International Journal of Advancing Research, Innovation and Entrepreneurship

Vol 1(2), DOI:10.82036/p9x29640, July 2025 *ISSN:2977-9332*

Remote and In-Person Learning in Computer Programming: Student Perspectives and Educational Implications in a Post-Pandemic World

Kayode I. Adenuga Ph.D. FHEA
University of Law Business School, Birmingham United Kingdom
Centre for Research, Innovation, Development and Entrepreneurship (CRIDE), United Kingdom
*Corresponding Author Email address: kayodeadenuga@yahoo.ca

ABSTRACT
In response to the COVID-19 pandemic, United Kingdom (UK) government implemented several restrictive measures such as lockdowns, social distancing, and social "bubbles," necessitating a sudden shift from face-to-face to online teaching mode. This transition occurred with minimal preparation for instructors, many of whom struggled to adapt traditional face-to-face methods for virtual delivery. Consequently, challenges emerged teaching programming courses, including difficulties managing student behaviour remotely and concerns about academic decline, particularly among learners needing structured support. While anecdotal evidence suggests negative impacts on programming students' performance during lockdowns, robust empirical data remains limited. Thus, this study explores the impact of COVID-19 on learner performance in Level 3 and 4 programming courses at an outstanding UK College. Using an interpretive research paradigm and qualitative methods, 11 out of 24 full-time students completed an open-ended electronic survey in April 2022. Data anonymisation and ethical standards were strictly observed. Findings indicate that while remote learning is a viable alternative during disruptions, there remains a strong preference for face-to-face instruction, especially for complex, skills-based subjects like programming. Success of online learning mode depends on interaction quality, engagement, motivation, and accessible resources. Blended learning, combining online and in-person methods, offers a resilient path forward to support diverse learner needs and enhance educational equity.

Keywords: *Blended learning, COVID-19 pandemic, Programming module, Remote learning.*

1 INTRODUCTION

Until the emergence of fully online university programs, most higher education teaching was conducted through face-to-face (F2F) methods. With the rapid advancement and integration of digital technologies in education, higher education institutions began to incorporate online learning as part of their regular offerings. The global shift towards online education was significantly accelerated by the onset of the COVID-19 pandemic. The COVID-19 virus, a novel strain of coronavirus previously unidentified in humans (GDC, 2019), was first detected in Wuhan, Hubei Province, China. Its impact has been far-reaching, affecting nearly every aspect of human life, including social systems, health services, economies, and education (Gov.UK, 2022).

In response, governments implemented a range of restrictive measures, including national and regional lockdowns, social distancing policies, tiered responses, and the formation of social "bubbles." In the UK, for instance, the national lockdown announced by Prime Minister Boris Johnson on March 23, 2020, affected all educational institutions from higher education and further education colleges to sixth forms, secondary, and primary schools. According to UNESCO (2020), approximately 1.6 billion students and over 100 million teachers across more than 190 countries were affected by school closures in April 2020. Institutions worldwide were forced to shift rapidly to remote instruction (Crawford et al., 2020), which involved conducting learning activities online through digital technologies. This sudden transition led to the pervasive use of educational technology, often without adequate planning, raising concerns about its effectiveness and impact (Guppy et al., 2022).

During this period, digital platforms were extensively employed to maintain the continuity of learning (Dhawan, 2020; Mehta, Miletich, & Detyna, 2021), resulting in an unprecedented global exposure to online learning. As Goldschmidt (2020) observed, a "tsunami" of online learning swept across the globe, effectively halting face-to-face instruction and compelling institutions to adopt digital systems (Thahir, Julius, Tamam, & Thahir, 2023). However, the shift to online learning happened with little preparation or training, leaving many instructors unprepared and often replicating traditional face-to-face teaching methods in online formats. While learning continued, the transition to remote education posed challenges for both educators and learners. Many instructors expressed a preference for in-

Vol 1(2), DOI:10.82036/p9x29640, July 2025 ISSN:2977-9332

person teaching, believing that effective learning is best achieved through direct interaction. Based on anecdotal evidence and personal communications with further education (FE) lecturers, managing student behaviour remotely proved difficult, particularly for learners who needed more structured, face-to-face support potentially contributing to academic decline for some students.

Although there has been anecdotal evidence that the national lockdown negatively impacted the academic performance of Level 3 Extended Diploma students in programming courses, there is a lack of robust empirical evidence in England to establish a direct correlation between school closures and changes in student performance or attitudes. The debate around the effectiveness of online versus face-to-face learning continues, largely influenced by the nature of specific courses and the level of student engagement they require. Some students express a preference for online learning but desire meaningful, real-time interactions with instructors and peers. They argue that the move to online platforms does not necessarily equate to effective adoption or adaptation by learners and teachers alike.

This is further complicated by concerns over students' home environments, access to stable internet, the availability of academic support, and the potential for distractions from gaming and social media use on the same devices used for learning (Sam, 2022). While numerous studies have explored the effects of online learning during and after the COVID-19 pandemic, few have examined key factors such as student preferences, concentration, motivation, performance, and learning experiences especially in the context of programming courses in further education settings in the United Kingdom.

This study sets out to retrospectively explore how COVID-19 affected learner performance in IT programming courses within the Level 3 Extended Diploma during the national lockdown. By drawing on research from both the height of the pandemic and the period that followed, it aims to offer meaningful insights and recommendations to improve how programming courses are delivered online or in hybrid formats modes of learning that are becoming the new norm in further and higher education across the UK.

2 LITERATURE REVIEW/RELATED WORK

A growing body of research has explored students' learning mode preferences both prior to and during the COVID-19 pandemic. For example, Mehta, Aula-Blasco, and Mantaj (2024) examined students' preferences for different learning modes and investigated whether these preferences varied based on student characteristics such as discipline, study level, and gender. Their study aimed to (i) identify students' preferred learning modes for lectures and tutorials, and (ii) determine whether preferences varied by academic discipline. This was partly prompted by a petition submitted to the UK Parliament, which indicated that students valued face-to-face (F2F) teaching more than online instruction. Based on this, it was assumed that attendance would rise once F2F teaching resumed. However, this expectation was not met in practice. Academic staff observed that attendance at lectures and tutorials remained lower than anticipated and continued to decline over time. This was echoed by the *Times Higher Education* (2022), which reported a global drop in class attendance post-COVID-19, suggesting a disconnect between students' stated preferences and actual behaviours. These findings raise critical questions about how students truly wish to learn and what their preferred learning modes genuinely are.

In Germany, medical students enrolled in an electrocardiogram course expressed a strong preference for F2F learning over its e-learning equivalent, attributing their preference to the value of direct lecturer interaction (Keis, Grab, Schneider, & Öchsner, 2017). Similarly, Page et al. (2017) found that approximately 70% of Australian physiology students preferred in-person instruction. Engineering students from California State University also identified several challenges associated with online learning, including technical issues, reduced engagement, concerns about privacy, and fatigue resulting from attending multiple online sessions (Asgari et al., 2021).

In Saudi Arabia, higher education students acknowledged the convenience of online learning during the pandemic but also felt that the overall quality of education and depth of learning had declined. This suggests a possible negative correlation between online learning environments reduced engagement, and decreased motivation (Almossa, 2021). Similarly, Hollister et al. (2022), reviewing research by Means and Neisler (2020), reported that only around half of surveyed undergraduates who began their studies in person but transitioned online were satisfied with their learning experience. Notably, only one-fifth of students reported being satisfied after the shift to online instruction, citing lack of peer collaboration and diminished motivation as key reasons.

These findings collectively point to a recurring preference for F2F learning, which is not surprising given the important role of personal interaction with instructors in the learning process (Keis et al., 2017). Mehta et al. (2024) found that 52.2% of students selected in-person learning as their first choice, while 47.5% chose other modes. Notably, F2F was the most frequently selected first choice, followed by blended and mixed asynchronous-synchronous online modes. Conversely, 51.4% of students ranked synchronous online learning as their least preferred mode. In the specific context of computer science relevant to the current study, 42.8% of students identified blended learning as their first choice, while 55.8% selected synchronous online as their last choice. These findings suggest that, regardless of the delivery method, what matters most is how well a mode of teaching engages learners and supports effective learning, which will differ depending on the subject area and academic level.

Vol 1(2), DOI:10.82036/p9x29640, July 2025 ISSN:2977-9332

A key implication of this research is that academic staff can tailor their course designs by aligning learning modes with the specific needs of their discipline. For example, text-based and theoretical subjects may incorporate more online instruction, while practical, hands-on fields like computer programming may require a stronger emphasis on in-person learning. However, a limitation of Mehta et al.'s study is that data were collected during live in-person or online sessions, potentially excluding the perspectives of students in blended learning modes or those who were absent. This could mean the findings do not fully represent the wider student population.

McGowan et al. (2022) conducted another relevant study focused on the shift from an MSc in Software Development (conversion) course (MSc SD) to a fully online Post Graduate Certificate in Software Development (PG Cert) module during the national lockdown. The two programmes maintained comparable delivery schedules and assessment frameworks. Using a quantitative approach, they analysed outcomes for a cohort of 163 students (93 male, 70 female), all of whom held non-computing degrees (at least a 2:1) and met a socio-economic criterion, having been furloughed or made redundant due to the pandemic. Their results showed that apart from a higher dropout rate which can be attributed to the programme being fully funded, the PGCert cohort performed as well as, or better than, the previous MSc SD cohort. Student satisfaction was notably high, with the PGCert rated 4.9 out of 5.0 across categories such as teaching, feedback, resources, and organisation matching historical scores for the MSc SD. Attendance for the PGCert was also higher, averaging 83.5% compared to the MSc's 71.2%. While prior academic background did not appear to significantly influence programming scores, the overall success of the PGCert could partly be attributed to factors such as stricter admission criteria and a cohort skewed towards students with STEM backgrounds. These findings suggest that online delivery did not negatively impact outcomes and offer a valuable benchmark for future programme design as institutions navigate post-pandemic educational policy.

Guppy et al. (2022), through a mixed-methods study, found that most students and staff preferred a shift toward blended or hybrid models post-pandemic, with modest increases in support for fully online courses. This aligns with earlier trends identified by Anthony et al. (2020), which suggested a rise in blended learning even before the pandemic. Guppy et al.'s findings further revealed that between two-thirds and three-quarters of respondents including students, faculty, senior administrators, and instructional designers anticipated greater use of online courses in the future. There was strong consensus across these groups regarding the likely growth of blended/hybrid models in higher education. However, students appeared more skeptical than staff about large-scale digital transformation, while instructional designers were generally optimistic but expressed concerns about who would teach such courses. While these studies project transformation in digital learning, few expect dramatic or revolutionary changes. Nevertheless, future research must explore how best to navigate this shift, considering the perspectives of faculty, students, and learning designers.

3 METHODOLOGY

This section outlines the research methodology and design used to investigate the impact of COVID-19 on learner achievement in the Level 3 and 4 Extended Diploma IT Programme. A research methodology can be described as a structured plan that guides a study from its theoretical foundations to the design, data collection, analysis, and interpretation of findings (Chen & Hirschheim, 2004). It provides a framework for identifying suitable methods of data collection and analysis based on the research questions and context. This study adopts an interpretive research paradigm, which is particularly suited to exploring people's experiences within social and organisational settings (Creswell & Creswell, 2017). The interpretive paradigm enables researchers to understand a phenomenon from the perspectives of the individuals involved (Cranton & Taylor, 2012), allowing for a more meaningful exploration of how students and educators navigated the shift to remote and hybrid learning during the COVID-19 pandemic. Accordingly, a qualitative research approach was applied in this study. Qualitative research is especially appropriate when a topic is complex, not well understood, or underexplored—such as the educational impact of the pandemic on further education learners. It allows researchers to examine not just what happened, but how and why, in the context of real-world experiences. In particular, the study was designed as a retrospective inquiry to understand how COVID-19 influenced learner performance in IT programming courses offered during the national lockdown. The research draws on insights from both the peak of the pandemic and the period that followed, using the participants' experiences to reflect on the effectiveness of different learning modes. A total of 11 full-time Level 3 and 4 students from a College of Technology participated in the study. Given the relatively small sample size, a quantitative approach would not have been suitable. Instead, the qualitative method enabled the collection of rich, detailed data that could offer deeper insights into learners' challenges, preferences, and engagement during remote and hybrid learning. This interpretive approach was therefore chosen as the most appropriate way to address the research objectives.

3.1 DESCRIPTION OF DATA COLLECTION, INSTRUMENTS, AND APPROACH

This research was conducted at one of the leading Colleges of Technology in the United Kingdom, focusing on students in the Computing Department enrolled in Level 3 and Level 4 programmes who had taken programming courses during the COVID-19 lockdown. To gather their perspectives, an

Vol 1(2), DOI:10.82036/p9x29640, July 2025 ISSN:2977-9332

open-ended survey questionnaire was developed and distributed electronically. This format was chosen not only for convenience but also to ensure the safety of participants and researchers by avoiding physical contact during and after the global pandemic. Clear instructions were provided at the beginning of the survey, allowing participants to make an informed decision about whether to take part. Ethical considerations were strictly observed throughout the study. In line with the Data Protection Act (1998), Freedom of Information Act (2000), and General Data Protection Regulation (GDPR, 2018), all responses were fully anonymised. To protect participants' identities, they were asked to generate unique identifiers by combining two letters of their choice with a number, rather than using any personal or traceable information. The questionnaire was administered in April 2022, targeting all eligible students at the specified levels. Out of a total population of 24 students, 11 responded to the survey. While the sample size was relatively small, the richness and consistency of the responses suggested that a data saturation point may have been reached. This means that the key themes emerging from the responses were sufficient to address the research objectives and provide meaningful insights into the learners' experiences during remote learning.

4 RESULTS AND DISCUSSION

This study's findings were shaped by the key themes identified through personal teaching experience and direct communication with colleagues during the COVID-19 lockdown. The focus was to explore the impacts of the pandemic on learners' achievement in programming courses within the Level 3/4 Extended Diploma IT Programme. The primary variables investigated included learning mode preference, loss of focus and concentration, motivation, academic performance, timely task submission, peer discussion, disruptive behaviour, and overall learning experience. Additionally, the study included a section for participant recommendations, acknowledging the value of learner perspectives in improving future teaching approaches.

4.1 LEARNING MODE PREFERENCE

One central objective was to understand students' preferred mode of learning for programming courses during the lockdown. Most participants expressed a strong preference for face-to-face learning, citing its higher engagement levels and richer learning experience compared to remote instruction. Participants acknowledged the necessity and benefits of remote learning during lockdown but consistently emphasized that in-person learning better supported their educational needs.

"I'm not against remote learning; it can be a powerful tool, especially during lockdown when we had no choice. However, it requires full engagement from both lecturers and students to be effective. Overall, face-to-face learning is more beneficial due to the immersive learning environment" (JG4).

Others pointed out the personal connection and immediacy of support that face-to-face interaction provides:

"You get a more personal experience face to face, which can be more beneficial than remote learning" (DL7).

"Learning face to face is much better because it is easier to ask questions and feel engaged" (GJ20).

While some participants felt remote learning could be equally effective if both teachers and students fully commit:

"Participation and support are possible whether face to face or remote, provided both parties engage" (DE4).

However, some noted challenges with remote learning, particularly when quick feedback was needed:

"Remote learning is fine when you know what you're doing, but when issues arise, face-to-face discussions allow instant responses and better feedback" (JE96).

These findings align with recent post-pandemic research by Mehta et al., (2024), which showed that 52.2% of students preferred in-person learning as their first choice, while blended and online modes were secondary options. The data suggest that while mode preference varies, the key to effective learning lies in engagement and interaction, echoing participant sentiments.

4.2 CONCENTRATION AND FOCUS

Participants reported significant challenges maintaining concentration during remote programming lessons, often due to distractions at home. This echoes concerns raised by Sam (2022) about the unsuitability of many home environments for focused learning, including issues like unreliable internet and competing demands for the same device.

"Distractions were more common with remote learning — noises at the door, pets, and lack of a dedicated learning environment made it harder to focus" (JG4).

Others described the temptation to disengage or walk away from their desks during online sessions:

"It was easy to play games or leave my desk for other activities" (JM).

Parents especially found home distractions challenging:

"With a 9-month-old at home, staying focused online was difficult. A proper home office might have helped, but I still prefer face-to-face teaching" (JE96).

Vol 1(2), DOI:10.82036/p9x29640, July 2025 ISSN:2977-9332

Overall, face-to-face learning was seen as more motivating and conducive to maintaining focus.

4.3 MOTIVATION

Motivation waned for many learners as the uncertainty of the pandemic and lockdown continuation wore on. The lack of a clear timeline for returning to in-person classes contributed to feelings of discouragement:

"Constantly changing news about lockdown endings made me lose motivation; I didn't know when normal learning would resume" (JB8).

Disruptions affected not only students but also staff and management, compounding challenges:

"Learning staggered across all subjects; motivation and focus were cut in half" (JW1).

These findings mirror international studies, such as Asgari et al. (2021), which noted a decrease in motivation and engagement during COVID-19 despite the convenience of online learning. Similarly, Hollister et al. (2022) reported a marked drop in student satisfaction following transitions to online formats, largely due to diminished interest and collaboration opportunities.

4.4 ACADEMIC PERFORMANCE

Discussions with teaching staff suggested that learners' academic potential was somewhat constrained by remote learning conditions. Several participants themselves reflected on how the home environment contributed to procrastination and reduced productivity:

"Being at home made me lazier. Without a set schedule, I woke up late and procrastinated, resulting in unfinished work. At college, I could get help after lectures, which wasn't possible remotely" (JB8).

Comparatively, McGowan et al. (2022) found that online postgraduate certificate programs performed as well or better than traditional face-to-face courses, although factors such as cohort background influenced outcomes. Their study highlighted the evolving impact of COVID-19 on education delivery and emphasized the need for adaptable policies.

4.5 TIMELY TASK SUBMISSION

Timely submission of programming assignments was challenged during the lockdown, often due to motivation issues and decreased interaction with lecturers. Students noted delays linked to difficulties in resolving programming errors without immediate support:

"I delayed tasks mostly because of a lack of motivation and social interaction" (JG1).

"It was harder to complete assignments as I couldn't speak directly to teachers about programming errors; lectures and presentations were delayed" (HA1).

Technical challenges with platforms such as Moodle and Teams also contributed to missed deadlines:

"Using Moodle and Teams for the first time was confusing and disorganized; no assignment timetable meant it was easy to miss things" (DK1).

These observations resonate with Sam (2022), who highlighted the challenges educators faced during the rapid shift to online teaching without adequate training.

4.6 PEER DISCUSSION

All participants strongly agreed that peer discussion is crucial for learning programming, as it fosters engagement and deeper understanding:

"Face-to-face discussions help with problem-solving and sharing knowledge, which builds skills" (JG1).

Remote learning limited private interactions with teachers, making peer support even more important:

"I couldn't talk privately with teachers during lessons, so I relied on peers to explain programming issues" (HA1).

"Peers provide different perspectives and simpler explanations when I don't understand something" (GJ20).

Sam (2022) also emphasized the importance of real-time interaction and engagement, rather than passive online lectures.

4.7 DISRUPTIVE BEHAVIOUR

Participants reported some instances of disruptive behaviour during online sessions, such as being removed from calls by peers, highlighting limitations in managing online classroom dynamics:

"In classes with younger students, being removed from calls disrupted lessons" (JG20).

"I kept getting kicked out of Teams calls, which is frustrating. Discord might have managed permissions better" (JW1).

Such issues reflect challenges noted by Selvaraj et al. (2021) and Stafford (2020), who observed that assumptions about student behaviour in online settings often do not hold true, requiring new management approaches. Exploring correlations between learner age and disruptive behaviour could inform future teaching adaptations.

Vol 1(2), DOI:10.82036/p9x29640, July 2025 ISSN:2977-9332

4.8 OVERALL LEARNING EXPERIENCE

Most participants felt face-to-face learning provided a better overall experience, particularly for programming courses that require hands-on guidance:

"Face-to-face made it easier to ask for help and receive demonstrations" (JG1).

"I was unhappy having to learn everything online; hands-on teaching is far better" (JE96).

"My performance improved with face-to-face teaching, especially since I hadn't learned programming before" (JB8).

"Certain programming languages like C# require interactive learning, which was difficult remotely" (JW1).

4.9 RECOMMENDATIONS

Participants emphasized the need for reliable technology and well-organized resources to support online learning:

"Lecturers ensured we had access to plenty of learning materials, which helped, but distractions and connectivity issues remain challenges" (JG1).

"All resources should be consolidated with clear instructions, and communication with teachers should be easier to reduce time wasted on setup" (GJ20).

"Tutors should maintain consistent video conferencing and provide one-to-one support with screen sharing to review work. There needs to be strict policies to ensure students receive the attention they deserve" (JE96).

"Better organisation and potentially using platforms like Discord could improve online learning experiences and reduce issues like being kicked out of calls" (JW1).

5 CONCLUSION

This study reveals that while most participants recognize remote learning as a viable alternative during unprecedented disruptions such as the COVID-19 pandemic, there remains a strong preference for face-to-face learning, especially for complex and practical subjects like computer programming. The investigation identified critical factors influencing learners' experiences and outcomes, including learning mode preference, focus and concentration, motivation, academic performance, timely submission of tasks, peer discussion, disruptive behaviour, and overall learning experience.

From a theoretical perspective, the findings align with constructivist learning theories that emphasize the importance of interaction, engagement, and social learning in knowledge construction. The study underscores that the mode of delivery is less important than the quality of interaction and engagement it fosters. This supports Naidu's (2022) argument that online and flexible learning should not seek to replace traditional campus-based education but rather to complement it by creating resilient, adaptable, and learner-centered environments.

Practically, the results highlight that remote learning's effectiveness depends heavily on accessible resources, active engagement by both instructors and students, and supportive technological infrastructure. Participants emphasized that motivation and concentration are significantly influenced by the learning environment and the availability of immediate assistance, particularly in skills-based programming courses. Moreover, peer-to-peer interaction remains a fundamental component of effective learning, reinforcing Vygotsky's social development theory, which posits that collaborative dialogue enhances understanding.

The study also reveals challenges related to digital disruptive behaviors, which indicate the need for better management and control mechanisms within e-learning platforms. This echo concerns raised in recent literature about the digital readiness of both educators and learners in online environments (Selvaraj et al., 2021). Overall, this study underscores the fundamental human nature of education. While technological advancements offer novel modalities for instruction and learning, the core of effective education remains the interpersonal connection between educators and learners, as well as peer-to-peer interactions. Face-to-face instruction continues to provide unique advantages, such as immediate feedback, dynamic engagement, and the cultivation of learning communities, which are particularly critical in skill-intensive disciplines like programming. Nevertheless, when designed with intentionality and supported adequately, remote learning emerges as a vital mechanism for mitigating educational disruptions and broadening access to learning opportunities.

Looking ahead, the integration of blended learning approaches that strategically leverage the complementary strengths of both in-person and online modalities will be essential. Such integration not only ensures educational continuity in the face of unforeseen challenges but also facilitates learner autonomy by accommodating diverse preferences and contexts. This equilibrium represents a progressive pathway toward more resilient, equitable, and inclusive educational systems.

5.1 RECOMMENDATIONS

In conclusion, the researcher draws on the findings of this study to offer recommendations for the three key stakeholder groups identified below:

For Educators:

Vol 1(2), DOI:10.82036/p9x29640, July 2025 ISSN:2977-9332

i. Design remote programming lectures that are interactive and activity-rich to maintain student engagement and enable ongoing assessment of understanding during sessions.
ii. Proactively offer one-to-one follow-up sessions not only to those who request them but also to students who might be struggling silently, ensuring no learner is left behind.
iii. Provide supplementary learning materials that are clear, accessible, and tailored to different learning styles to support autonomous learning outside synchronous sessions.

For Educational Administrators and Managers:

i. Invest in and deploy robust e-learning platforms equipped with advanced features to control and minimize digital disruptions during sessions.
ii. Encourage and support ongoing professional development for educators, ensuring they are proficient with all technological tools available within learning management systems to optimize teaching delivery.
iii. Facilitate the integration of peer collaboration tools to simulate the benefits of face-to-face peer discussions within remote learning environments.

For Policy Makers:

i. Develop age-appropriate and engaging digital content frameworks that consider developmental differences among learners, reducing the likelihood of disruptive behaviors and enhancing participation.
ii. Establish clear policies and guidelines that promote equitable access to technology, timely technical support, and continuous digital skills training for both educators and students.

ACKNOWLEDGEMENTS

I sincerely thank all the students who took part in the survey. I greatly appreciate their time and willingness to contribute.

REFERENCES

Almossa, S. Y. (2021). University students' perspectives toward learning and assessment during COVID-19. *Education and Information Technologies*, *26*(6), 7163–7181.

Asgari, S., Trajkovic, J., Rahmani, M., Zhang, W., Lo, R. C., & Sciortino, A. (2021). An observational study of engineering online education during the COVID-19 pandemic. *PLOS ONE*, *16*(4), e0250041.

Chen, W., & Hirschheim, R. (2004). A paradigmatic and methodological examination of information systems research from 1991 to 2001. *Information Systems Journal*, *14*(3), 197–235.

Cranton, P., & Taylor, E. W. (2012). A theory in progress? Issues in transformative learning theory. *European Journal for Research on the Education and Learning of Adults*, *4*(1), 35–47.

Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., ... Lam, S. (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning & Teaching*, *3*(1), 1–20.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage Publications.

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*, *49*(1), 5–22.

Government of the District of Columbia. (2019). *What is COVID-19?* https://coronavirus.dc.gov/page/what-covid-19

Goldschmidt, K. (2020). The COVID-19 pandemic: Technology use to support the wellbeing of children. *Journal of Pediatric Nursing*, *53*, 88.

Gov.UK. (2022). *Analysis of the health, economic and social effects of COVID-19 and the approach to tiering*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/944823/Analysis_of_the_health_economic_and_social_effects_of_COVID-19_and_the_approach_to_tiering_FINAL_-_accessible_v2.pdf

Guppy, N., Verpoorten, D., Boud, D., Lin, L., Tai, J., & Bartolic, S. (2022). The post-COVID-19 future of digital learning in higher education: Views from educators, students, and other professionals in six countries. *British Journal of Educational Technology*, *53*(6), 1750–1765.

Hollister, B., Nair, P., Hill-Lindsay, S., & Chukoskie, L. (2022). Engagement in online learning: Student attitudes and behavior during COVID-19. In *Frontiers in Education*.

Keis, O., Grab, C., Schneider, A., & Öchsner, W. (2017). Online or face-to-face instruction? A qualitative study on the electrocardiogram course at the University of Ulm to examine why students choose a particular format. *BMC Medical Education*, *17*(1), 194.

Vol 1(2), DOI:10.82036/p9x29640, July 2025 *ISSN:2977-9332*

McGowan, A., Sage, P., Adhikari, J., Hanna, P., & Stewart, D. (2022). Teaching programming during COVID lockdowns–a positive lesson. In *Proceedings of the 7th International Conference on Human Interaction and Emerging Technologies*.

Means, B., & Neisler, J. (2020). *Suddenly online: A national survey of undergraduates during the COVID-19 pandemic*. Digital Promise. https://digitalpromise.org/wp-content/uploads/2020/07/ELE_CoBrand_DP_FINAL_3.pdf

Mehta, K. J., Aula-Blasco, J., & Mantaj, J. (2024). University students' preferences of learning modes post COVID-19-associated lockdowns: In-person, online, and blended. *PLOS ONE, 19*(7), e0296670.

Mehta, K. J., Miletich, I., & Detyna, M. (2021). Content-specific differences in Padlet perception for collaborative learning amongst undergraduate students. *Research in Learning Technology, 29*.

Naidu, S. (2022). Reimagining and reengineering education systems for the post-COVID-19 era. *Distance Education, 43*(1), 1–5.

Page, J., Meehan-Andrews, T., Weerakkody, N., Hughes, D. L., & Rathner, J. A. (2017). Student perceptions and learning outcomes of blended learning in a massive first-year core physiology for allied health subjects. *Advances in Physiology Education, 41*(1), 44–55.

Sam, C. Y. (2022). Post-COVID-19 and higher education. *Journal of Applied Learning and Teaching, 5*(1), 156–164.

Selvaraj, A., Radhin, V., Benson, N., & Mathew, A. J. (2021). Effect of pandemic-based online education on teaching and learning system. *International Journal of Educational Development, 85*, 102444.

Stafford, V. (2020). EdTech review: Teaching through Zoom–what we've learned as new online educators. *Journal of Applied Learning and Teaching, 3*(2), 150–153.

Thahir, M., Julius, A., Tamam, B., & Thahir, W. (2023). Students' learning culture in higher education after the COVID-19 pandemic. *Conciencia, 23*(1), 75–82.

Times Higher Education. (2022). Has student attendance recovered post-pandemic? Take our survey. *Times Higher Education*. Available at: https://www.timeshighereducation.com/news/has-student-attendance-recovered-post-pandemic-take-our-survey (Accessed 20th July 2025).

UNESCO. (2020). *One year into COVID-19 education disruption: Where do we stand?* Retrieved July 23, 2025, from https://www.unesco.org/en/articles/one-year-covid-19-education-disruption-where-do-we-stand