frontiers | Frontiers in Education

TYPE Original Research
PUBLISHED 16 October 2024
DOI 10.3389/feduc.2024.1449363

OPEN ACCESS

EDITED BY
Fezile Özdamlı,
Near East University, Cyprus

REVIEWED BY
Katerina Kedraka,
Democritus University of Thrace, Greece
Fatma Miralay,
Near East University, Cyprus
Sezer Kanbul,
Near East University, Cyprus

*CORRESPONDENCE
Bianca Ifeoma Chigbu
✉ bianca7h@yahoo.com

RECEIVED 14 June 2024
ACCEPTED 27 September 2024
PUBLISHED 16 October 2024

CITATION
Lukashe M, Chigbu BI and Umejesi I (2024) Synchronous online learning and career readiness in higher education: student perceptions, challenges, and solutions. *Front. Educ.* 9:1449363. doi: 10.3389/feduc.2024.1449363

Synchronous online learning and career readiness in higher education: student perceptions, challenges, and solutions

Mihlali Lukashe, Bianca Ifeoma Chigbu* and Ikechukwu Umejesi

Department of Sociology and Anthropology, University of Fort Hare, Alice, South Africa

Synchronous Online Learning (SOL) environments have rapidly transformed the educational landscape. However, there is limited research on their efficacy in equipping students with the necessary skills to succeed in the workforce, particularly in developing essential professional skills like digital literacy, interpersonal communication, and practical experience. This study explores how SOL impacts students' readiness for the workforce and the development of these critical skills. The research employed a qualitative methodology involving in-depth interviews with 27 third- and fourth-year students from a South African university. Purposive sampling was used to capture diverse experiences regarding SOL and its influence on professional skill development. Thematic analysis was performed to identify critical patterns and insights from the interviews. Findings reveal that SOL environments effectively enhance students' technical skills and digital adaptability, essential for navigating a digital workforce. However, SOL is inadequate in developing interpersonal skills and providing practical, hands-on experiences. Students reported a lack of networking opportunities and expressed concerns about their preparedness for the demands of real-world employment, particularly in fields requiring strong interpersonal skills and practical experience. The study highlights the need for educational innovations that combine the benefits of digital learning with comprehensive skill development strategies, particularly in soft skills and experiential learning.

KEYWORDS

synchronous online learning, career readiness, professional skills development, digital literacy, interpersonal skills, higher education, educational technology

1 Introduction

With the shift to online education, Zoom, Microsoft Teams, and Google Meet platforms have become central to virtual learning environments. This study uses the term Synchronous Online Learning (SOL) to describe real-time educational activities conducted through these platforms. These platforms enable live interaction through features like breakout rooms, polls, and chat functions, which actively engage students and promote immediate feedback from instructors. The accelerated transition to SOL environments catalyzed by the COVID-19 pandemic represents a pivotal shift in the educational landscape, fundamentally altering traditional pedagogical models and the dynamics of student engagement and learning (Andrew et al., 2021; Díaz, 2020; Papavasiliou and Papavasiliou, 2021).

While this transformation offers unprecedented access to education across geographical barriers, enhancing digital literacy and facilitating the integration of technology in learning

processes (Nurbekova et al., 2022), it raises significant concerns regarding the development of interpersonal and practical communication skills that are vital for career readiness. Synchronous online education impacts many disciplines differently, influencing academic achievement according to the field of study. In applied fields like medicine and engineering, students frequently encounter difficulties from insufficient practical training, as virtual settings fail to adequately emulate clinical laboratories and physical demonstrations (Haftador et al., 2021; Wu et al., 2022). In disciplines such as business and computer science, virtual learning has demonstrated favorable results as students gain flexible access to resources and interactive tools that improve engagement and performance (Gunawan and Shieh, 2023; Xhomara and Dasho, 2023; Zekaj, 2023). Research highlights the necessity for customized strategies in virtual learning since academic achievement might differ markedly based on the alignment of the virtual format with course prerequisites (Goode et al., 2022).

Additionally, the DIGIGLO framework emphasizes the need for educators to continuously develop digital competence to meet the demands of evolving educational technologies and ensure students are adequately prepared for the digital workforce (Alarcón et al., 2020). Practical communication is a cornerstone of academic competence, including digital literacy, as it supports a student's ability to collaborate effectively, develop leadership skills, and navigate professional environments (Duncan et al., 2017; Plotnikova and Strukov, 2019; Weritz, 2022). Interpersonal skills, such as communication and teamwork, are increasingly demanded in the modern workforce (Myers et al., 2014; Spivakovskyy et al., 2020). However, they are often underdeveloped in SOL environments due to the lack of spontaneous, face-to-face interactions.

Research indicates that digital competence and reading skills are interrelated, with students' ability to effectively comprehend and analyze information in digital formats influencing their broader digital literacy (Soboleva et al., 2020). This interconnection suggests that an inability to foster robust reading and communication skills within virtual learning environments may also limit students' digital competence (Soboleva et al., 2020). Moreover, understanding how digital reading influences digital competence is essential for enhancing students' overall readiness for both academic and professional success (Castro and Sevillano, 2022; Khulwa and Luthfia, 2023; Pikhart et al., 2023).

Furthermore, the transition to online education has spotlighted and possibly exacerbated existing educational inequities (Dawadi et al., 2024; Gohain, 2024; Supovitz et al., 2023). Students from economically disadvantaged backgrounds may encounter significant barriers, including limited access to reliable internet and computing resources, which can impede their full participation in digital learning environments (Drane et al., 2020). This digital divide affects immediate educational outcomes and has long-term implications for career readiness and equity in employment opportunities (Drane et al., 2020; Surianshah, 2021). Moreover, the SOL model's limited provision for experiential learning—such as internships, laboratory work, and other practical engagements—poses additional challenges (van Wart et al., 2020), mainly for students in low-resource contexts (Supovitz et al., 2023). These experiences are critical for bridging theoretical knowledge with practical application, a gap that online platforms are structurally ill-equipped to close (Afzal et al., 2023; Iftikhar et al., 2022; van Wart et al., 2020). The absence of these practical experiences can leave students underprepared for the demands of professional environments, where applied skills and hands-on knowledge are indispensable (Al Kaabi and Qawasmeh, 2020).

Addressing the gap in soft skills development extends across all educational levels, from primary education to higher education and vocational training. Still, it is particularly critical in higher education, where students prepare to enter the workforce. Interpersonal skills are essential for students to effectively communicate, collaborate with others, and navigate professional environments in higher education. A study by Chigbu et al. (2023) and Chigbu and Nekhwevha (2022) emphasizes that students inadequately equipped to meet the requirements of contemporary workplaces are frequently poorly prepared. In the same vein, Jones and Brady (2022) contend that SOL environments, while advantageous in numerous respects, often lack the spontaneous interactions and nonverbal communication opportunities that facilitate the development of interpersonal skills.

This study, set within the context of higher education in South Africa (SA), aims to critically examine the impact of SOL on students' career readiness. In SA, where educational inequities are stark, addressing the soft skills gap is particularly urgent. The country's reliance on SOL environments during and after the COVID-19 pandemic has further spotlighted these inequities, particularly for students from rural or under-resourced communities who may lack the infrastructure to engage fully with SOL platforms. This study seeks to understand the depth and breadth of professional skills development within SOL frameworks and to identify strategic interventions that could enhance educational outcomes and better prepare students for professional success. By investigating these dynamics, the study intends to contribute to the broader discourse on educational equity and effectiveness in the era of digital learning, proposing pathways for innovation in higher education that align with the needs and challenges of the future workforce. The paper is organized as follows: Section 2 reviews previous findings on SOL. Section 3 presents the conceptual model. Section 4 covers research methodology and data collection. Section 5 presents the results and its discussions. Section 6 provides practical implications, while Section 7 provides conclusions and limitations with recommendations for future research.

1.1 Literature review

SOL has reshaped educational paradigms, introducing opportunities and challenges affecting student career readiness (Dhawan, 2020; Goh and Abdul-Wahab, 2020; Rahimi and Oh, 2024; Singha and Singha, 2024). Extant literature emphasizes that virtual environments facilitate the expansion of digital literacy, a fundamental skill set in today's technology-driven workplace (Khulwa and Luthfia, 2023). A study by Lacka and Wong (2021) underscores the critical nature of digital proficiency as a core competency in the future labor market, highlighting that SOL environments can effectively deliver content that enhances these skills. However, while these platforms impart digital and technical knowledge, they frequently fail to foster comprehensive professional skills (Soeprijanto et al., 2022). According to Lindsey and Rice (2015), although students can acquire theoretical knowledge and basic technical skills through online courses, the absence of interactive, face-to-face learning experiences significantly hinders the development of interpersonal skills such as empathy, collaborative work, leadership, and teamwork (Tiwari and Tiwari, 2021). This gap is further explored in a study by Jones and Brady (2022), who argue that the virtual setting often lacks the organic, spontaneous interactions critical for cultivating a deep understanding

of non-verbal communication and other soft skills essential for workplace success.

Furthermore, the literature reveals a concerning divide in access to and quality SOL, exacerbating educational inequities (Al Kaabi and Qawasmeh, 2020). Students from lower socio-economic backgrounds are often disadvantaged by poor digital infrastructure, which limits their ability to engage fully with online learning platforms, affecting their overall educational outcomes and future job prospects. Surianshah (2021) points out that this digital divide not only impacts academic performance but also restricts these students' opportunities for networking and career advancement. On the practical experience front, Bimrose and Brown (2019) highlight the challenges associated with the SOL format's inability to offer real-world and hands-on experiences, such as internships and laboratory work, that are crucial for bridging the gap between academic theories and professional practices. The absence of such experiences can leave graduates ill-prepared for the demands of the workforce, which increasingly values academic knowledge and the ability to apply this knowledge in practical settings (Udeogalanya, 2021). Therefore, while SOL offers a range of benefits, it also poses significant challenges that educational institutions must address to fully prepare students for the complexities of the modern job market (Soboleva et al., 2020).

1.2 Conceptual framework

The conceptual framework for understanding the impact of SOL on career readiness and professional skill development critically examines how the shift to SOL has influenced students' perceptions of their preparedness for the workforce. Key concepts include digital adaptability and proficiency, networking and interpersonal skills, practical experience and career support, and soft skills development. While SOL positively influences students' digital proficiency due to increased reliance on digital tools, it simultaneously undermines networking and interpersonal skills due to the lack of in-person interactions, which limits students' ability to build meaningful professional connections and excel in team-based environments (Pitcher et al., 2022; Withanachchi et al., 2022). Figure 1 depicts the conceptual framework for understanding the impact of SOL on career readiness and professional skill development.

Furthermore, SOL restricts access to practical experiences like internships and career workshops, creating perceived skill gaps that hinder career readiness. Although higher digital proficiency directly contributes to improved career readiness, the limited opportunities for developing soft skills pose a significant challenge in a rapidly evolving workforce. Therefore, addressing gaps in practical experience, networking opportunities, and career workshops is crucial for students to effectively navigate the complexities of the future workforce (AbuKhousa and Atif, 2016; Gardner et al., 2021). The framework visually represents the intricate relationships among these critical concepts, emphasizing the need for comprehensive support through online internships, mentorship programs, and skill development workshops to bridge the gap between digital adaptability and holistic career readiness (Rodriguez and Lieber, 2020).

2 Methods and design

2.1 Research design and participants

This investigation implements a qualitative research methodology to 27 third- and fourth-year students from a South African university to explore their experiences with SOL and its impact on professional skill development. The qualitative approach is particularly well-suited for this investigation because it enables the exploration of nuanced perspectives and identifying themes that may not be observable through quantitative methods (Creswell and Poth, 2016). This methodological decision is consistent with the study's objective to obtain comprehensive, in-depth insights into how SOL environments affect the development of critical professional skills. This study explores the effectiveness of SOL platforms and their impact on student engagement and career readiness. Specifically, the research is guided by four key questions: First, it examines what SOL activities are perceived as most effective for fostering student engagement within SOL environments. Second, the study investigates how students perceive the advantages and challenges of SOL compared to traditional

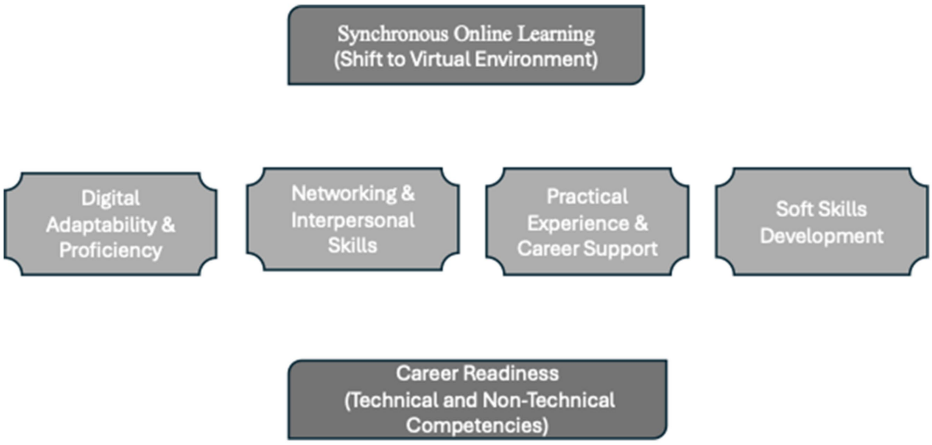

FIGURE 1
Conceptual framework for understanding the impact of SOL on career readiness and professional skill development.

face-to-face learning. Third, it explores how SOL prepares students for career readiness in a digital workforce. Finally, the research seeks to identify strategies to implement in SOL environments to enhance student engagement, motivation, and career preparedness. In particular, a phenomenological design was adopted to understand and interpret the lived experiences of students facing the challenges of SOL.

The purposive sampling of 27 participants in the study guaranteed a diverse representation of perspectives on SOL. Purposive sampling was implemented to identify individuals who could furnish pertinent, comprehensive data (Patton et al., 2024). The participants were enrolled third- and fourth-year students (withheld for blind review). The selection of third- and fourth-year students enabled the capture of perspectives from individuals at critical stages of their academic journey, closely approaching entry into the workforce. The sample size was determined by data saturation, which occurred when no new themes emerged during the analysis, indicating that the information was sufficiently rich (Fusch and Ness, 2015). Although the sample size is limited and consistent with qualitative research, this study does not aim to generalize its findings to the entire population. Instead, it seeks to provide detailed insights into participants' lived experiences. Future studies may expand on these findings by incorporating more extensive, diverse samples to validate the results across different contexts. This sampling strategy aimed to ensure robust findings by capturing a comprehensive range of experiences from various demographic backgrounds and disciplines (Morrison and Hughes, 2023; Villon et al., 2023). Participants were selected to reflect a diversity of demographic characteristics that could influence their experiences with SOL (Table 1).

This diversity ensured that the findings captured not only the broad impacts of SOL but also the nuanced ways in which factors such as access to technology, academic discipline, and socioeconomic status shaped students' experiences. The study aimed to provide a more holistic understanding of how SOL environments influence career readiness by including students from various fields and backgrounds.

2.2 Ethical considerations, instruments, and data collection procedure

All participants provided informed consent before participating in the study. All participants were apprised of the study's objectives, the voluntary nature of their participation, and their right to withdraw at any time without penalty. The transcripts were stripped of all identifying information to guarantee confidentiality, and pseudonyms were employed to report the findings. Data were securely stored in password-protected files accessible only to the research team. To ensure that the study adhered to ethical standards in human research, the University of (University of Fort Hare) Research Ethics Committee granted ethical approval. To increase the credibility and validity of the findings, this study implemented triangulation by integrating various data sources and methodologies. The primary data were obtained through semi-structured interviews, which provided extensive qualitative insights (Tolich, 2020) into their experiences with SOL and professional skill development. Participants could freely express themselves through the interview format, which resulted in exhaustive and detailed data that reflected their viewpoints on various subjects, such as digital literacy, career preparation, and student engagement. Examples of the interview questions were:

- Can you describe how SOL has impacted your ability to develop professional skills?
- What challenges have you faced in maintaining interpersonal relationships with your peers and instructors in a virtual environment?
- What are the main advantages of SOL over traditional face-to-face learning?

A small group of students piloted the interview guide to refine questions and guarantee clarity. Interviews were conducted in person and via online platforms, contingent upon the availability and preferences of the participants, to ensure inclusivity and flexibility. The interviews were audio-recorded and supplemented with field notes to capture contextual information and non-verbal indicators. They all lasted between 30 and 40 min. To mitigate variability in the data collection process, the researchers conducted all interviews, ensuring data collection's consistency and reliability (Castillo-Montoya, 2016; Majid et al., 2017).

In addition, the study incorporated secondary data from existing literature, reports, and prior studies pertinent to career readiness, digital literacy, and SOL. This secondary data was employed to contextualize and substantiate the primary findings, thereby establishing a more comprehensive framework for understanding the extent to which the results are consistent with or different from established research in the field. The study triangulated its findings by incorporating primary data from interviews and secondary data from the literature, ensuring the conclusions were robust, well-supported, and reflective of multiple perspectives.

TABLE 1 Overview of participant characteristics.

Demographic factor	Details
Age range	20–25 years
Gender	Balanced representation of male and female
Socioeconomic background	Low-, middle-, and high-income households
Academic disciplines	Social sciences, humanities, management, commerce, science, agriculture, education, law

2.3 Data analysis

Thematic analysis, as outlined by Braun and Clarke (2006), was employed to analyze the interview data. The process began with the transcription of all interviews, followed by an initial reading to gain familiarity with the data. An initial coding framework was developed based on the interview guide, which covered four key areas: (1) student engagement with SOL activities, (2) perceptions of the advantages and challenges of SOL compared to traditional face-to-face learning, (3) career readiness and preparation in virtual learning environments, and (4) the overall impact of SOL on student motivation and wellbeing. During the initial data review, several emerging patterns were identified, including student satisfaction with interactive features (e.g., polls, quizzes, and live Q&A sessions),

challenges with technical issues (e.g., connectivity problems and platform limitations), and perceptions of collaboration within group projects. These patterns and the interview guide formed the basis for systematic coding. The data were then systematically coded using NVivo software, allowing for the organization and retrieval of coded data. Codes were grouped into broader themes that aligned with the research questions and reflected recurring insights from participants. The five key themes that emerged from the analysis were as follows:

1 Effectiveness of SOL Activities: This theme included interactive lectures, multimedia content, and group projects, which participants frequently cited as influential in fostering engagement and active learning.
2 Advantages of SOL: Students highlighted flexibility, accessibility, and time savings as significant benefits of SOL, which allowed them greater control over their schedules and learning environments compared to traditional in-person education.
3 Challenges in Career Readiness: This theme captured the difficulties students faced in gaining hands-on experience, practical skills, and networking opportunities, which are crucial for career preparation in a digital workforce.
4 Impact on Student Motivation and Wellbeing: The analysis revealed that extended screen time, isolation, and lack of structure negatively impacted students' motivation, focus, and mental health, with many expressing concerns about burnout and decreased engagement.
5 Preparedness for the Digital Workforce: Under this theme, participants discussed how SOL helped them develop essential digital skills and remote work capabilities, which they viewed as increasingly relevant for future employment.

These themes were reviewed and refined through iterative cycles, ensuring they accurately captured the data's essence (Aprile and Knight, 2020; Mueller, 2017). Validation techniques such as member checking and peer debriefing were utilized to enhance the credibility and reliability of the findings (Majid et al., 2017). The themes were interpreted based on the conceptual framework and existing literature, and the relationships between the themes were analyzed to provide a comprehensive understanding of the impact of SOL on career readiness. Finally, the themes were reported in the findings and analysis section, supported by participant-representative quotes to illustrate critical points.

3 Findings and analysis

3.1 Effective synchronous online learning activities

Some SOL activities may be perceived as more engaging and effective than others. Out of 27 participants, 20 students highlighted the significance of interactive lectures, group projects and discussions, and multimedia content in fostering an engaging SOL environment.

Interactive lectures conducted through Zoom, Microsoft Teams, and Blackboard were regarded as among the most effective SOL activities. Approximately 15 participants highlighted specific features like polls, quizzes, and question and answer (Q&A) sessions, which promoted active learning and immediate feedback. *Thelma* explained how these features enhanced engagement: *"One such activity is interactive lectures, in which lecturers conduct live sessions with interactive features like polls, quizzes, and Q&A sessions using tools like Zoom, Microsoft Teams, or Blackboard instead of traditional lectures" (P1).* The inclusion of real-time Q&A sessions and live polls also helps foster a communal learning environment where students can develop critical thinking skills. *Samuel* emphasized: *"In my experience, SOL activities that emphasize interactivity and critical thinking are the most effective. For instance, I particularly enjoy synchronous webinars that include live polls and Q&A sessions, as they offer immediate feedback and foster a sense of communal learning" (P2).* These features, mentioned by about 13 participants, allow students to connect theoretical knowledge with practical applications, ultimately deepening their understanding.

Collaboration through group projects and discussions emerged as a central theme, with 18 students finding these activities highly engaging and beneficial for skill development. *Akhona* highlighted the significance of collaboration: *"I find group projects and discussions the most engaging and effective in SOL. When we collaborate on assignments or tackle case studies, it feels like we are in an actual classroom, sharing ideas and building off each other's knowledge" (P3).* Breakout rooms and discussion boards facilitate more focused peer learning and idea-sharing environments. Group projects also help students develop essential problem-solving and teamwork skills. *Thando* elaborated: *"Group projects are an excellent option because they enable students to collaborate virtually while developing their communication, problem-solving, and teamwork skills" (P4).* Group work enables students to engage with diverse perspectives and refine their understanding of complex concepts.

Quizzes and short videos are particularly appealing due to their simplicity and clarity in conveying information, helping students retain core concepts. Approximately 12 participants emphasized the value of quizzes. *Sibu* stresses the value of quizzes: *"I think quizzes and short videos are the best. The quizzes help me check if I understand what we are learning, and the videos simply explain things" (P5).* Quizzes allow students to assess their understanding in real time, providing immediate feedback that encourages self-directed learning. Additionally, around 10 participants mentioned sharing articles, videos, or memes adds an element of fun to the SOL process. *Zikhona* continued: *"I also like when we can share stuff we find online, like articles or memes, with the class because it makes learning feel less stressful and more fun" (P6).* These informal sharing opportunities create a more relaxed environment, helping students relate course content to real-world applications.

The thematic analysis indicates that most students find interactive lectures, group projects, and engaging multimedia content the most effective and engaging activities in SOL environments. The combination of immediate feedback, collaborative skills development, and accessible multimedia enhances student engagement and promotes a positive learning experience. Most participants uncovered that interactive SOL activities, including multimedia content, exams, group projects, and live lectures, were the most effective in creating engagement. These activities fostered a virtual learning environment that facilitated the practical application of theoretical concepts, immediate feedback, and active participation. In particular, group projects were highly commended for their ability to foster

collaboration, problem-solving, and cooperation, essential skills for preparing for a career.

Interactive lectures conducted through platforms like Zoom, Microsoft Teams, and Blackboard are widely regarded as highly effective in promoting engagement and immediate feedback. Features like polls, quizzes, and Q&A sessions transform traditional lectures into active learning environments. These align with Chickering and Gamson (1987) principles of good practice in education, explicitly fostering active learning and student-faculty contact. These interactive features encourage communal learning and critical thinking, creating a more inclusive and participatory environment. Group projects and discussions, often facilitated through breakout rooms, are beneficial for developing essential skills. The collaborative benefits of group projects align with Johnson and Johnson (2009) theory of cooperative learning, which posits that group interactions foster more profound understanding and critical thinking (Lai, 2019; Ma et al., 2021). The emphasis on teamwork and problem-solving skills resonates with Vygotsky (1978) socio-cultural theory, highlighting the role of social interaction in cognitive development. Quizzes and short videos effectively convey information clearly and simply, allowing students to grasp core concepts. The preference for quizzes as a tool for immediate feedback supports the literature on formative assessment (Aryal, 2021), which indicates that such assessments significantly improve learning outcomes. Furthermore, sharing memes and videos introduces an element of informal learning (Nasibullov et al., 2021), which can reduce stress and enhance engagement. Ultimately, these findings highlight the significance of interactive lectures, group projects, and engaging multimedia content in fostering an effective and positive SOL environment.

3.2 Advantages of synchronous online learning

We present a thematic analysis of the most significant advantages of SOL compared to traditional face-to-face education, as highlighted by 25 of 27 participants. By classifying and categorizing the interview transcripts, key themes were identified that emphasize the advantages of flexibility, accessibility, personal comfort, and time and cost reductions in SOL.

Flexibility and accessibility were emphasized by 22 participants, who noted the ability to manage their schedules, engage in global learning, and review recorded lectures at their own pace. *Viwe* highlighted the importance of flexibility in managing schedules: *"The flexibility and accessibility of SOL provide a significant advantage over traditional face-to-face education. It allows me to manage my schedule, review recorded lectures at my own pace, and engage in a global learning environment, which enriches my academic experience" (P7).* This level of schedule management empowers students to balance academic commitments with personal and professional responsibilities. The global nature of SOL platforms enables students to connect with peers worldwide, enhancing their educational and cultural experiences. This interconnectedness fosters a diverse and enriching learning environment that traditional face-to-face settings may struggle to replicate.

Approximately 18 students highlighted time and cost savings as significant motivators for preferring SOL over traditional methods. The ability to save on commuting and other related expenses makes online education appealing. *Mohali* emphasized the convenience of studying from home: *"The biggest perk for me is that SOL saves time and money. I do not have to commute or worry about finding parking, and I can study from home. Plus, the recorded lectures make catching up on missed classes easy" (P8).* The elimination of daily commutes allows students to invest more time in studying or other productive activities, significantly improving their overall efficiency. Beyond time savings, SOL eliminates costs associated with transportation, accommodation, and other campus-based expenses. This makes education more accessible to students from diverse socio-economic backgrounds.

Attending classes in a relaxed environment is crucial to students' preference for SOL, as noted by around 16 participants. *Andy* emphasized the relaxed atmosphere of online courses: *"I like that I can join a class in my pajamas, and I can rewind the lectures if I did not catch something the first time. It's just way more relaxed and easier to keep up with" (P9).* The casual learning environment reduces stress and allows students to focus more on academic content without the pressures of formal settings. Recorded lectures that can be rewound and reviewed multiple times enable students to grasp complex concepts more effectively. This feature promotes self-directed learning and reduces anxiety associated with missing important information.

Students particularly appreciated the flexibility and accessibility that SOL offered, as it enabled them to effectively manage their schedules and reconcile their personal and academic responsibilities. Students could also interact with peers from various cultural contexts, which enhanced their academic experience due to the global connectivity that SOL platforms facilitated. SOL eliminated daily commutes and other expenditures associated with traditional in-person learning, which resulted in significant time and cost savings. Critical advantages of SOL include flexibility, accessibility, time and cost savings, and personal comfort. Flexibility emerged as a significant benefit, allowing students to manage their schedules and review recorded lectures at their own pace. The ability to "engage in a global learning environment" aligns with Moore (2018) theory of transactional distance, which posits that increased flexibility reduces psychological barriers to learning. Time and cost savings were highlighted as SOL eliminates the need for commuting, a finding supported by recent studies showing that online education reduces costs for institutions and students (Siddiqa, 2022). This financial accessibility makes education more inclusive, particularly for socio-economically disadvantaged students. Personal comfort, such as studying in pajamas, was emphasized, highlighting the relaxed atmosphere of SOL (Lindstrom et al., 2021). This aligns with research on learning environments, underscoring the importance of creating student-centered, comfortable spaces that reduce stress and facilitate learning. Collectively, these advantages illustrate the capacity of virtual learning to provide a more accessible, flexible, and comfortable educational experience, ultimately reducing barriers for a diverse range of students (Arora et al., 2023).

3.3 SOL, social disconnect, challenges, and coping strategies

The impact of virtual learning on social connections and the sense of community and belonging is presented in this section. Key themes emerged that reveal challenges and coping strategies related to the social aspects of virtual learning. A recurring theme, as highlighted by

20 participants, was the loss of casual and spontaneous interactions that traditionally occur on campus. This disruption has made it difficult for students to connect with their peers on a deeper level. *Viwe* emphasized the gap left by the lack of spontaneous interactions: *"SOL has made it challenging to connect with my peers on a deeper level. While we have occasional discussions on forums and breakout rooms, the absence of casual, spontaneous interactions leaves a gap in fostering a genuine sense of community" (P7). Mihlali* echoed this sentiment: *"While it's difficult to replicate the spontaneous conversations on campus, I've found solace in organized virtual study groups and extracurricular activities" (P10).* The absence of informal engagement opportunities prevents students from building more meaningful relationships, impacting their overall sense of community and belonging.

The loss of casual interactions has affected students' ability to build and maintain a community with their peers. The impact of this disconnect was further elaborated by 15 students, such as *Fred*, who noted how: *"This has impacted my overall feeling of belonging within the student body, and I find myself relying on personal networks outside of school for social support" (P11). Clement* mentioned a similar experience: *"It's been harder to connect with people since everything is online. We chat a bit in discussion forums, but meeting in person is different. I do not feel as much of a community vibe, which has affected how close I feel to my classmates" (P12).* These sentiments align with the research of Inan and Bolliger (2024), who noted that online learners often experience a reduced sense of community due to limited social presence.

Despite these challenges, around 12 participants found ways to maintain social connections and a sense of community through organized study groups and extracurricular activities. *Avela* highlighted the role of virtual study groups in maintaining connections: *"Even though I cannot see my friends in person, I feel like we are still connected. We text and have video calls after classes, so it's not too bad. The online study groups help us stay in touch and work together" (P13). Akhona* also found solace in structured online activities: *"I've found solace in organized online study groups and extracurricular activities" (P3).* These organized interactions align with research by Trespalacıos and Uribe-florez (2020), who found that virtual study groups can help foster a sense of community in online learning environments. Andy mentioned relying on personal networks outside of school for social support, highlighting an alternative coping strategy.

The thematic analysis of student perspectives on the impact of SOL on social connections and the sense of community and belonging reveals significant challenges and coping strategies. A recurring theme was the loss of casual and spontaneous interactions traditionally occurring on campus, making it difficult for students to connect with their peers on a deeper level. This disruption left a gap in fostering a genuine sense of community, and many students struggled to build and maintain a sense of belonging. The absence of informal engagement opportunities directly affected students' ability to develop meaningful relationships, leading to reliance on personal networks outside of school for social support (Lu and Zhang, 2023). The absence of practical, hands-on experience and opportunities to cultivate interpersonal and networking skills in virtual environments was a significant concern. The lack of in-person interaction impeded students' capacity to establish professional relationships and acquire real-world experience, which is essential for career success. Many students expressed apprehension that SOL environments, despite their ability to enhance their digital literacy, did not adequately equip them for the workforce in fields that necessitate applied skills. Despite the challenges, some students found solace in organized virtual study groups and extracurricular activities, which provided a structured environment for maintaining social connections. The findings also resonate with research, which noted that online learners often experience a reduced sense of community due to limited social presence. These insights emphasize the importance of creating structured virtual spaces for informal engagement and organized study groups to support students in navigating the social disconnect of SOL (Delahunty et al., 2014).

3.4 SOL and student motivation, focus, and wellbeing challenges

The impact of SOL on motivation, focus, and overall mental wellbeing is a significant concern. Students pointed out the challenges posed by virtual learning and the coping strategies students have employed. A consistent theme was decreased motivation and focus due to the lack of structure and increased screen time associated with virtual learning, as emphasized by 18 participants. *Caroline* highlighted how the absence of structured routines led to procrastination and isolation: *"SOL has undoubtedly affected my motivation and focus. The lack of structured routines has led to procrastination, and the absence of peer engagement has left me feeling isolated" (P14). Sibusiso* echoed the struggle with focus and motivation: *"Staring at a screen all day makes it hard to focus, and it's really easy to get distracted at home. My motivation goes up and down" (P15).* The absence of structured routines and accountability mirrors research findings on online education's impact on student motivation. Hong et al. (2021) noted that the lack of routine and physical presence often leads to procrastination and lower engagement.

The shift to SOL has also affected students' mental wellbeing, with approximately 14 participants mentioning monotony and lack of social interaction. *Zintle* emphasized the impact of monotony and social isolation: *"SOL has brought unique challenges to my mental wellbeing, particularly due to the monotony and lack of social interaction" (P16). Sindi* also highlighted feelings of isolation: *"The absence of peer engagement has left me feeling isolated" (P17).* These findings align with recent studies by Bakkialakshmi and Sudalaimuthu (2022) and De Michele (2020) that emphasize the psychological toll of isolation and monotony, contributing to increased stress and anxiety among students in virtual learning environments.

Despite the challenges, about 10 participants stated they had employed various coping strategies to improve motivation, focus, and mental wellbeing. *Thobela* found structure by creating a daily schedule and joining online study groups: *"To cope, I've created a daily schedule to maintain a sense of structure and joined virtual study groups for accountability" (P17). Thelma* highlighted the role of small goals in maintaining motivation: *"At first, it was hard to stay focused, but now I try to keep my motivation up by making small goals for each class" (P1).* Setting goals and creating schedules aligns with self-regulation strategies, emphasizing the importance of goal-setting and self-monitoring in improving motivation and focus. Around 9 students employed mindfulness practices, and 6 participants mentioned taking regular breaks to manage the screen. *Anathi* explained: *"I try to*

manage by taking breaks and going for walks to clear my head" (P18). Hendrick practiced mindfulness exercises and maintained social connections through video calls: *"I've found that practicing mindfulness exercises and maintaining regular contact with friends* via *video calls have helped mitigate these effects and improved my focus" (P19).* These coping strategies have been shown to reduce stress and improve focus.

This section presents a thematic analysis of how SOL has impacted student motivation, focus, and mental wellbeing, drawing on responses from four participants without revealing their identities. A pervasive theme was a notable decline in motivation and focus attributed to the absence of structured routines and the extensive screen time required by SOL environments. This lack of structure often leads to procrastination and feelings of isolation, mirroring findings that the absence of routine and physical presence can reduce student engagement and motivation (Hong et al., 2021). Moreover, students reported that the monotony and diminished social interactions inherent in SOL have adversely affected their mental wellbeing, contributing to increased stress and anxiety, a finding supported by Bakkialakshmi and Sudalaimuthu (2022) and De Michele (2020), who noted the psychological toll of isolation in online learning settings. Despite these challenges, the students also shared various coping strategies they have adopted to counter the negative impacts. One student created a personal schedule and joined virtual study groups to combat the loss of structured learning environments to foster accountability and structure, showing the importance of goal-setting and self-monitoring. Others mentioned setting small, manageable goals and taking regular breaks to manage screen fatigue and maintain focus. Some students have turned to mindfulness practices and maintained active social connections through digital means to enhance their mental resilience and focus, aligning with Seabrook et al. (2020) advocacy for mindfulness exercises to reduce stress and improve overall psychological wellbeing. These adaptive strategies (Chigbu et al., 2024) underscore the necessity for students to actively manage their learning environments and mental health in the face of the unique challenges posed by virtual learning.

3.5 Preparedness for real-world challenges and solutions for the future of work

We looked at how the shift to SOL has influenced students' perceptions of career readiness and their ability to develop professional skills. By coding and categorizing the responses of five students, key themes emerged that highlight the challenges posed by virtual learning and the support needed to bridge gaps, particularly in the context of the future of work. A consistent theme noted by 22 participants was the positive impact of SOL on students' adaptability to digital tools, which they see as crucial for the future of work. *Ayanda* noted that SOL improved their adaptability to digital tools, emphasizing their importance for the future of work: *"The shift to virtual learning has made me more adaptable to digital tools, which is crucial for the future of work" (P20). Hlengiwe* echoed this sentiment, highlighting digital collaboration and communication skills: *"SOL has expanded my proficiency in digital collaboration and communication, which are crucial professional skills for the future of work" (P21).* These insights align with the literature on the growing importance of digital skills in the future workforce (Chigbu et al., 2023; Chigbu and Nekhwevha, 2022; Chigbu and Nekhwevha, 2021). Navigating and leveraging digital tools for collaboration and communication is increasingly vital.

However, approximately 17 students consistently identified the negative impact of SOL on networking and interpersonal skills due to the lack of in-person interactions. *Avela* emphasized the decline in networking skills: *"My networking and interpersonal skills have suffered. To bridge this gap, more virtual networking events and workshops focusing on soft skills development would be beneficial as remote work becomes increasingly common" (P13). Clement* also highlighted the lack of in-person networking opportunities: *"The lack of in-person networking has made it difficult to build strong professional connections" (P12). Viwe* recognized the need for more practice working in teams: *"I've learned a lot about using online tools, which will help me in my career since more jobs are going remote. But I need more practice working in teams" (P7).* These challenges highlight SOL's limitations in providing adequate networking and team collaboration opportunities (Brewer et al., 2015; Lowenthal et al., 2020).

Around 15 students consistently expressed the need for practical, hands-on experience and additional career support to bridge gaps in their professional skills. *Sanele* felt they were missing practical skills due to the lack of internships: *"I feel like I'm missing out on hands-on experience. More internships would help us develop the digital and technical skills that employers will demand" (P22). Thabo* suggested virtual internships as a possible solution: *"Maybe more group projects or online internships could help." Hendrick* highlighted the need for workshops focusing on career skills: *"We could use more workshops on interviewing, resumes, and other career stuff to prepare us for remote work and digital collaboration" (P19). Eric* suggested virtual mentorship programs to bridge the networking gap: *"Online mentorship programs or alumni networking sessions could help bridge this gap and ensure we are ready for an increasingly digital workforce" (P23).* Some scholars advocate for practical experience and career workshops to enhance career readiness, particularly in an increasingly remote work environment (McQuillan et al., 2021).

The thematic analysis of how SOL has influenced students' perceptions of career readiness and their ability to develop professional skills reveals challenges and solutions, particularly in the future of work. A consistent theme was the positive impact of SOL on students' adaptability to digital tools, which they see as crucial for their future careers. However, students consistently identified the adverse effects of SOL on networking and interpersonal skills due to the lack of in-person interactions. This decline in networking opportunities has hindered the development of strong professional connections and teamwork skills. Recent research by Lowenthal et al. (2020) and Brewer et al. (2015) supports this, highlighting the limitations of virtual learning in providing adequate opportunities for networking and collaboration.

Furthermore, students expressed the need for practical, hands-on experience and additional career support to bridge gaps in their professional skills. The lack of internships and practical experience leaves them unprepared for employers' digital and technical demands. Solutions like online internships, mentorship programs, and career workshops focusing on interviewing and resume writing were suggested to enhance career readiness and prepare students for remote work and digital collaboration.

It is essential to expound upon the theoretical understanding of career readiness and to contextualize it inside SOL environments. Career readiness denotes the qualities necessary for effective

employment entrance (Chigbu and Nekhwevha, 2022), encompassing technical and interpersonal skills. The competencies delineated by Duncan et al. (2017), Plotnikova and Strukov (2019), and Weritz (2022) encompass critical thinking, communication, teamwork, digital literacy, and professionalism. The rise of remote and hybrid work arrangements has rendered flexibility and digital skills essential for career preparedness. SOL environments provide students significant opportunities to cultivate indispensable digital competencies in contemporary businesses. The requirement to utilize online platforms like Zoom, Microsoft Teams, and Blackboard improves students' competence in digital communication tools and collaborative technology. These platforms replicate professional situations, enabling students to hone abilities that correspond with the requirements of the modern digital workplace. Students in online environments frequently acquire skills in managing virtual meetings, collaborating on shared documents, and engaging in remote teamwork, all directly applicable to several careers.

Alongside technical competencies, SOL environments foster vital soft skills such as communication, collaboration, and self-regulation. The implementation of group projects, discussion forums, and peer cooperation in an online setting reflects the increasing focus on remote teamwork in professional environments. These experiences compel students to enhance their written communication, negotiate responsibilities within virtual teams, and efficiently manage their time—all essential skills for success in professional environments, especially in a globalized digital industry. A crucial element of professional preparedness cultivated by SOL is adaptability. In the contemporary, swiftly changing workplace, individuals must adapt to new technologies and platforms. SOL settings necessitate that students acclimatize to diverse technologies, formats, and autonomous learning modalities. The adaptability developed via the management of asynchronous courses, the transition between digital devices, and the navigation of remote cooperation is a highly sought-after attribute by several organizations. The ability to acquire new technologies and adapt to evolving processes will be essential in the future workforce.

Although SOL enhances the cultivation of technical and interpersonal abilities, it also poses problems, especially when acquiring practical skills. Numerous professional domains necessitate practical experience, whether via laboratory work, internships, or other modalities of applied learning (Sobri et al., 2023; van Wart et al., 2020). These changes may be constrained in a virtual setting, perhaps leading to students feeling inadequately prepared for real-world technical requirements. This particularly applies to sectors that depend significantly on face-to-face engagements or apparatus, such as healthcare or engineering. Consequently, guaranteeing that online education includes access to virtual simulations, remote internships, or project-based learning can assist in closing this gap in professional preparedness. A further problem posed by virtual learning is the absence of possibilities for networking and developing interpersonal interactions. Conventional, face-to-face educational environments facilitate impromptu discussions and casual exchanges, essential for building professional networks and honing interpersonal skills. In an online setting, organic connections are frequently supplanted by structured, scheduled engagements, complicating students' ability to develop professional relationships. This may hinder students throughout their transfer to the workforce when establishing a professional network, which is essential for career progression.

To comprehensively facilitate career readiness, learning institutions must undertake proactive measures to confront these issues. Integrating online internships, industry-associated projects, and remote mentorship initiatives can offer students avenues for real skill enhancement and professional networking, even within a virtual framework. Additionally, colleges may provide virtual employment fairs and networking events, enabling students to establish essential contacts for workforce entry. Career preparedness in SOL necessitates a comprehensive strategy wherein institutions prioritize not just the dissemination of academic material but also preparing students for the necessities of a swiftly changing digital labor market. By including chances for experiential learning and professional networking, virtual learning environments can more effectively prepare students for success in their future employment.

3.6 Enhancing synchronous online learning

Students revealed their perception of the improvements they would like to see in SOL platforms and resources provided by their institutions. The analysis is based on interview data highlighting key challenges related to internet accessibility, video tutorials, study materials, navigation, and social and emotional support. One of the primary challenges identified by 25 students was the lack of reliable high-speed internet access in many provinces of SA. This issue hinders equitable access to online learning resources, particularly for students in underserved communities. *Jackson* emphasized the need to enhance internet infrastructure: *"Many provinces in SA still lack reliable high-speed internet access. Improving internet infrastructure and affordability would ensure all students have equal access to online learning resources" (P24).* This lack of reliable internet access limits students' ability to attend live sessions and impacts their participation in group projects and access to asynchronous content.

Twenty six students strongly desire more comprehensive learning resources, particularly in complex subjects. They called for additional video tutorials, study guides, and live Q&A sessions. *Zintle* highlighted the need for video tutorials: *"More video tutorials would be helpful, especially for complex subjects. And it would be great if professors could offer more live Q&A sessions so we can ask questions directly" (P16).* Video tutorials and live Q&A sessions can address gaps in understanding, providing students with clarity on challenging topics. *Hendrick* suggested improving study materials: *"I'd like more study guides and summaries for each module. Also, it'd be cool if there was a better way to chat with other students and find people to study with" (P19).* Well-organized study guides and summaries enable students to review core concepts efficiently and facilitate peer learning through improved communication channels. *Hector* emphasized the need for better organization of learning materials: *"They should make it easier to find old lectures and assignments. Sometimes things get lost, and I cannot figure out where to look" (P25).* A centralized repository for past lectures and assignments would help students locate essential materials without confusion or delay.

Beyond academic concerns, about 23 students also highlighted the social and emotional challenges associated with SOL. They called for stakeholders to recognize these issues and incorporate activities that promote wellbeing. *Caroline* emphasized the importance of community and wellbeing: *"The stakeholders should acknowledge the social and emotional challenges students face during virtual learning.*

Incorporate activities and discussions that promote wellbeing and create a sense of community within the virtual classroom" (P14). By acknowledging these challenges and promoting a sense of community, institutions can help students feel more connected and supported during SOL.

Students offered several recommendations to improve SOL platforms and resources. First, the call for improved internet infrastructure reflects concerns about digital inequality highlighted by Eden et al. (2024), Mac Domhnaill et al. (2021), and Skinner (2019), emphasizing that reliable high-speed internet access is vital for equitable education. Second, comprehensive learning resources were needed, including more video tutorials, live Q&A sessions, and well-organized study guides and summaries - comprehensive resources that promote understanding. Third, the importance of platform navigation and material organization was stressed, with easier access to past lectures and assignments that show user-friendly navigation and improve student satisfaction and engagement. Finally, the recommendation to incorporate activities that promote wellbeing and community within virtual classrooms aligns with recent studies by John and Bates (2024), emphasizing the importance of social and emotional learning in online education. These recommendations aim to create a more inclusive, engaging, and supportive virtual learning environment.

3.7 Making virtual learning more engaging and interactive

There are ways to make SOL sessions more engaging and interactive. The analysis synthesizes responses highlighting the importance of interactive platforms, flexibility in learning opportunities, timely feedback, and exposure to guest speakers and experts. Students widely recognized the value of interactive learning platforms like Zoom, Microsoft Teams, and Google Meet. These platforms provide features that enable real-time interaction between students and lecturers, fostering a more engaging SOL environment. *Erin* emphasized the importance of real-time interaction: *"Yes, only if the institution utilizes interactive learning platforms that allow for real-time interaction between students and lecturers. For example, platforms like Zoom, Microsoft Teams, or Google Meet offer features such as breakout rooms, polls, and chat functions that encourage engagement" (P26).* Breakout rooms offer students opportunities for collaborative learning in smaller groups, enabling them to engage in focused discussions. Polls and chat functions encourage participation, making virtual learning more dynamic and inclusive.

Flexibility is another crucial factor that enhances the interactivity and engagement of SOL sessions. Twenty three of the participants appreciate institutions that provide recorded lectures, discussion forums, and virtual office hours to accommodate different schedules and learning preferences. *Thando* advocated for flexibility in learning opportunities: *"They (the University) should provide flexibility by offering recorded lectures, discussion forums, and virtual office hours. This accommodates students with different schedules and learning preferences" (P4).* Discussion forums allow students to interact asynchronously, sharing ideas and asking questions beyond live sessions. This asynchronous engagement ensures that all students can participate, even if they cannot attend live lectures.

Timely feedback on student performance is essential for keeping students motivated and helping them track their progress. Twenty one students suggested incorporating self-assessment and reflection activities to enhance engagement further. For instance, *Akhona* highlighted the importance of timely feedback: *"I think lecturers should offer timely feedback on student performance and provide opportunities for self-assessment and reflection. This helps us track our progress and keeps us motivated throughout the course" (P3).* Self-assessment activities, such as quizzes and reflection prompts, encourage students to critically evaluate their understanding of course content and identify areas for improvement.

Exposure to guest speakers and industry experts enhances the relevance of course content and provides students with diverse perspectives on their field of study, as noted by 7 students. *Mihlali* suggested including more guest speakers: *"More guest speakers and experts to give us different ideas about what we are learning" (P10).* Bringing in guest speakers adds variety to the learning experience and allows students to see the practical applications of their coursework, making sessions more engaging.

The final findings focused on how SOL sessions can be more engaging and interactive, revealing key themes like interactive platforms, flexibility in learning opportunities, timely feedback, and exposure to guest speakers and experts. Students widely recognized the value of platforms like Zoom, Microsoft Teams, and Google Meet, as real-time interaction through breakout rooms, polls, and chat functions fosters collaboration and inclusion (Grynyshyna et al., 2023; Qi et al., 2023). Flexibility in learning opportunities was highlighted as crucial for engagement, with students advocating for recorded lectures, discussion forums, and virtual office hours to accommodate different schedules and preferences. This aligns with the Community of Inquiry framework (Garrison and Arbaugh, 2007), emphasizing the importance of flexibility. Timely feedback and opportunities for self-assessment were also highlighted, with students noting that timely, constructive feedback significantly improves learning outcomes (Bajaj et al., 2018). Lastly, exposure to guest speakers and industry experts was recommended to provide variety and practical insights, consistent with Kolb et al. (2014) experiential learning theory, which shows that bringing external experts helps students connect theory to practice. These recommendations underscore the need to create a more dynamic and inclusive SOL environment. Below is a breakdown of Table 2 with a concise summary of the key findings from the thematic analysis of interviews with 27 participants regarding their experiences with SOL.

Table 2 provides a clear overview of the qualitative findings, showing the specific themes mentioned by participants, their repetitions (number of participants), and the calculated frequencies. To further illustrate the key findings, the concept map below summarizes the major themes and sub-themes identified in the study regarding the impact of SOL on student engagement, learning outcomes, and career preparedness.

Figure 2 visually summarizes the key themes from examining students' experiences with SOL. It emphasizes the benefits of flexibility, accessibility, and cost reductions, as well as the efficacy of multimedia content, group projects, and interactive lectures in promoting engagement. The map also demonstrates the challenges associated with social disconnect and isolation and the impact on motivation and wellbeing. Students are implementing mitigating strategies, including mindfulness and goal-setting. Finally, it touches

TABLE 2 Findings and analysis.

Major theme	Sub-theme/ Activity	Number of participants	Frequency (%)
Effective SOL activities	Interactive lectures (zoom, teams, blackboard)	20 out of 27	74%
	Polls, quizzes, Q&A sessions	15 out of 27	56%
	Group projects and discussions	18 out of 27	67%
	Breakout rooms and short videos	12 out of 27	44%
	Sharing articles, memes	10 out of 27	37%
Advantages of SOL	Flexibility and accessibility	22 out of 27	81%
	Time and cost savings	18 out of 27	67%
	Personal comfort (Relaxed learning environment)	16 out of 27	59%
Challenges	Loss of casual, spontaneous interactions	20 out of 27	74%
	Difficulty in building peer relationships	15 out of 27	56%
Coping	Virtual study groups and extracurriculars	12 out of 27	44%
Motivation	Decreased motivation due to lack of structure	18 out of 27	67%
	Feelings of isolation and monotony	14 out of 27	52%
Wellbeing	Coping strategies (schedules, mindfulness)	10 out of 27	37%
Career readiness	Improved adaptability to digital tools	22 out of 27	81%
	Decline in networking and interpersonal skills	17 out of 27	63%
	Need for practical, hands-on experience	15 out of 27	56%
Enhancing SOL	More comprehensive learning resources (video tutorials, Q&A)	26 out of 27	96%
	Better platform navigation and material organization	23 out of 27	85%
	Social and emotional support activities	23 out of 27	85%

on career readiness, acknowledging that SOL enhances digital skills; however, additional practical experience and networking opportunities are required to prepare students for employment adequately.

3.8 Specific solutions and implementation plan for enhancing SOL and career readiness

The findings of this study emphasize the necessity of improving digital learning tools to address students' concerns regarding technical difficulties and limited engagement in SOL environments. Institutions should implement advanced platforms like Zoom and Microsoft Teams, which offer virtual whiteboards, project management systems, and real-time collaboration capabilities. To optimize these instruments' efficacy, students and faculty must receive thorough training. This solution has the potential to impact institutional policies by motivating universities to prioritize investments in digital infrastructure and establish technology-based learning standards, thereby guaranteeing that students can enjoy a completely immersive digital learning experience.

The results also emphasized the importance of networking opportunities in SOL, which are essential for career readiness. To resolve this issue, institutions should implement structured virtual networking events throughout the academic year, including career fairs and alumni mentorship programs. Partnerships with professional organizations and industries can enhance the quality of these networking events. Student surveys and employment monitoring are viable methods for universities to evaluate the efficacy of these initiatives. This solution could result in changes to career services by incorporating virtual networking opportunities as a fundamental component of career development support at the institutional level.

Additionally, students in the study identified a deficiency in practical, hands-on experience, an essential element of career readiness. Institutions should incorporate virtual apprenticeships, project-based learning, and real-world case studies to lessen this disparity. These experiences will enable students to implement their theoretical knowledge in simulated professional environments. University partnerships with industries will allow them to provide virtual apprenticeships directly associated with their curriculum. This method not only improves learning outcomes but also guarantees that students acquire practical skills, which has the potential to influence national education policies to prioritize virtual internships and hands-on learning.

The findings show that the need to cultivate soft skills, including communication, leadership, and collaboration, in SOL environments was a prominent theme. To resolve this issue, educational institutions must integrate mandatory soft skills development modules into their curricula. Digital platforms that promote interaction can facilitate the delivery of these modules through peer collaboration, role-playing, and group discussions. Peer and instructor evaluations can evaluate students' advancement in ᵗhese domains. This solution has the potential to stimulate institutional changes that prioritize the development of soft skills as an integral component of the overall educational framework.

The research also demonstrated that extended screen time, isolation, and a lack of structure adversely affected student motivation and wellbeing. To address this issue, universities should provide SOL students with technical support and comprehensive mental health services. This may encompass workshops on managing digital fatigue and preserving mental health, peer support groups, and online counseling. Establishing virtual help centers to provide real-time assistance will help students resolve technical or mental health issues. Integrating these services may

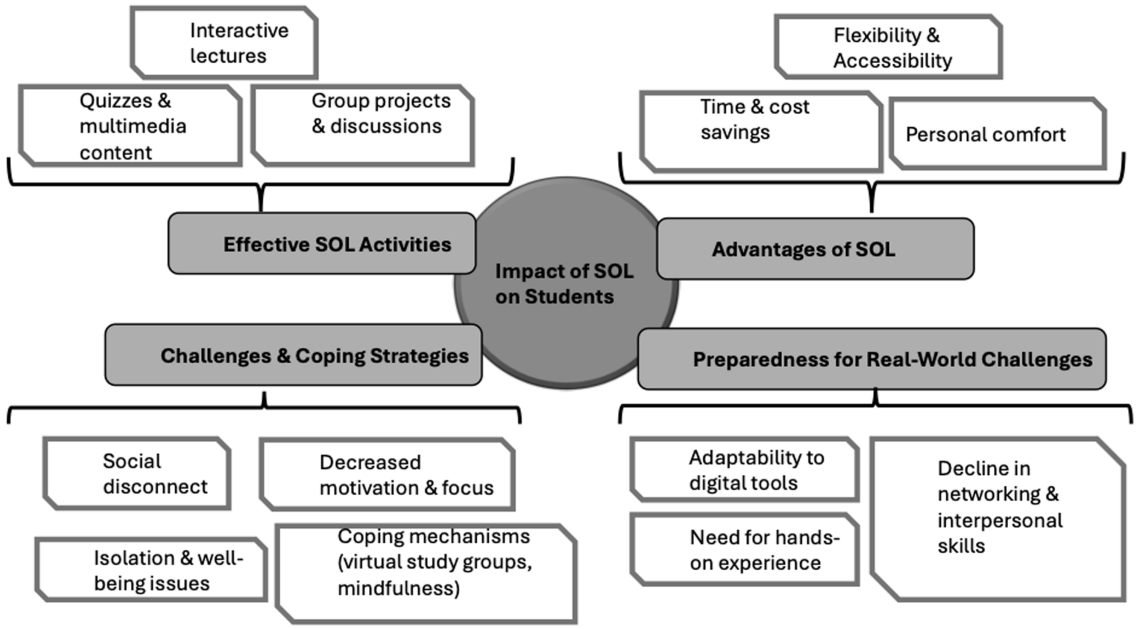

FIGURE 2
Key themes from students' experiences with SOL.

result in institutional reforms that incorporate student support systems more comprehensively into digital learning environments.

In general, these extensive solutions are intended to address the primary obstacles identified in the study and provide practical, actionable steps that can impact institutional and political decisions. By implementing these solutions, universities will enhance their digital education infrastructure and support systems and improve student engagement and career readiness. These modifications have the potential to influence more extensive educational policies, guaranteeing that digital learning environments adequately prepare students for the requirements of the contemporary workforce.

4 Conclusion, limitations, and future work

This study has comprehensively explored how SOL environments at the University impact students' career readiness and professional skill development, unveiling critical insights across several domains. It found that students recognize an enhancement in their digital adaptability and proficiency, which aligns with the growing demand for digital skills in the modern workforce. However, the study also highlights significant challenges, notably in networking and interpersonal skills, which have deteriorated due to the limited in-person interactions afforded by SOL environments. Such skills are essential for building professional relationships and effective workplace communication. Furthermore, the findings reveal a concerning gap in practical experience and career support, with students reporting a lack of hands-on experiences such as internships and workshops that are crucial for practical skill development and market preparedness. Additionally, the development of soft skills—such as teamwork, problem-solving, and critical thinking—is impeded by the online format, as the natural interactions typical of physical classroom settings are absent, making it challenging for students to develop these critical skills. Collectively, these findings illustrate the dual-edged nature of SOL, where losses in interpersonal skill development and practical experience starkly counterbalance gains in digital proficiency.

This study's limitations include its small, homogenous sample size and its confinement to a single institution, which may not represent the broader student experience across different educational contexts. While providing depth, the qualitative approach limits the generalization of findings across a wider population. Furthermore, relying solely on self-reported data may introduce bias, as students' perceptions may not fully reflect their competencies. Future research should expand on these findings by incorporating a larger, more diverse sample to enhance the generalizability of the results. Quantitative methods could be integrated to quantitatively measure the specific impacts of SOL on various professional skills. Longitudinal studies would provide insights into the long-term effects of SOL on career trajectories and success. Additionally, investigating the efficacy of interventions designed to enhance networking, interpersonal, and practical skills within SOL environments could offer valuable directions for curriculum development and educational policy.

Data availability statement

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

Ethics statement

The studies involving humans were approved by the University of Fort Hare Research Ethics Committee. The studies were conducted in

accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

ML: Conceptualization, Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation. BC: Visualization, Supervision, Software, Funding acquisition, Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation. IU: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Project administration.

Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. This work was supported by the National Research Foundation (NRF) Reference/Grant Number: PSTD2204133322. We also acknowledge the Govan Mbeki Research and Development Centre (GMRDC) at the University of Fort Hare South Africa, and the National Institute for the Humanities and Social Sciences (NIHSS) for their financial support for this study.

Acknowledgments

We thank the participants for participating in this research and making this study possible.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

References

AbuKhousa, E., and Atif, Y. (2016). "Virtual social spaces for practice and experience sharing" in State-of-the-art and future directions of smart learning, *Lecture Notes in Educational Technology*. Ed. Y. Li (Singapore: Springer) 409–414.

Afzal, A., Khan, S., Daud, S., Ahmad, Z., and Butt, A. (2023). Addressing the digital divide: access and use of technology in education. *J. Soc. Sci. Rev.* 3, 883–895. doi: 10.54183/jssr.v3i2.326

Al Kaabi, N. H. O., and Qawasmeh, F. (2020). The impact of digital divide on the quality of university education. *Int. J. Acad. Res. Bus. Soc. Sci.* 10, 565–578. doi: 10.6007/ijarbss/v10-i11/8125

Alarcón, R., del Pilar Jiménez, E., and de Vicente-Yagüe, M. I. (2020). Development and validation of the DIGIGLO, a tool for assessing the digital competence of educators. *Br. J. Educ. Technol.* 51, 2407–2421. doi: 10.1111/bjet.12919

Andrew, L., Wallace, R., and Sambell, R. (2021). A peer-observation initiative to enhance student engagement in the synchronous virtual classroom: a case study of a COVID-19 mandated move to online learning. *J. Univ. Teach. Learn. Pract.* 18, 1–23. doi: 10.53761/1.18.4.14

Aprile, K. T., and Knight, B. A. (2020). The WIL to learn: students' perspectives on the impact of work-integrated learning placements on their professional readiness. *Higher Educ. Res. Dev.* 39, 869–882. doi: 10.1080/07294360.2019.1695754

Arora, J. S., Pham, J. T., Alaniz, L., Khoshab, N., and Tang, C. J. (2023). The implications of virtual learning on plastic surgery education: a National Survey of plastic surgery residents and fellows. *Plast. Reconstr. Surg. Glob. Open* 11:e5373. doi: 10.1097/GOX.0000000000005373

Aryal, H. (2021). A literature survey on student feedback assessment tools and their usage in sentiment analysis. *ArXiv Preprint*. ArXiv:2109.07904

Bajaj, J. K., Kaur, K., Arora, R., and Singh, S. J. (2018). Introduction of feedback for better learning. *J. Clin. Diagn. Res.* 12, FC11–FC16. doi: 10.7860/JCDR/2018/36744.12402

Bakkialakshmi, V. S., and Sudalaimuthu, T. (2022). "Students emotional psychology on online learning during pandemic period" in 2022 International Conference on Data Science, Agents and Artificial Intelligence (IEEE), 1–6.

Bimrose, J., and Brown, A. (2019). Professional identity transformation: supporting career and employment practitioners at a distance. *Br. J. Guid. Couns.* 47, 757–769. doi: 10.1080/03069885.2019.1698008

Braun, V., and Clarke, V. (2006). Using thematic analysis in psychology. *Qual. Res. Psychol.* 3, 77–101. doi: 10.1191/1478088706qp063oa

Brewer, P. E., Mitchell, A., Sanders, R., Wallace, P., and Wood, D. D. (2015). Teaching and learning in cross-disciplinary virtual teams. *IEEE Trans. Prof. Commun.* 58, 208–229. doi: 10.1109/TPC.2015.2429973

Castillo-Montoya, M. (2016). Preparing for interview research: the interview protocol refinement framework. *Qual. Rep.* 21, 811–831. doi: 10.46743/2160-3715/2016.2337

Castro, S. S., and Sevillano, M. Á. P. (2022). Effectiveness of a digital serious game in improving reading comprehension and academic performance. *Invest. Sobre Lect.* 2022, 40–66. doi: 10.24310/isl.vi17.14325

Chickering, A. W., and Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bull.* 3:7.

Chigbu, B., and Nekhwevha, F. H. (2021). The future of work and uncertain labour alternatives as we live through the industrial age of possible singularity: evidence from South Africa. *Technol. Soc.* 67:101715. doi: 10.1016/j.techsoc.2021.101715

Chigbu, B. I., and Nekhwevha, F. H. (2022). Academic-faculty environment and graduate employability: variation of work-readiness perceptions. *Heliyon* 8:e09117. doi: 10.1016/j.heliyon.2022.e09117

Chigbu, B. I., Ngwevu, V., and Jojo, A. (2023). The effectiveness of innovative pedagogy in the industry 4.0: educational ecosystem perspective. *Soc. Sci. Human. Open* 7:100419. doi: 10.1016/j.ssaho.2023.100419

Chigbu, B. I., Umejesi, I., and Makapela, S. L. (2024). "Adaptive intelligence revolutionizing learning and sustainability in higher education: enhancing learning and sustainability with AI" in Implementing interactive learning strategies in higher education (United States of America: IGI Global), 151–176.

Creswell, J. W., and Poth, C. (2016). Qualitative inquiry & research design: Choosing among five approaches. *2nd* Edn. California: Sage Publications.

Dawadi, S., Goshtasbpour, F., and Kukulska-Hulme, A. (2024). Equitable access to higher education learning and assessment: perspectives from low-resource contexts. *J. Interact. Media Educ.* 2024, 1–15. doi: 10.5334/jime.832

De Michele, R. (2020). "Benefits, drawbacks and psychological impact of online lectures during quarantine due to Covid-19 pandemic" in Proceedings of the 6th EAI International Conference on Smart Objects and Technologies for Social Good, Antwerp, Belgium. 257–260.

Delahunty, J., Verenikina, I., and Jones, P. (2014). Socio-emotional connections: identity, belonging and learning in online interactions. A literature review. *Technol. Pedagog. Educ.* 23, 243–265. doi: 10.1080/1475939X.2013.813405

Dhawan, S. (2020). Online learning: a panacea in the time of COVID-19 crisis. *J. Educ. Technol. Syst.* 49, 5–22. doi: 10.1177/0047239520934018

Díaz, J. E. M. (2020). Virtual world as a complement to hybrid and mobile learning. *Int. J. Emerg. Technol. Learn.* 15, 267–274. doi: 10.3991/ijet.v15i22.14393

Drane, C., Vernon, L., and O'shea, S. (2020). The impact of "learning at home" on the educational outcomes of vulnerable children in Australia during the COVID-19 pandemic.

Literature Review prepared by the National Centre for Student Equity in Higher Education, Curtin University, Australia. 1–16.

Duncan, D. W., Birdsong, V., Fuhrman, N., and Borron, A. (2017). The impacts of a national internship program on interns' perceived leadership, critical thinking, and communication skills. *J. Leadership Educ.* 16, 23–39. doi: 10.12806/V16/I2/R2

Eden, C. A., Chisom, O. N., and Adeniyi, I. S. (2024). Promoting digital literacy and social equity in education: lessons from successful initiatives. *Int. J. Manag. Entrepr. Res.* 6, 687–696. doi: 10.51594/ijmer.v6i3.880

Fusch, P., and Ness, L. (2015). Are we there yet? Data saturation in qualitative research. *Walden Fac. Staff Publ.* 20, 1408–1416. doi: 10.46743/2160-3715/2015.2281

Gardner, M. E., Bodiya, E. C., and Subramanian, S. (2021). Remote learning barriers and opportunities for graduate student and postdoctoral learners in career and professional skill development: a case study. *J. Microb. Biol. Educ.* 22, 10–1128. doi: 10.1128/jmbe.v22i1.2451

Garrison, D. R., and Arbaugh, J. B. (2007). Researching the community of inquiry framework: review, issues, and future directions. *Internet High. Educ.* 10, 157–172. doi: 10.1016/j.iheduc.2007.04.001

Goh, P. S.-C., and Abdul-Wahab, N. (2020). Paradigms to drive higher education 4.0. *Int. J. Learn. Teach. Educ. Res.* 19, 159–171. doi: 10.26803/ijlter.19.1.9

Gohain, D. (2024). "Online tutelage: meeting the educational needs in the post-pandemic scenario" in *Digitalization of higher education* (Ontario, Canada: Apple Academic Press), 159–180.

Goode, E., Nieuwoudt, J., and Roche, T. (2022). Does online engagement matter? The impact of interactive learning modules and synchronous class attendance on student achievement in an immersive delivery model. *Australas. J. Educ. Technol.* 38, 76–94. doi: 10.14742/ajet.7929

Grynyshyna, M., Boiko, T., Boklan, M., Husakova, N., and Pozniak, A. (2023). Comparative analysis of ways to integrate Microsoft teams, zoom, Google meet into the educational process of higher education institutions of Ukraine. *J. Higher Educ. Theory Pract* 23, 43–51.

Gunawan, S., and Shieh, C.-J. (2023). Enhancing business students' self-efficacy and learning outcomes: a multiple intelligences and technology approach. Contemporary. *Educ. Technol.* 15:ep470. doi: 10.30935/cedtech/13647

Haftador, A. M., Shirazi, F., and Mohebbi, Z. (2021). Online class or flipped-jigsaw learning? Which one promotes academic motivation during the COVID-19 pandemic? *BMC Med. Educ.* 21, 1–8. doi: 10.1186/s12909-021-02929-9

Hong, J.-C., Lee, Y.-F., and Ye, J.-H. (2021). Procrastination predicts online self-regulated learning and online learning ineffectiveness during the coronavirus lockdown. *Personal. Individ. Differ.* 174:110673. doi: 10.1016/j.paid.2021.110673

Iftikhar, A., Ahmed, N., and Shah, M. (2022). Analyzing digital divide among university students of Pakistan. *Turkish Online J. Dist. Educ.* 24, 261–271. doi: 10.17718/tojde.1105081

Inan, F. A., and Bolliger, D. U. (2024). Online instructors' pedagogical beliefs and choice of student learning activities. *Educ. Technol. Res. Dev.* 72, 727–746. doi: 10.1007/s11423-023-10331-z

John, A., and Bates, S. (2024). Barriers and facilitators: the contrasting roles of media and technology in social–emotional learning. *Soc. Emot. Learn. Res. Pract. Policy* 3:100022. doi: 10.1016/j.sel.2023.100022

Johnson, D. W., and Johnson, R. T. (2009). An educational psychology success story: social interdependence theory and cooperative learning. *Educ. Res.* 38, 365–379. doi: 10.3102/0013189X09339057

Jones, I. D., and Brady, G. (2022). Informal education pedagogy transcendence from the 'academy' to Society in the Current and Post COVID environment. *Educ. Sci.* 12, 1–19. doi: 10.3390/EDUCSCI12010037

Khulwa, C. A., and Luthfia, A. (2023). "Generation Z students' digital literacy on online learning readiness" in 2023 11th international conference on information and education technology (IEEE), 360–364.

Kolb, D. A., Boyatzis, R. E., and Mainemelis, C. (2014). "Experiential learning theory: previous research and new directions" in Perspectives on thinking, learning, and cognitive styles (New York: Routledge), 227–247.

Lacka, E., and Wong, T. C. (2021). Examining the impact of digital technologies on students' higher education outcomes: the case of the virtual learning environment and social media. *Stud. High. Educ.* 46, 1621–1634. doi: 10.1080/03075079.2019.1698533

Lai, P. P. Y. (2019). "Reinforcing blended learning approach by using blackboard collaborate in computer lab environment to enhance students' learning experience" in 2019 IEEE International Conference on Engineering, Technology and Education (IEEE), 1–8.

Lindsey, N. S., and Rice, M. L. (2015). Interpersonal skills and education in the traditional and online classroom environments. *J. Interact. Online Learn.* 13, 126–136.

Lindstrom, D. L., Schmidt-Crawford, D., and Thompson, A. D. (2021). Flexible but languishing: what we've learned about virtual working and learning. *J. Digi. Learn. Teach. Educ.* 37, 150–151. doi: 10.1080/21532974.2021.1936985

Lowenthal, P., Borup, J., West, R., and Archambault, L. (2020). Thinking beyond zoom: using asynchronous video to maintain connection and engagement during the COVID-19 pandemic. *J. Technol. Teach. Educ.* 28, 383–391.

Lu, H., and Zhang, X. (2023). Multi-level students' sense of community development in hybrid and online learning environments at higher educational institutions: a systematic literature review. *Interact. Learn. Environ.*, 1–24. doi: 10.1080/10494820.2023.2214803

Ma, X., Azemi, A., and Buechler, D. (2021). Integrating Microsoft teams to promote active learning in online lecture and lab courses. *IEEE Front. Educ. Conf.* 2021, 1–9. doi: 10.1109/FIE49875.2021.9637398

Mac Domhnaill, C., Mohan, G., and McCoy, S. (2021). Home broadband and student engagement during COVID-19 emergency remote teaching. *Distance Educ.* 42, 465–493. doi: 10.1080/01587919.2021.1986372

Majid, M. A. A., Othman, M., Mohamad, S. F., Lim, S. A. H., and Yusof, A. (2017). Piloting for interviews in qualitative research: operationalization and lessons learnt. *Int. J. Acad. Res. Bus. Soc. Sci.* 7, 1073–1080. doi: 10.6007/IJARBSS/v7-i4/2916

McQuillan, N., Wightman, C., Moore, C., McMahon-Beattie, U., and Farley, H. (2021). Developing resilient graduates to be future workplace leaders. *Higher Educ. Skills Work Based Learn.* 11, 214–227. doi: 10.1108/HESWBL-11-2019-0162

Moore, M. G. (2018). "The theory of transactional distance" in Handbook of distance education (New York: Routledge), 32–46.

Morrison, L., and Hughes, J. (2023). Making the shift to virtual professional learning. *Technol. Pedagog. Educ.* 32, 105–116. doi: 10.1080/1475939X.2022.2156918

Mueller, J. (2017). Capturing student learning with thematic analysis. *J. Adv. Res. Soc. Sci. Human.* 2, 342–347. doi: 10.26500/jarssh-02-2017-0601

Myers, T., Blackman, A., Andersen, T., Hay, R., Lee, I., and Gray, H. (2014). Cultivating ICT students' interpersonal soft skills in online learning environments using traditional active learning techniques. *J. Learn. Des.* 7, 38–53.

Nasibullov, K., Abitov, I. R., Artishcheva, L. V., Ustin, P. N., Alishev, T. B., and Popov, L. M. (2021). Possibilities of dynamic assessment of student engagement in online learning. *Eur. Proc. Soc. Behav. Sci.* 246–256. doi: 10.15405/epsbs.2021.06.04.29

Nurbekova, Z., Nurbekov, B., Maulsharif, M., Naimanova, D., and Baimendinova, A. (2022). Using virtual learning objects in educational content. Ruse, Bulgaria: ACM International Conference Proceeding Series, 174–178.

Papavasiliou, C., and Papavasiliou, S. (2021). Virtual learning: the affects of Covid-19 on rural student and teacher engagement. Proceedings of the 19th International Conference on E-Society. Available at: https://scholar.archive.org

Patton, C. V., Sawicki, D. S., and Clark, J. J. (2024). Basic methods of policy analysis and planning. New York: Routledge.

Pikhart, M., Klimova, B., Meunier, F., Ibarra, I., Suñer Muñoz, F., Zamborova, K., et al. (2023). A systematic review of the cognitive impact of digital media modalities on reading comprehension in L2. *Invest. Sobre Lect.* 18, 56–87. doi: 10.24310/isl.2.18.2023.16655

Pitcher, B. D., Ravid, D. M., Mancarella, P. J., and Behrend, T. S. (2022). Social learning dynamics influence performance and career self-efficacy in career-oriented educational virtual environments. *PLoS One* 17:e0273788. doi: 10.1371/journal.pone.0273788

Plotnikova, N. F., and Strukov, E. N. (2019). Integration of teamwork and critical thinking skills in the process of teaching students. *Cypriot J. Educ. Sci.* 14, 1–10. doi: 10.18844/cjes.v14i1.4031

Qi, J., Tang, H., and Zhu, Z. (2023). Exploring an affective and responsive virtual environment to improve remote learning. *Virt. Worlds* 2, 53–74. doi: 10.3390/virtualworlds2010004

Rahimi, R. A., and Oh, G. S. (2024). Rethinking the role of educators in the 21st century: navigating globalization, technology, and pandemics. *J. Mark. Anal.* 12, 182–197. doi: 10.1057/s41270-024-00303-4

Rodriguez, S., and Lieber, H. (2020). Relationship between entrepreneurship education, entrepreneurial mindset, and career readiness in secondary students. *J. Exp. Educ.* 43, 277–298. doi: 10.1177/1053825920919462

Seabrook, E., Kelly, R., Foley, F., Theiler, S., Thomas, N., Wadley, G., et al. (2020). Understanding how virtual reality can support mindfulness practice: mixed methods study. *J. Med. Internet Res.* 22:e16106. doi: 10.2196/16106

Siddiqa, A. (2022). A study of students perception about virtual learning: an evidence from Punjab, Pakistan. *J. Educ. Soc. Stud.* 3, 41–51. doi: 10.52223/jess.20223105

Singha, R., and Singha, S. (2024). "Educational innovation transforming higher education for workforce readiness" in Advancing student employability through higher education (IGI Global), 37–55.

Skinner, B. T. (2019). Making the connection: broadband access and online course enrollment at public open admissions institutions. *Res. High. Educ.* 60, 960–999. doi: 10.1007/s11162-018-9539-6

Soboleva, E. V., Suvorova, T. N., Zenkina, S. V., and Bocharov, M. I. (2020). Professional self-determination support for students in the digital educational space. *Eur. J. Contemp. Educ.* 9, 603–620. doi: 10.13187/ejced.2020.3.603

Sobri, A. Y., Voak, A., Fairman, B., and Wonorahardjo, S. (2023). Engaging with industry through internships in order to acquire the skills, knowledge and attitudes for the world of work: the Indonesian student experience. *J. Higher Educ. Theory Pract.* 23, 1–17.

Soeprijanto, S., Diamah, A., and Rusmono, R. (2022). The effect of digital literacy, self-awareness, and career planning on engineering and vocational teacher education students' learning achievement. *J. Technol. Sci. Educ.* 12, 172–190. doi: 10.3926/JOTSE.1434

Spivakovskyy, S., Slipchuk, V., Svyrydenko, O., Perova, S., and Krysalo, O. (2020). Virtual space as a platform for student research practices. *Int. J. Industr. Eng. Prod. Res.* 31, 547–558. doi: 10.22068/ijiepr.31.4.547

Supovitz, J. A., Hemphill, A. A., Manghani, O., and Watson, C. (2023). Cogs of inequity: how structural inequities impeded school efforts to support students and families at the outbreak of the COVID-19 pandemic. *Equity Educ. Soc.*:275264612311536. doi: 10.1177/27526461231153666

Surianshah, S. (2021). Digital divide in education during COVID-19 pandemic. *J. Ekon. Malay.* 55, 103–112. doi: 10.17576/JEM-2021-5503-07

Tiwari, V., and Tiwari, A. (2021). A study of effectiveness of online learning a study of effectiveness of online mode of education in Pune region. *Int. J. Future Gen. Commun. Netw.* 14, 2177–2190.

Tolich, M. (2020). What qualitative researchers must do when ethical assurances disintegrate? Recognise internal confidentiality, establish process consent, reference groups, referrals for participants and a safety plan. *Comput. Suppor. Qual. Res.* 1068, 22–32. doi: 10.1007/978-3-030-31787-4_2

Trespalacıos, J., and Urıbe-florez, L. J. (2020). Developing online sense of community: graduate students' experiences and perceptions. *Turk. Online J. Dist. Educ.* 21, 57–72. doi: 10.17718/tojde.690340

Udeogalanya, V. (2021). Aligning digital literacy and student academic success: lessons learned from COVID-19 pandemic. *Bus. Manag. Rev.* 12, 54–65. doi: 10.24052/BMR/V12NU01/ART-26

van Wart, A., O'Brien, T. C., Varvayanis, S., Alder, J., Greenier, J., Layton, R. L., et al. (2020). Applying experiential learning to career development training for biomedical graduate students and postdocs: perspectives on program development and design. *CBE Life Sci. Educ.* 19:es7. doi: 10.1187/cbe.19-12-0270

Villon, J. T., Balon, J., and Aranilla, A. (2023). Seasoned teachers' digital skills readiness in the online learning of selected. *J. Educ. Manag. Dev. Stud.* 2, 53–60. doi: 10.52631/jemds.v2i4.149

Vygotsky, L. S. (1978). Socio-cultural theory. *Mind Soc.* 6, 23–43.

Weritz, P. (2022). Hey leaders, it's time to train the workforce: critical skills in the digital workplace. *Admin. Sci.* 12:94. doi: 10.3390/admsci12030094

Withanachchi, S., Darmon, D., and Sreesing, P. (2022). Building career skills through virtual exchange. *Bus. Manag. Rev.* 13, 41–52. doi: 10.24052/BMR/V13NU01/ART-06

Wu, Q., Wang, Y., Lu, L., Chen, Y., Long, H., and Wang, J. (2022). Virtual simulation in undergraduate medical education: a scoping review of recent practice. *Front. Med.* 9:855403. doi: 10.3389/fmed.2022.855403

Xhomara, N., and Dasho, A. (2023). Online interactions and student learning outcomes in a moodle-based e-learning system. *Technol. Pedagog. Educ.* 32, 419–433. doi: 10.1080/1475939X.2023.2214576

Zekaj, R. (2023). The impact of online learning strategies on students' academic performance: a systematic literature review. *Int. J. Learn. Teach. Educ. Res.* 22, 148–169. doi: 10.26803/ijlter.22.2.9