equity should not be framed solely as an issue of access to tools or internet connectivity. The findings reveal that even when students have basic access, a lack of institutional support, culturally sensitive content, and adequate training for both students and instructors can inhibit meaningful digital engagement. Structural challenges—like uneven policy enforcement, under-resourced infrastructure, and cultural constraints—must be addressed through system-level interventions that go beyond individual effort.

As dealing with digital inequity in a developing country like Afghanistan is arduous and requires a plethora of time, efforts, and budgets, this study calls upon teachers and educators to be soft and flexible toward their students while assigning them to activities that entail the use of technology. Furthermore, it suggests that the Ministry of Higher Education holds different competitions for students to create innovative digital content. Lastly, this study suggests other researchers involved in digital equity and technological imbalance in higher education, Afghanistan to examine each facet of digital equity separately, examining the hindrances as well as some applied solutions in-depth. Future study in Afghanistan's higher education sector should prioritize identifying gender-specific impediments to digital equity, with a particular emphasis on female students' access to technology and online learning potential. Additionally, there is a huge research deficit in effective pedagogical practices for achieving digital equity in online learning settings, demanding the incorporation of linguistic variety and cultural contexts. It is critical to examine the role of government policies and activities in addressing digital equity challenges, such as financing for technological infrastructure and digital literacy programs. Lastly, in order to solve issues with digital equity and guarantee equitable access to education in Afghanistan, future researchers should investigate cooperative relationships between higher education institutions, governmental

bodies, non-profits, and the commercial sectors. These partnerships should focus not only on distributing digital tools but also on fostering sustainable ecosystems for digital learning—ones that are inclusive, localized, and attuned to the cultural and linguistic diversity of Afghan higher education. To further understand how digital disparities appear in various educational environments, future research should investigate cross-institutional and cross-national comparative studies. For instance, comparing student access, educational adaptations, and digital infrastructure among institutions in various geographical areas.

One main limitation of this study was relying on participants' self-reported data without external observations of actual institutional infrastructures to validate findings. Since the research did not incorporate triangulation through such observations, the results may be influenced by participants' subjective biases or self-perception inaccuracies. To ensure more validity, further studies could implement various external observations and internal assessments to gauge digital equity. Besides, although the study could provide insight into digital equality concerns in Afghan higher education, the findings are based on a single institution and a small sample size. As a result, national-level generalizations should be approached with caution.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

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Supplementary material

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References

Aboagye, E., Yawson, J. A., and Appiah, K. N. (2020). COVID-19 and e-learning: The challenges of students in tertiary institutions. *Soc. Educ. Res.* 1, 109–117. doi: 10.37256/ser.122020422

Aguilar, S. J. (2020). Guidelines and tools for promoting digital equity. *Inform. Learn. Sci.* 121, 285–299. doi: 10.1108/ils-04-2020-0084

Alexander, B., Adams Becker, S., and Cummins, M. (2016). *Digital literacy in higher education, Part I: An NMC Horizon Project strategic brief (Vol. 3.3)*. Austin, TX: The New Media Consortium

Amirova, A., Nurumov, K., Kasa, R., Akhmetzhanova, A., and Kuzekova, A. (2023). The impact of the digital divide on synchronous online teaching in Kazakhstan during COVID-19 school closures. *Front. Educ.* 7:1083651. doi: 10.3389/feduc.2022.1083651

Anderson, M., and Kumar, M. (2019). *Digital Divide Persists Even as Lower-Income Americans Make Gains in Tech Adoption*. Washington, DC: Pew Research Center.

Braun, V., and Clarke, V. (2012). "Thematic analysis," in *APA Handbook of Research Methods in Psychology*, Vol. 2, ed. H. Cooper (Washington, DC: American Psychological Association), 57–71.

Callo, E. C., and Yazon, A. (2020). Exploring the factors influencing the readiness of faculty and students on online teaching and learning as an alternative delivery mode for the new normal. *Univ. J. Educ. Res.* 8, 3509–3518. doi: 10.13189/ujer.2020.080826

Charania, A., and Davis, N. E. (2016). A smart partnership: Integrating educational technology for underserved children in India. *Educ. Technol. Soc.* 19, 99–109.

Collin, S., and Brotcorne, P. (2019). Capturing digital (in) equity in teaching and learning: A sociocritical approach. *Int. J. Inform. Learn. Technol.* 36, 169–180. doi: 10.1108/IJILT-05-2018-0059

Collis, V., and Vegas, E. (2020). *Unequally Disconnected: Access to Online Learning in the U.S.* Washington, DC: Brookings Institution.

Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative*, 4th Edn. Saddle River, NJ: Prentice Hall.

Cuban, L. (2001). *Oversold and Underused: Computers in the Classroom*. Cambridge, MA: Harvard University Press.

Davies, R. S., and West, R. E. (2014). "Technology integration in schools," in *Handbook of Research on Educational Communications and Technology*, eds J. M. Spector, M. D. Merrill, J. Elen, and M. J. Bishop (Cham: Springer), 841–853.

Davis, M. (2019). *K-12 Districts Wasting Millions by not Using Purchased Software, New Analysis Finds*. Available online at: https://marketbrief.edweek.org (accessed May 14, 2019).

Doepke, M., and Zilibotti, F. (2020). *COVID-19 and Children's Education*. New York, NY: Psychology Today.

Ehsan, F. H., and Faqiry, F. M. (2021). Integration of ICT in the teaching and learning processes in Afghan public universities: A case study of Kabul polytechnic university. *Int. J. Sci. Eng. Sci.* 5, 35–41.

Elaiess, R. (2017). Digital divide in Libya: A general assessment. *Int. Res.* 7, 1–9.

Foulger, T. S., Graziano, K. J., Schmidt-Crawford, D. A., and Slykhuis, D. A. (2017). Teacher educator technology competencies. *J. Technol. Teach. Educ.* 25, 413–448.

Frank, J., Salsbury, M., McKelvey, H., and McLain, R. (2021). Digital equity and inclusion strategies for libraries. *Int. J. Inform. Divers. Inclusion* 5, 185–202. doi: 10.33137/ijidi.v5i3.36190

FutureSource (2016). *Education Technology Hardware Spend In K-12 Increases 7% in 2015*. Chennai: FutureSource Consulting.

Golley, J., and Kong, S. T. (2016). Inequity of opportunity in China's educational outcomes. *China Econ. Rev.* 51, 116–128. doi: 10.1016/j.chieco.2016.07.002

Golzar, J. (2019). *Educational Technology Use at Afghan Public Universities: A Study of Technology Integration*. Indiana, PA: Indiana University of Pennsylvania.

Golzar, J., Sarwarzada, T., and Miri, M. A. (2023). Coping with teacher professional identity tensions: Using TPACK during global crisis time. *J. Lang. Identity Educ.* 1–19. doi: 10.1080/15348458.2023.2281952

Gorski, P. C. (2009). Insisting on digital equity: Reframing the dominant discourse on multicultural education and technology. [Feature ABI: Y]. *Urban Educ.* 44, 348–364. doi: 10.1177/0042085908318712

Hashemi, A. (2021). Online teaching experiences in higher education institutions of Afghanistan during the COVID-19 outbreak: Challenges and opportunities. *Cogent Arts Hum.* 8:1947008. doi: 10.1080/23311983.2021.1947008

Hohlfeld, T. N., Ritzhaupt, A. D., Barron, A. E., and Kemker, K. (2008). Examining the digital divide in K-12 public schools: Four-year trends for supporting ICT literacy in Florida. *Comput. Educ.* 51, 1648–1663. doi: 10.1016/j.compedu.2008.04.002

Hohlfeld, T. N., Ritzhaupt, A. D., Dawson, K., and Wilson, M. L. (2017). An examination of seven years of technology integration in Florida schools: Through the lens of the levels of digital divide in schools. *Comput. Educ.* 113, 135–161. doi: 10.1016/j.compedu.2017.05.017

Khan, G. F., Moon, J., Swar, B., Zo, H., and Rho, J. J. (2012). E-government service use intentions in Afghanistan: Technology adoption and the digital divide in a war-torn country. *Inform. Dev.* 28, 281–299. doi: 10.1177/0266666912438879

Khlaif, Z. N., Salha, S., Affouneh, S., Rashed, H., and ElKimishy, L. A. (2020). The COVID-19 epidemic: Teachers' responses to school closure in developing countries. *Technol. Pedagogy Educ.* 30, 95–109. doi: 10.1080/1475939X.2020.1851752

King County (2015). *King County Performance 2015: Executive Summary*. Available online at: https://kingcounty.gov/~/media/depts/executive/performance-strategybudget/PerformanceAndStrategy/Executive_Priorities_Summary_032217.ashx (accessed July 10, 2014).

Kinnard, M., and Dale, M. (2020). *School shutdowns raise stakes of digital divide for students*. Associated Press. Available online at: https://apnews.com/article/us-news-ap-top-news-sc-state-wire-south-carolina-virus-outbreak-588cc887c8a949c874841ef489c80184 (accessed March 30, 2020).

Koh, J. H. L. (2018). TPACK design scaffolds for supporting teacher pedagogical change. *Educ. Technol. Res. Dev.* 67, 577–595. doi: 10.1007/s11423-018-9627-5

Kshema, J. (2016). Digital literacy matters: Increasing workforce productivity through blended English language programs. *High. Learn. Res. Commun.* 6, 1–17. doi: 10.18870/hlrc.v6i4.354

Kurt, S. (2018). Moving toward a universally accessible web: Web accessibility and education. *Assistive Technol.* 31, 199–208. doi: 10.1080/10400435.2017.1414086

Lambert, S. R. (2020). Do MOOCs contribute to student equity and social inclusion? A systematic review 2014–18. *Comput. Educ.* 145:103693. doi: 10.1016/j.compedu.2019.103693

Laskar, M. H. (2023). Examining the emergence of digital society and the digital divide in India: A comparative evaluation between urban and rural areas. *Front. Sociol.* 8:1145221. doi: 10.3389/fsoc.2023.1145221

Leibowitz, B., and Bozalek, V. (2016). The scholarship of teaching and learning from a social justice perspective. *Teach. High. Educ.* 21, 109–122. doi: 10.1080/13562517.2015.1115971

Lo, N., and Chan, S. (2024). "Gamification for higher education applications," in *Handbook of Research in Online Learning*, eds T. Martindale, T. B. Amankwatia, L. Cifuentes, and A. A. Piña (Chennai: Brill) 576–610. doi: 10.1163/9789004702813_025

Lo, N. P. K. (2023). Digital learning and the ESL online classroom in higher education: Teachers' perspectives. *Asian-Pac. J. Sec. Foreign Lang. Educ.* 8, 1–22. doi: 10.1186/s40862-023-00198-1

Ma, X. Z., Ertmer, P. A., Pelgrumen, C. P. M., Watsonta, J. R., and Tanu, M. C. S. (2024). The impact of technology integration on student learning outcomes. *JTL* 1, 73–90. doi: 10.54443/ijset.v2i9.218

Mariscal, J., Mayne, G., Aneja, U., and Sorgner, A. (2019). Bridging the gender digital gap. *Economics* 13, 1–12 doi: 10.5018/economics-ejournal.ja.2019-9

McLaughlin, C. (2016). *The Homework Gap: The Cruelest Part of the Digital Divide.* Washington, DC: NEA Today.

McLean, S., Frazier, V., and Vo, T. (2020). *Barriers to Digital Equity: A Case Study of King County.* Seattle, WA: Seattle University.

Middleton, K. L., and Chambers, V. (2010). Approaching digital equity: Is wifi the new leveler? *Inform. Technol. People* 23, 4–22. doi: 10.1108/09593841011022528

Nagel, D. (2016). *Spending on Instructional Tech to Reach $19 Billion within 5 Years.* Available online at: https://thejournal.com/articles/2014/06/11/spending-on-instructional-techto-reach-19-billion-within-5-years.aspx (accessed June 11, 2016).

Nagle, C., and Vitez, K. (2021). *Fixing the Broken Textbook Market.* Denver, CO: U.S. PIRG Education Fund.

Noor, S., Tajik, O., and Golzar, J. (2022). Simple random sampling. *Int. J. Educ. Lang. Stud.* 1, 78–82. doi: 10.22034/ijels.2022.162982

Noorajan, A. (2020). "A critical reflection of teacher education policies and programs in Afghanistan," in *Teacher Education in the Global Era*, ed. K. Pushpanadham (Cham: Springer). doi: 10.1007/978-981-15-4008-0_14

Papendieck, A. (2018). Technology for equity and social justice in education: A critical issue overview. *Texas Educ. Rev.* 6, 1–9. doi: 10.15781/T2891278V

Putra, R. G., Koto, R. D., Wagino, W., Maksum, H., Saputra, H. D., and Fernandez, D. (2025). Meta-analysis study: Application of technology enhanced learning model on student learning outcomes. *EduLine* 5, 148–155. doi: 10.35877/454RI.eduline3555

Qizi, K. D. S. (2021). "The use of technology in English language learning," in *Proceedings of the Euro-Asia Conferences*, Chennai (124–127).

Resta, P., Laferriere, T., McLaughlin, R., and Kouraogo, A. (2018). "Issues and challenges related to digital equity: An overview," in Second handbook of information technology in primary and secondary education, eds J. Voogt, G. Knezek, R. Christensen, and K. W. Lai (Cham: Springer), 1–18. doi: 10.1007%2F978-3-319-53803-7_67-1

Robinson, L., Cotten, S. R., Ono, H., Quan-Haase, A., Mesch, G., Chen, W., et al. (2015). Digital inequities and why they matter. *Inform. Commun. Soc.* 18, 569–582. doi: 10.1080/1369118X.2015.1012532

Roth, K. (2020). *Technology in Education: The Ongoing Debate of Access, Adequacy and Equity.* Available online at: https://educate.bankstreet.edu/independent-studies/248 (accessed April 21, 2020).

Saay, S., and Norta, A. (2018). An architecture for e-learning infrastructures on a national level: A case study of the Afghanistan Research and Education Network. *Int. J. Innovat. Learn.* 23, 54–75. doi: 10.1504/IJIL.2018.088790

Sarwari, K., Kakar, A. F., Golzar, J., and Miri, M. A. (2021). Distance learning during COVID-19 in Afghanistan: Challenges and opportunities. *E-Learn. Digit. Media* 19, 144–162. doi: 10.1177/20427530211044757

Selwyn, N. (2016). Digital downsides: Exploring university students' negative engagements with digital technology. *Teach. High. Educ.* 21, 1006–1021. doi: 10.1080/13562517.2016.1213229

Solomon, G., Allen, N. J., and Resta, P. E. (2003). *Toward Digital Equity: Bridging the Divide in Education.* Hoboken, NJ: Prentice Hall.

Tawfik, A. A., Reeves, T. D., and Stich, A. (2016). Intended and unintended consequences of educational technology on social inequality. *TechTrends* 60, 598–605. doi: 10.1007/s11528-016-0109-5

The Ministry of Communication and Information Technology (2018). *ICT Policy for Afghanistan.* Available online at: https://mcit.gov.af/sites/default/files/2018-12/information%20and%20communications%20technology%20Policy%20of%20MCIT%20.pdf (accessed May 2, 2025).

Wang, F., Kinzie, M. B., Mcguire, P., and Pan, E. (2009). Applying technology to inquiry- based learning in early childhood education. *Early Childhood Educ. J.* 37, 381–389. doi: 10.1007/s10643-009-0364-6

Warschauer, M. (2003). Dissecting the "digital divide": A case study in Egypt. *Inform. Soc.* 19, 297–304. doi: 10.1080/01972240309490

Warschauer, M., Cotton, S., and Ames, M. G. (2011). One laptop per child birmingham: Case study of a radical experiment. *Int. J. Learn. Media* 3, 61–76. doi: 10.1162/IJLM_a_00069

Warschauer, M., Knobel, M., and Stone, L. (2004). Technology and equity in schooling: Deconstructing the digital divide. *Educ. Pol.* 18, 562–588. doi: 10.1177/0895904804266469

Warschauer, M., and Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Rev. Res. Educ.* 34, 179–225. doi: 10.3102/0091732X09349791

Willems, J., and Bossu, C. (2012). Equity considerations for open educational resources in the glocalization of education. *Distance Educ.* 33, 185–199. doi: 10.1080/01587919.2012.692051

Willems, J., Farley, H., and Campbell, C. (2019). The increasing significance of digital equity in higher education. *Aust. J. Educ. Technol.* 35, 1–8. doi: 10.14742/ajet.5996

Xie, Z., Xiao, L., Hou, M., Liu, X., and Liu, J. (2021). Micro classes as a primary school–level mathematics education response to COVID-19 pandemic in China: Students' degree of approval and perception of digital equity. *Educ. Stud. Math.* 108, 65–85. doi: 10.1007/s10649-021-10111-7

Yang, H. H., Zhu, S., and MacLeod, J. (2018). Promoting education equity in rural and underdeveloped areas: Cases on computer-supported collaborative teaching in China. *Eur. J. Math. Sci. Technol. Educ.* 14, 2393–2405. doi: 10.29333/ejmste/89841

Young, J. R., and Noonoo, S. (2020). *Education World Reacts to Coronavirus: The Latest Developments.* Available online at: https://www.edsurge.com/news/2020-03-05-education-world-reacts-to-coronavirus-the-latest-developments (accessed May 2, 2025).

Yousofi, R. (2022). Grammarly deployment (in)efficacy within EFL academic writing classrooms: An attitudinal report from Afghanistan. *Cogent Educ.* 9:2142446. doi: 10.1080/2331186X.2022.2142446

Yuen, A. H., Park, J. H., Chen, L., and Cheng, M. (2017). Digital equity in cultural context: Exploring the influence of Confucian heritage culture on Hong Kong families. *Educ. Technol. Res. Dev.* 65, 481–501. doi: 10.1007/s11423-017-9515-4