

AN EVALUATION OF HOW TECHNOLOGY IMPLEMENTATION
IMPACTED STUDENTS LEARNING IN THIRD LEVEL EDUCATION
(UNDERGRADUATES AND POSTGRADUATES) DURING THE COVID-19
PANDEMIC

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DECLARATION

I, Deborah Akinbami, hereby declare that this dissertation report is my original work and has been completed as part of the requirements for the award of a bachelor's degree in business at National College of Ireland

All sources of information used in the course of this research have been appropriately acknowledged and referenced. To the best of my knowledge, this dissertation has not been submitted, either in whole or in part, for the award of any other degree or qualification in this or any other institution.

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ACKNOWLEDGEMENTS

First and foremost, I give all glory and thanks to God Almighty for granting me the strength, wisdom, and perseverance to complete this research. Without His grace, this journey would not have been possible and complete. I would also like to express heartfelt appreciation to my classmates for their encouragement, shared insights, and offered their time and support during the course of this research. Your contributions, whether through thoughtful discussions or shared experiences, helped shape the direction and depth of this work.

I extend my thankful gratitude to my supervisor, Robert Macdonald, whose guidance, support, and constructive feedback have been invaluable throughout the course of this study. Without your mentorship this research wouldn't be what it is today, you have also contributed greatly to my personal and academic growth over the years.

To my friends, thank you for your constant motivation and for always believing in me, even during the most challenging moments. I appreciate all your spontaneous calls of encouragement. Your encouragement and support lifted my spirits and helped me stay focused.

Finally, to my family, especially my son Joshua your unwavering love, prayers, and support have been the foundation of my journey. I am especially grateful for your understanding, patience, and sacrifices which have made this academic pursuit possible. Thank you for being my greatest cheerleaders.

This study is a reflection of the collective support I have received from all of you, and I am deeply grateful.

ABSTRACT

This study investigated the impact of technology implementation on student learning in third-level education during the COVID-19 pandemic, focusing on undergraduate and postgraduate students in Irish universities. The pandemic-induced shift to online education posed significant challenges and opportunities, raising questions about the quality, accessibility, and effectiveness of virtual learning platforms. The research problem addressed in this study centres on the need to evaluate how online technologies influenced educational outcomes, student engagement, and the usability of digital tools amidst emergency remote teaching. A descriptive quantitative survey was conducted with 77 students, schooling in third-level institutions in Ireland, employing a structured online Google Forms questionnaire to gather data their experiences with online learning. Frequency tables, bar charts, and comparative analysis were used to interpret the data, guided by four key objectives: perceived quality of education, student engagement, barriers to learning, and effectiveness of digital platforms and lecturer competence. The findings revealed that most students perceived technology as having a somewhat positive or very positive impact on learning quality. Engagement levels varied, with a majority participating frequently in online classes, though a significant minority reported low or no engagement. Key barriers included difficulty focusing at home, limited interaction with lecturers, and mental health stress. While digital platforms were generally deemed effective, limited training and disparities in lecturer competence influenced outcomes. This research contributes to the growing body of literature on digital education by providing student-centred insights into the successes and shortcomings of pandemic-era online learning. The study concludes that while online technologies supported continuity in education, future improvements require equitable access, effective training, and pedagogically driven digital integration.

Keywords: Online learning, Digital tools, COVID-19 pandemic, Student engagement, Higher education, Technology implementation, Ireland

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INTRODUCTION

In late 2019, the outbreak of COVID-19 prompted an unprecedented global shift across every aspect of society, including education (Selingo et al., 2021). Although the pandemic context is important, the more critical issue and the focus of this study lies in how third-level education systems were compelled to transform rapidly from face-to-face and traditional instruction to technology-mediated learning environments (Mazurek, 2022). This shift, which was sudden, complex and widespread, has had profound implications for students as well as lecturers and institutions alike (Stracke et al., 2022).

In Ireland, all schools, universities, and childcare services were closed in March 2020 following government guidelines issued by Taoiseach Leo Varadkar (McGuire, 2023). Third-level education institutions remained partially or fully closed for nearly two academic years, prompting a fundamental restructuring of learning and teaching methods (Debeş, 2021). Almost overnight, universities were required to abandon physical classrooms in favour of virtual ones. The rapid relocation of teaching to online platforms implied that institutions had to scale up or adopt digital technologies and tools, often with little preparation or long-term planning.

This dramatic shift to online learning presented both significant opportunities and challenges as well. Most universities made substantial investments to convert face-to-face curricula into virtual formats (Lieberman et al., 2020). However, the implementation of online learning on such a scale demanded that lecturers, students, and administrative staff adapt quickly to new modes of interaction and unfamiliar technologies. If possible, such a transition would have occurred gradually. This would have allowed time for careful planning, infrastructure development and training. In its place, many stakeholders were exposed to a process of trial and error to navigate online education (Samat et al., 2020). This study examines the impact of this technological transformation on student learning at the third level, with a focus on undergraduate and postgraduate students in Ireland. Particularly, this research evaluates the effectiveness of synchronous online learning. This was the primary mode of instruction used during the pandemic. It determined student engagement, outcomes and experience (Qiao & Yijun, 2023).

For online learning systems to be effective, there must be a successful interaction of a range of components. According to Azhari and Ramadan (2022), these include digital infrastructure as well

as lecturer competency, pedagogical strategies, student adaptability and access to resources. This study examines how these components functioned in real-world scenarios during the pandemic. As Belt and Lowenthal (2023) observed, institutions must fully understand the strengths and limitations of online learning to be productive. Therefore, this study is a critical approach which aims to assess not just whether online education occurred, but how it did and what its effects were.

The core of this research focuses on synchronous online learning. It is where lecturers and students interact in real-time via digital platforms (e.g., Google Meet, Microsoft Teams and Zoom). Though dynamic, this mode of learning requires more engagement and structure than asynchronous learning, as it simulates the classroom environment to some extent (Gómez-Rey et al., 2018). My focus on synchronous learning is to reflect its dominant use during the pandemic in Irish higher education (Farrell et al., 2021) and its potential to mirror the experiences found in traditional classroom environment. Fortunately, this digital transition did not happen in a vacuum. Society across different sectors was already experiencing a steady increase in the use of technology, including education (OECD, 2023). Before the pandemic, many institutions had begun integrating digital tools into teaching. For example, in their report, Cornman et al. (2020) stated that in the United States, average school district spending on information and communications technology (ICT) services, equipment and supplies increased from \$77,657 in 2015 to \$300,336 in 2017. This increase demonstrates that pedagogical technology was already gaining ground before its adoption was accelerated at the instance of the global health crisis.

However, the unforeseen nature of the disruption caused by the pandemic revealed significant disparity concerning preparedness and infrastructure. Lecturers as well as students had to adjust quickly to unfamiliar digital platforms. This required both emotional resilience as well as technical competence (Akram et al., 2021). First of all, this transition impacted student engagement, the quality of education and the general academic experience (Svihus, 2024). This is why this study will be evaluating the perceived impact of online technology on the quality of education received by third-level students during the COVID-19 pandemic. The study will determine whether technology-enhanced education diminished or improved students' learning outcomes, from both personal and academic perspectives. Secondly, the study seeks to assess the nature of participation in virtual learning environments particularly student engagement levels during synchronous online

classes. Online engagement is perceived as multilayered. This is because it includes presence, motivation, communication and interactivity (McManus et al., 2024). Understanding how students engaged, or failed to engage, will offer important insights into the effectiveness or otherwise of online learning.

Thirdly, this study aims to identify the most common personal, technological and environmental challenges that students encountered during this period. Research shows that barriers could include lack of access to devices, poor internet connectivity, emotional and mental health challenges or home distractions (Khawaja et al., 2023; McManus et al., 2024). This research aims to contribute to understanding the equity issues in technology-mediated education by identifying these barriers. Lastly, this study will examine the perceptions of students and lecturers regarding the interactivity, usability and pedagogical effectiveness of the online platforms used. Technologies such as Zoom, Blackboard and Moodle became significant to teaching during this period, but how they were used defined their effectiveness as Svihus (2024) echoes. While some lecturers struggled, others excelled at leveraging these platforms for effective student engagement (Shoaib et al., 2023). Understanding how both groups experienced these tools can inform future training and implementation strategies.

Overall, the aim of this study is to build/achieve a better understanding of how technology reshaped third-level education during the COVID-19 pandemic. The study will highlight what worked well and what did not, and present evidence-based insights that can guide future policy and practice. The integration of digital tools in education is likely to continue despite that the pandemic has officially ended. Lessons learned during that period can influence long-term strategies for blended and fully online learning. This would ensure that future implementations are more effective, efficient and equitable. This study also has implications for curriculum developers as well as policymakers. According to Ali (2020), introducing ICT literacy at earlier stages of education (primary and secondary levels) would better prepare students for the increasing reliance on digital pedagogy in higher education. Such understanding would help enhance the inclusivity of modern education systems and bridge digital divides.

To close this introduction, this research is not merely about the pandemic, even though COVID-19 serves as the catalyst. It is about how third-level institutions adapted to a crisis through

technology; how students experienced this change, and what this means for the future of education in a digitally advancing world. This study offers a comprehensive evaluation of the role of technology in shaping learning outcomes during one of the most transformative periods in modern education history by exploring the key variables of quality, engagement, barriers, and usability.

LITERATURE REVIEW

2.1 Introduction to Educational Technology

Educational technology has evolved to become a foundational element in modern learning environments from being merely supplementary tools in the past. According to Christensen (2011, 2024), from the 1960s onward, innovations such as the BASIC programming language enabled students to directly engage with computing. The Vocational Education Act of 1963 in the U.S. also marked an important milestone by enabling funding for early classroom technology (Cornman et al., 2020). Subsequent decades have witnessed the development of personal computers as well as the integration of digital tools/technologies into schools and universities (OECD, 2023). In contemporary times, digital platforms are now often used to assess, deliver and support learning at all educational levels (Dennen & Jones, 2023). Learning management systems (LMS), including Blackboard, Moodle and Canvas, enabled online coursework, assessments as well as communication. A study argues that such digital integration increases student motivation and participation in their studies (Mmakola & Maphalala, 2023). Dennen and Jones (2023) also believe that it enhances inclusion, especially for remote learners.

In third-level education, blended learning models had begun gaining traction before COVID-19 (Samat et al., 2020). This development was influenced by institutional priorities and staff readiness, although adoption remained uneven (Shahin, 2021). COVID-19 accelerated this shift. It forced universities to adopt technology urgently and universally (Stankovska et al., 2021). This study builds upon that context. It seeks to assess how students experienced the sudden integration of technology during the pandemic and its implications for future digital education practices.

2.2 The Impact of COVID-19 on Third-Level Education

The COVID-19 pandemic triggered a global shift to emergency remote learning from traditional education. According to the UNESCO (2020), over 1.5 billion students in 190 countries by mid-2020 were affected by school closures. Third-level institutions in Ireland shut down abruptly in March 2020, forcing universities to migrate assessments, courses and support online (McGuire, 2023). Despite prior limited usage, platforms such as Moodle, Microsoft Teams became essential. System-wide unpreparedness was exposed by this transition. While institutional support was often

inconsistent, many lecturers lacked the digital training required to deliver effective online instruction. Additionally, students encountered numerous challenges (e.g., limited access to devices, poor internet connectivity, etc.) (Toquero, 2020). Both educators and learners, as Ali (2020) observed, were forced into emergency modes of teaching, sometimes without sufficient resources or structured planning.

A critical question remains: did this transition represent a temporary technological fix or pedagogical progress? This is because Barbour et al. (2020) caution against mixing up emergency remote teaching with high-quality online education because the latter requires intentional instructional design and support. The pandemic exposed different learning experiences and digital inequalities (Dubey & Pandey, 2020; Khawaja et al., 2023). Understanding these distinctions is important to improve future technology use in higher education, especially moving beyond crisis response to inclusive and sustainable digital learning models.

2.3. Objective 1: Perceived Impact of Technology on Quality of Learning

There has been significant debate around the perceived quality of education delivered to students in higher education with the sudden reliance on online technology during the COVID-19 pandemic (Abu Talib et al., 2021; Rani et al., 2025). The sudden transition of students to digital platforms from traditional face-to-face classrooms required that they adapt to new learning environments under often challenging circumstances. Examining students' perception of the quality of such digitally delivered education is critical for understanding whether technology was merely a stopgap solution during the global crisis or whether it served as an effective alternative. From the literature, there are mixed results in terms of students' satisfaction and performance. While some students found the digital format less engaging and harder to follow (Selvanathan et al., 2023), others reported increased convenience and flexibility with online learning (Stankovska et al., 2021; Xu & Xue, 2023). An important variable to understand is the mode of online delivery, that is, synchronous versus asynchronous. Synchronous learning, involving real-time interaction through platforms such as Microsoft Teams or Zoom, helped a lot to encourage live discussions and recreate aspects of a classroom environment. In contrast, asynchronous modes, relying on forums, readings and recorded lectures, offered greater flexibility but less direct engagement (Rani et al., 2025). According to Xu and Xue (2023), although student satisfaction with synchronous learning

was generally higher, it was not necessarily associated with better learning outcomes. This view reflects findings by Belt and Lowenthal (2023) and Bailey et al. (2023) who found in their studies that real-time interaction contributed to a sense of connection with peers and lecturers, but that due to scheduling conflicts and screen fatigue, not all students preferred this format.

User capabilities contributed significantly to shaping student perceptions of quality. Research shows that the use of interactive tools such as instant chat features, collaborative documents and live polls allowed students to participate more actively during lessons (Bozkurt & Sharma, 2020). Video content, both pre-recorded and live, also supported various learning styles. It allowed students to revisit, rewind or pause complex topics at their own pace. Learning management systems (LMS) (e.g., Blackboard and Moodle) further enhanced structured learning by offering centralised access to course materials, assignment submissions, and feedback. According to Rosário and Dias (2022), LMS platforms became the backbone of remote learning, helping students to stay organised amidst a disrupted academic calendar and to manage their workloads.

There were various pedagogical outcomes of these technological tools depending on how effectively they were integrated into course design. Gamified quizzes, breakout rooms and multimedia tools, when creatively used enhanced student engagement and helped to strengthen their understanding of major concepts (Despitasaki & Joni, 2025). These strategies fit with the principles of active learning, where students are encouraged to participate, reflect, and collaborate rather than passively absorb content (Alenezi, 2023). According to Qiao and Yijun (2023), active learning strategies such as peer teaching, group work and problem-solving exercises became crucial for students' long-term retention and deeper understanding. Nevertheless, these tools were as effective as the instructors' ability to design lessons that leveraged their functionalities and the familiarity of the instructors with digital pedagogy.

This transition raises the following questions: are better tools essentially leading to better pedagogy, or are they merely substituting traditional delivery methods without genuine transformation? The answer appears to lie in the preparedness of instructors and instructional intent. In other words, while digital tools can enhance learning quality, if used to simply replicate face-to-face lectures in a virtual format without adaptation, their potential will be diminished. For

example, a PowerPoint presentation read aloud over Zoom is unlikely to yield better results than an in-person seminar that encourages discussion and inquiry. This suggests that the quality of learning during that period was determined by both technology availability and the educators' ability to redesign instructional approaches which are suitable for the new environment.

2.4 Objective 2: Student Engagement in Online Learning

According to Bond and Bedenlier (2019), there is a common recognition that student engagement is a major factor in academic success. Nonetheless, the rapid shift to online learning during the COVID-19 pandemic presented significant challenges to maintain high levels of student motivation, interaction and participation. Engagement in a traditional classroom setting is often enabled through physical presence, peer interaction and spontaneous dialogue (Martin & Borup, 2022). However, new strategies had to be adopted to stimulate student involvement with the advent of remote learning, especially synchronous delivery methods. In synchronous online environments, educators attempted to recreate classroom dynamics through the use of virtual tools such as breakout rooms, live discussion forums and group work (Belt & Lowenthal, 2023). These interactive elements were designed to support active participation and peer collaboration. For example, breakout rooms offered smaller spaces to students for dialogue, which enabled personalised and focused discussions. These features, when facilitated effectively helped to build a sense of classroom community and sustain attention (Qiao & Yijun, 2023). However, these strategies were not without limitations. One commonly cited challenge was the use, or lack, of cameras during online sessions (Rasheed et al., 2020). While keeping cameras on could increase accountability and visual interaction, many students chose to leave them off due to concerns around internet bandwidth, privacy or simply discomfort. This often created a disengaged atmosphere where lecturers were met with silent screens, making it difficult to gauge student understanding or reactions in real time.

At the same time, social and emotional disconnect was a key barrier to meaningful engagement. According to Bozkurt and Stracke (2022), the absence of face-to-face cues, such as body language, tone, and eye contact, impacted how students perceived their connection to peers and lecturers. Many students reported feeling mentally fatigued or isolated, a situation that led to less motivation to actively engage. Masalimova et al. (2022) also observed that the lack of social presence in online

classrooms can negatively affect student emotional well-being and morale. Mental health challenges such as loneliness, anxiety and burnout were frequently reported, particularly among students who did not have structured routines or supportive home environments (HSE, 2020a). Students found it harder to maintain a sense of academic motivation and belonging without such informal interactions which normally occurred on campus, before or after class, in communal spaces or during group study.

Despite these obstacles, some students preferred the flexibility of synchronous distance education (SDE). Findings from a study showed that SDE was often rated more highly in terms of student satisfaction even though it did not outperform asynchronous or face-to-face learning formats in terms of measurable effectiveness (Xu and Xue, 2023). This student satisfaction may have arisen from easy access to real-time instruction while remaining in a comfortable or familiar environment. Students who had strong digital skills and were self-motivated were more likely to thrive in such environments. Nevertheless, for others, especially students who found it difficult to stay focused in online settings or relied on in-person support, engagement declined sharply.

This review shows that technology provided both opportunities and obstacles for student engagement in higher education during the pandemic. While the overall level of engagement was mediated by technological, emotional and pedagogical factors, synchronous learning environments offered innovative tools for student interaction. Future digital education must move beyond technical delivery to address the deeper relational and motivational needs of learners.

2.5 Objective 3: Barriers to Access and Effective Learning

In many cases, the rapid transition to online education during the COVID-19 pandemic exposed and worsened existing challenges that prevented student access to effective learning (Rapanta et al., 2021). These barriers included technical, environmental, institutional and psychological challenges (Rasheed et al., 2020). Identifying and critically examining these barriers is crucial for understanding the differences in students' experiences and for coming up with strategies to create a more supportive and inclusive digital learning environment in future educational crises or reforms.

The first pressing and immediate challenge was technological access. According to Didenko et al. (2021), the success of online education was heavily dependent on access to devices such as tablets or laptops, as well as stable internet connections. Nevertheless, many students did not have reliable access to either the devices or stable internet connection. This forced some students to rely on their mobile phones or share a single device among multiple household members, a situation that is poorly suited for rigorous academic work (Dempsey et al., 2020). Synchronous learning was also impeded by unstable internet connections. According to Belt and Lowenthal (2023), this caused students to become disconnected during assessments or miss vital parts of their lectures. Furthermore, many students found it difficult to efficiently submit their assignments or navigate their course materials due to their unfamiliarity with learning management systems. Czerniewicz (2020) emphasised that students who lacked prior experience with digital platforms were exposed to a difficult learning curve, which prevented them from effectively engaging with content and assessments on such platforms.

Secondly, the effective learning of many students was hindered by substantial psychological and environmental challenges. Typically, remote learning required students to adapt to home environments that were not always conducive to academic focus (Ali, 2020). For those living in large households or shared accommodations, a lack of dedicated or quiet study space was a constant challenge. This was even made more difficult by distractions from younger siblings, household responsibilities or noise pollution, which altogether unsettled students' routine and concentration (Rosário & Dias, 2022). Psychologically, students faced increased feelings of demotivation, loneliness and anxiety owing to the isolation from peers and campus life (Selingo et al., 2021). Many of them reported higher levels of stress caused by workload pressure, uncertainty and reduced access to on-campus mental health support (Mulder et al., 2023). The emotional toll of learning in isolation and the fear of economic insecurity and illness impacted negatively on their overall well-being and academic performance (HSE, 2020a, 2020c).

Thirdly, there was uneven institutional support recorded during the period. While some universities struggled to respond effectively or promptly to student needs (Farrell et al., 2021), others provided assistance through device loans, digital literacy workshops or extended deadlines (Longhurst et al., 2020). The support systems in place, in many cases, were not easily accessible,

especially for students already marginalised or those unfamiliar with navigating university bureaucracies (Dunne et al., 2020). A visible gap existed between students' lived experiences and institutional policies at that time (Bray et al., 2020). For example, announcements about emergency funds or virtual counselling services often failed to reach students who needed them most. Sometimes the application processes were very time-consuming and complex (Czerniewicz, 2020). This created a disconnect between policy intention and practical implementation, raising concerns about how well institutions had anticipated and planned for the diverse needs of their student populations. As Gaba et al. (2021) argue, the pandemic did not affect all students equally. Geographic location, socioeconomic status and prior access to technology determined who was able to continue to learn effectively and those who could not or had to jump many hurdles to do so.

2.6 Objective 4: Staff Training, Technology Usability, and Pedagogical Effectiveness

The COVID-19 pandemic brought unprecedented demands on third-level education staff. While students faced adjustment challenges, educators were equally tasked with rapidly adopting unfamiliar technologies to continue delivering instruction (Falode et al., 2020). This section critically evaluates staff preparedness, platform usability, and the extent to which pedagogical goals were supported during this digital transition. One of the most immediate challenges was the lack of training in digital instruction. Most lecturers had little or no formal preparation in online teaching, leading to a reactive rather than planned transition (Önoral & Kurtulmus-Yilmaz, 2020). As Bailey et al. (2022) observed, effective digital learning depends not only on technical competence but also on the integration of sound pedagogical strategies. Akram et al. (2021) further argued that without a framework like Technological Pedagogical Content Knowledge (TPACK), staff often rely on surface-level use of digital tools. Educators are encouraged by TPACK to understand the connection that content, pedagogy and technology have, which supports depth and engagement in digital education.

Staff attitudes also played a critical role. While some educators embraced digital innovation, others felt reluctant or overwhelmed to adapt. According to Hashemi et al. (2022), openness to ICT and staff motivation strongly impacts the success of educational technology. Many lecturers in practice defaulted to direct lecture formats using platforms such as Zoom without adjusting teaching styles

for online engagement (Dennen & Jones, 2023). This reduced interactivity limited the potential for active learning. The teaching quality was substantially impacted by the usability of platforms. For example, the use of Microsoft Teams, Zoom and Moodle was prevalent, but each came with its unique challenges. For example, although effective for breakout sessions and live interaction, Zoom was criticised for lacking academic structure and causing fatigue (Rani et al., 2025). Microsoft Teams integrated multiple features but had a difficult learning curve. While Moodle offered strong administrative capabilities for assessments and feedback, its interface was often seen as outdated (Rosário & Dias, 2022). Students' experiences with Google Meet also varied. Some appreciated its simplicity, while others found it lacked the interactivity that engaged learning requires (Rani et al., 2025). These issues demonstrate that platform design and user experience are critical to have meaningful digital education.

During that period, Learning Management Systems (LMSs) contributed immensely to structured learning (Rosário & Dias, 2022). Using LMSs, lecturers were able to manage their coursework, track student participation and provide feedback (Stankovska et al., 2021). LMSs supported diverse assessment formats and promoted consistency when used effectively. However, their impact heavily depended on staff and student proficiency with the system. Unfamiliarity with the technology and poor navigation at times undermined their potential. This points to the need for user-centred design and adequate orientation for users (Tugun et al., 2020). A key concern that emerged was whether these tools were built with education in mind. For example, it was considered that Zoom and Teams were originally corporate tools repurposed for academic use. Without integrated instructional functionalities, their effectiveness was limited unless instructors actively redesigned their teaching methods. Going forward, institutions must invest in staff pedagogical training as well as technological access. This could include sustained professional development, embedding ICT skill-building into institutional culture and collaborative knowledge-sharing networks. In sum, while educators demonstrated resilience, confidence, disparities in training and platform usability influenced the effectiveness of online teaching. Future strategies will have to guarantee educator readiness by prioritising system-wide investment, continuous support and pedagogically grounded technology use.

2.7 Synthesis and Gaps in the Literature

Research on educational technology, especially in the context of the COVID-19 pandemic, provides valuable insights into the potential and challenges of digital learning environments. What clearly emerges from existing research is that when technology is effectively implemented, it can substantially enhance educational access, flexibility, and engagement (Angellika et al., 2022). Active learning and participation in higher education are widened through tools such as multimedia learning aids, learning management systems (LMS) and video conferencing. Many studies have mentioned that students often access diverse formats suited to their learning preferences (Gaba et al., 2021), engage in asynchronous discussions (Belt & Lowenthal, 2023) and benefit from the ability to revisit recorded materials (Qiao & Yijun, 2023). These developments indicate a major transition in the third-level education landscape.

Additionally, the literature shows that that educator readiness is a fundamental factor influencing the success of technology-enhanced learning. Studies by Bailey et al. (2022) and Dennen and Arslan (2022) reference the importance of teacher training, pedagogical adaptability and digital literacy. Likewise, student context (e.g., internet connectivity, access to devices and mental health), influences the effectiveness of digital learning (Selvanathan et al., 2023). It becomes apparent that the pandemic period revealed how disparities in infrastructure and support can result in unfair educational outcomes, heavily pointing to the need to put in place equity-focused digital strategies.

However, notable gaps remain despite this growing body of work. One such gap is the limited understanding of how different student cohorts, specifically undergraduates versus postgraduates, experienced the transition to online learning. Much of the literature treats students as a homogeneous group, overlooking variations in workload, academic maturity and autonomy that may affect their engagement with digital platforms. Moreover, there is insufficient cross-sectional empirical research on the academic and psychological impacts of extended online learning periods. Little known also is the sustainable institutional strategies needed to ensure that there is development in digital pedagogy and ongoing staff training. Some of these gaps will be addressed by this study through a structured and empirical examination of the impact of technology on student learning during the COVID-19 pandemic with focus on Ireland.

2.8 Overriding Research Question and Objectives of the Study

The central research question for this study is *What were the impacts, challenges, and effectiveness of online learning during the COVID-19 pandemic as experienced by third-level students?* It is both timely and significant. The COVID-19 pandemic forced a rapid transition in educational delivery methods, especially in higher education, where institutions shifted to digital platforms almost overnight from traditional in-person instruction (Farrell et al., 2021). While this change enabled learning continuity, it also revealed gaps in staff and institutional preparedness, pedagogical practice and technological infrastructure. Understanding how students experienced this transition is essential for evaluating the quality of education delivered during this period and for guiding future policy and investment in digital education, particularly in Ireland. The aim of this research is to collect students' perspectives and, based on those, provide actionable insights into what worked, what failed, and how educational institutions in Ireland can build more inclusive, resilient and effective digital learning environments going forward.

The following objectives are formed to answer the research question above:

- i. To evaluate the perceived impact of online technology on the quality of education received by third level students during the COVID-19 pandemic.
- ii. To assess student engagement levels during synchronous online classes and their participation in virtual learning activities.
- iii. To identify the most common technological, environmental, or personal barriers students faced in accessing and benefiting from online education.
- iv. To examine student and lecturer perceptions of the usability, interactivity, and pedagogical effectiveness of the online learning platforms used.

METHODOLOGY

3.1 Research Methodology Overview

This study aims to investigate the impacts, challenges, and effectiveness of online learning during the COVID-19 pandemic as experienced by third-level students in Ireland. The study is guided by four objectives: (1) to evaluate the perceived impact of online technology on the quality of education; (2) to assess student engagement during synchronous online classes; (3) to identify common technological, environmental, or personal barriers to effective learning; and (4) to examine the usability, interactivity, and pedagogical effectiveness of online learning platforms. Grounded in a positivist paradigm, this research assumes that reality is objective, measurable, and best understood through quantifiable data (Saunders et al., 2019). This paradigm fits with the aim of the study which is to generate quantifiable data based on patterns in participants' responses. It supports the use of statistical analysis to identify trends and test relationships in how technology impacted learning experiences during the pandemic (Creswell & Creswell, 2018).

3.2 Theoretical Influences

To inform its methodological approach and interpretation of data, this study draws upon two key theoretical frameworks: the Technology Acceptance Model (TAM) and Constructivist Learning Theory. These perspectives are complementary. They provide both a technological and pedagogical lens for understanding students' experiences with online learning during the COVID-19 pandemic.

Developed by Davis in 1989, the Technology Acceptance Model (TAM) is a widely recognised framework used to assess users' acceptance of and interaction with technology. The model posits that two primary factors, perceived usefulness (PU) and perceived ease of use (PEOU), predict an individual's intention to use a particular technology (Bailey et al., 2022). With regard to this study, TAM is highly suitable because it offers a structured basis for examining how students and lecturers evaluated online learning tools during the pandemic. For instance, students' engagement with platforms (e.g., Moodle or Zoom) is likely guided by how useful they found these platforms/tools in supporting their learning and how easy they were to navigate. TAM has been

validated across various educational settings and is often used in studies examining learning technologies (Venkatesh & Davis, 2000).

Constructivist Learning Theory is the chosen secondary theoretical influence in this study. It is an offshoot of the work of Piaget and Vygotsky. It provides a pedagogical foundation for understanding online engagement, viewing learning as an active process where students construct knowledge by interacting, experiencing and reflecting (Fosnot, 2013). In digital learning settings, tools such as discussion boards, real-time quizzes and virtual breakout rooms are designed to support these interactive experiences (Xu & Xue, 2023). Thus, constructivism helps frame how technological features can enhance or limit deep learning and meaningful engagement during synchronous online sessions.

Using these theories, this study aims to provide a more holistic evaluation of online education. While TAM focuses on usability and attitudes toward technology, constructivism emphasises pedagogical effectiveness and learner interaction. This dual-theory approach ensures that the study addresses both technical functionality and educational value, two pillars that are essential to understanding online learning experiences of students.

3.3 Data Collection Methods

This study will be employing a survey-based data collection method to effectively explore how technology impacted third-level students' learning experiences during the COVID-19 pandemic. According to Saunders et al. (2019), the survey method is common in social and educational research, and is valued for its scalability, efficiency and capacity to collect standardised data (opinions, behaviours or attitudes) across a large sample. A structured questionnaire was developed using Google Forms, chosen for its user-friendly interface, cost-effectiveness and ease of access for participants using various devices. Given that the focus of the study is on achieving quantitative outcomes, this tool is specifically suitable for capturing data that can be analysed statistically.

a. Survey Instrument Development

The primary data collection tool for this study is a structured questionnaire designed using Google Forms. Chosen for its low cost, remote functionality and accessibility, this instrument will enable

the study to find out students' experiences of online learning during the COVID-19 pandemic across four key thematic areas captured in the research objectives.

Some of the questions will assess the perceived quality of learning by asking students/lecturers to evaluate lecture delivery, academic performance, and overall educational outcomes during the transition to online learning. Five-point Likert scales questions are drawn up to collect standardised responses.

Other set of questions will explore student participation and engagement during online activities such as quizzes, live lectures and discussion forums. Participants are expected to indicate which digital tools most supported their learning and frequency of use/participation.

Another set of questions will identify barriers to learning, such as home environment, technological limitations and emotional stress. Participants will select all applicable challenges.

Lastly, some questions will evaluate usability and effectiveness of platforms such as Microsoft Teams, Moodle and Zoom, including lecturers' competence and the level of training received in using these tools. All the questions are closed-ended to make sure data collected are consistent and suitable for statistical analysis (Bhandari, 2022).

b. Design and Ordering

To enhance clarity and minimise respondent fatigue, the questionnaire contains only 14 questions. Questions are focused on engagement, barriers, and usability. Outlining the questions based by theme will help to reduce cognitive load and allow respondents to maintain a consistent frame of reference throughout the process (Buchanan and Bryman, 2007). Care was taken to avoid ambiguous or leading language, which could introduce misinterpretation or bias.

c. Reliability and Validity

To enhance the reliability and validity of the instrument, a pilot test was conducted with a small group of 10 third-level students. This trial aimed to assess clarity, interpretability, and the estimated completion time. Feedback from the pilot was used to rewrite/refine question wording and sequencing. In addition, once the final data are collected, Cronbach's alpha will be calculated to determine the internal consistency of key scales, particularly those measuring perceived platform usability, quality and engagement (Easterby-Smith et al., 2007). For face and content

validity, the questionnaire was reviewed by academic peers and the supervisor with expertise in academic research and survey methodology. Their feedback ensured that the instrument adequately covered the research objectives and that individual items were appropriate and aligned with the theoretical framework. In summary, the survey was designed with careful attention to structure, clarity, and methodological rigour, enabling the collection of meaningful and reliable data to address the objectives of the study.

3.4 Sampling Strategy and Population

The aim of this study which explores the impact of technology on student learning experiences during the COVID-19 pandemic requires a context-specific and targeted participant group. Therefore, the target population comprises undergraduate and postgraduate students currently residing in Ireland who were enrolled in third-level education during the pandemic. This population is appropriate because they directly experienced the shift from face-to-face to online education, providing relevant insights into the research question and objectives. To reach this population, the study will adopt a non-probability purposive sampling technique. According to Gravetter et al. (2020), purposive sampling is relevant when researchers need to focus on a specific subset of the population that has the experience or characteristics relevant to the research. In this case, the participants must have engaged in online learning during the COVID-19 lockdown, making purposive sampling the most logical and efficient method. The aim is not to generalise the findings but to achieve depth of insight from those with lived experience of the phenomenon under investigation.

Participants will be recruited through multiple online channels, including institutional mailing lists, student discussion forums, and social media platforms (e.g., Facebook, LinkedIn, Twitter). This digital recruitment strategy is especially fitting given the online context of both the study and the students' learning experiences (Choi et al., 2021). The inclusion criteria for participation are: being aged 18 or older, currently residing in Ireland, and having been enrolled in third-level education during the pandemic. In line with ethical guidelines (Saunders et al., 2016), participation is voluntary, and informed consent will be obtained through a brief consent statement embedded at the start of the questionnaire. The study aims to collect data from a minimum of 100 to 150 respondents. While this may not offer full statistical representativeness, it is a sufficient sample

size for conducting descriptive and comparative analyses such as frequency tables and chi-square tests (Taherdoost, 2022). This scope is adequate for an exploratory study, providing a meaningful overview of students' perceptions and experiences. The sample will serve to shed light on patterns and themes relevant to the research question, while also acknowledging the limitations inherent in non-probabilistic sampling approaches.

3.5 Ethical Considerations

Ethical integrity is critical for responsible research involving human participants. This study will adhere to established academic guidelines and institutional policies (BERA, 2018). Participants will receive clear information about the purpose of the study, their rights and the voluntary nature of participation through a consent statement included in the Google Forms questionnaire. Informed consent will be obtained, with participants free to withdraw at any point before submission without penalty. To ensure data privacy, responses will be fully anonymised. The Google Forms is configured to prevent email collection, and data will be stored securely on a password-protected device. Data will be retained for one year and then deleted in line with GDPR and institutional requirements. Formal ethical approval will be obtained from the relevant institutional ethics committee before data collection begins. These measures will ensure that the study upholds high ethical standards, prioritising participant safety, autonomy and confidentiality.

3.6 Limitations of the Methodology

Despite its strengths, the methodology of this study presents certain limitations. The cross-sectional survey design captures data at a single point in time, which would limit the ability to understand how students' experiences and perceptions may have evolved throughout the pandemic. Moreover, the use of self-reported data introduces the risk of recall bias or socially desirable responses. This can affect the accuracy of findings (Creswell & Creswell, 2018). The reliance on non-probability purposive sampling will further constrain the generalisability of the results to the wider population of third-level students in Ireland. This approach, while practical, may not capture the full diversity of student experiences (Bryman, 2016). Lastly, administering the survey exclusively online could unintentionally exclude students with limited internet access or those experiencing digital fatigue, an issue documented during the pandemic era (Czerniewicz,

2020). These limitations are acknowledged to ensure transparency and inform the interpretation of findings.

DATA ANALYSIS

4.1 Introduction

This chapter presents findings from the survey. Although the target sample was 150, data from 76 Irish university students were analysed. Despite the shortfall, the responses offer valuable insights into the impact of technology on education during COVID-19, helping to assess the scope and effects of ICT implementation.

4.2 Descriptive Statistical Analysis

This section presents the descriptive statistics from the student survey. Frequency tables and bar charts illustrate participants' perceptions of technology's role during COVID-19. The visual analysis highlights patterns in engagement, usability, and learning outcomes. This offers a clear overview of students' experiences with online learning during this critical period.

Table 1: Perceived Impact of Technology on Learning

Impact of technology on your learning	Percentage	Frequency
Somewhat positive	41%	31
Very positive	24%	18
Neutral	17%	13
Somewhat negative	12%	9
Very negative	7%	5

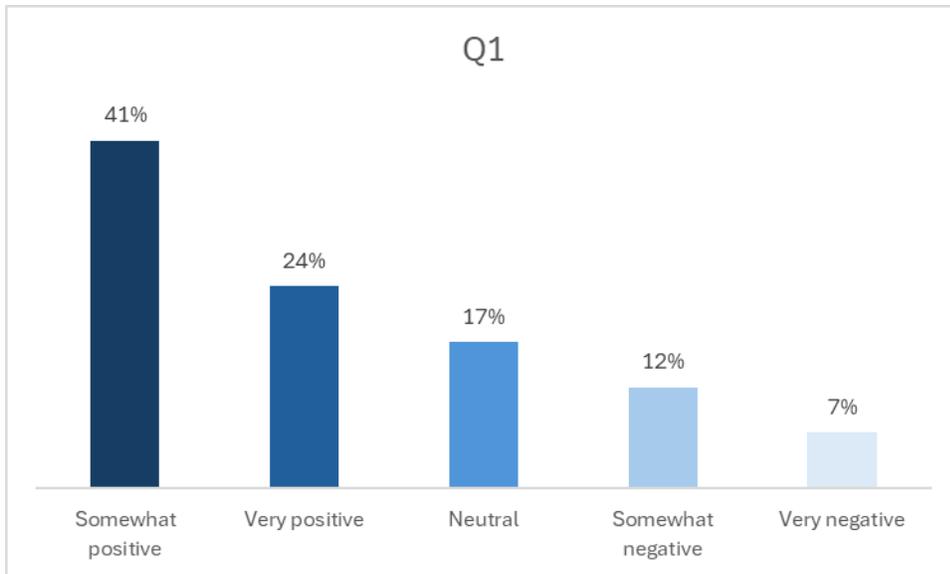


Figure 1: Perceived Impact of Technology on Learning

The majority of respondents (41%) reported that the impact of technology on their learning was “somewhat positive,” indicating general approval of the digital shift. A further 24% rated it as “very positive,” while 17% remained neutral. Conversely, 12% felt the impact was “somewhat negative” and 7% considered it “very negative.” Overall, the distribution is skewed towards positive responses, suggesting that most students viewed technology as a beneficial tool in maintaining academic continuity during the COVID-19 pandemic (Dubey & Pandey, 2020).

Q2. Did you feel Learning during this time improved the quality of lectures?

Table 2: Perceived Change in Lecture Quality During Remote Learning

Did you feel learning during this time improved the quality of lectures?	Percentage	Frequency
Slightly better than before	34%	26
About the same	24%	18
Slightly worse than before	21%	16
Much better than before	16%	12
Much worse than before	5%	4

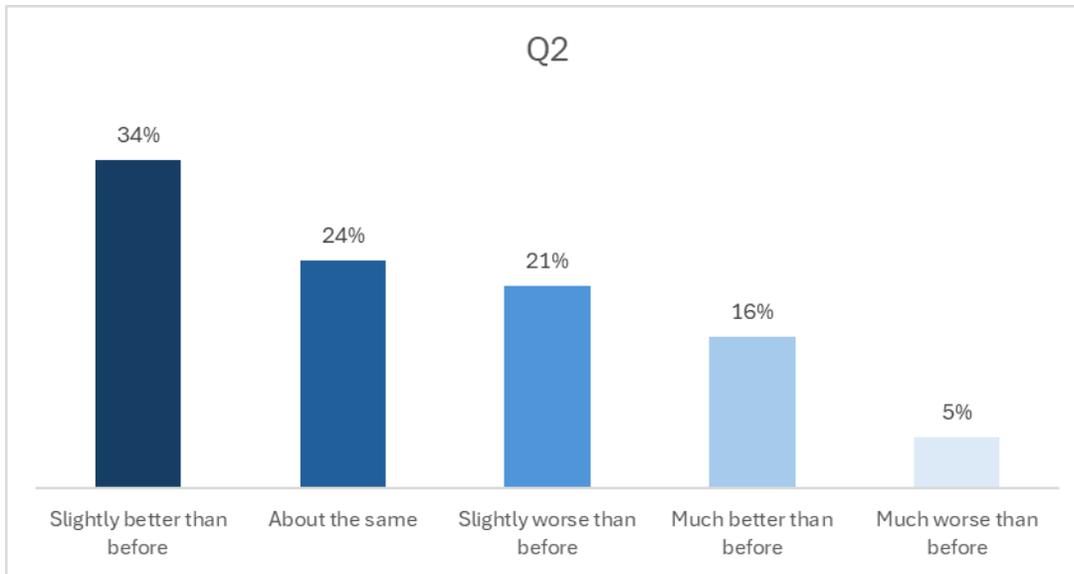


Figure 2: Perceived Change in Lecture Quality During Remote Learning

A majority of students (34%) felt that lecture quality was “slightly better than before,” suggesting that online learning had a moderately positive impact. Approximately 16% rated it as “much better,” indicating that some students experienced a significant improvement. Meanwhile, 24% of respondents felt the quality remained “about the same,” showing that for some, the transition had little effect. However, 21% believed it was “slightly worse,” and only 5% reported it was “much worse.” These results reveal a range of experiences (Selvanathan et al., 2023; Stankovska et al., 2021). While many students welcomed the flexibility and digital enhancements of remote learning, others may have struggled with adapting to the platforms or missed the structure of in-person instruction (Belt & Lowenthal, 2023). This mixed feedback highlights the complexity of evaluating the effectiveness of digital learning.

Q3. Compared to traditional face-to-face learning, how effective was technology-enabled learning for you?

Table 3: Effectiveness of Technology-Enabled Learning Compared to Traditional Learning

Slightly more effective	39%	30
About the same	24%	18
Slightly less effective	16%	12
Much more effective	16%	12

Much less effective	5%	4
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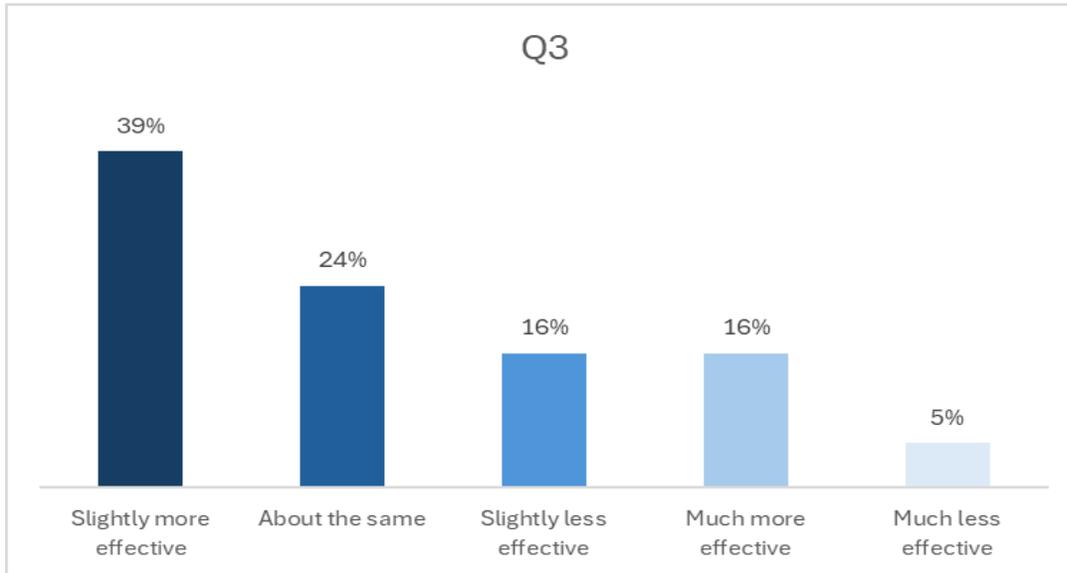


Figure 3: Effectiveness of Technology-Enabled Learning Compared to Traditional Learning

This question explored how students perceived the effectiveness of technology-enabled learning compared to traditional face-to-face learning. The most common response, selected by 39%, was “slightly more effective,” suggesting a moderate improvement. “About the same” was chosen by 24%, indicating no significant difference for many. There was an even split (16%) between those who found it “slightly less effective” and those who found it “much more effective,” showing mixed outcomes (Belt & Lowenthal, 2023). Only 5% felt it was “much less effective.” Overall, the results suggest that most students perceived online learning as equally or more effective than traditional methods during the COVID-19 period.

Q4. How would you describe your overall academic performance during the COVID-19 online learning period?

Table 4: Overall Academic Performance During COVID-19 Online Learning

Slightly better than before	30%	23
About the same	29%	22
Much better than before	20%	15
Slightly worse than before	14%	11
Much worse than before	7%	5

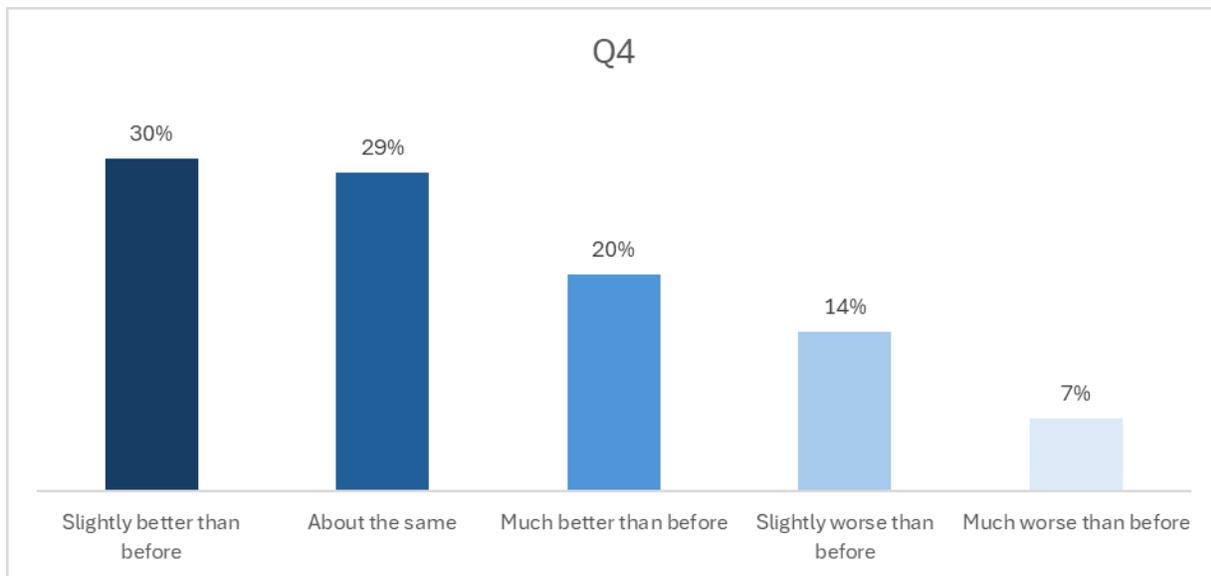


Figure 4: Overall Academic Performance During COVID-19 Online Learning

This question examined students’ academic performance during the COVID-19 remote learning period. “Slightly better than before” was the most selected option (30%), followed by “about the same” at 29%, indicating that most students slight improved or maintained their academic performance. Notably, 20% felt their performance was “much better,” suggesting that one-fifth experienced substantial improvement. Conversely, 14% reported “slightly worse” and 7% “much worse,” showing that a minority faced academic decline. These findings suggest that the flexibility of online learning, such as access to recorded lectures and self-paced study, likely contributed to improved outcomes (Angellika et al., 2022) for many, while a smaller group struggled to adapt or stay motivated in remote settings (Martin & Borup, 2022).

Q5. Do you feel e-learning improved your quality of education or hindered it?

Table 5: Perceived Impact of E-learning on Educational Quality

Slightly improved the quality	50%	38
Slightly hindered the quality	20%	15
Had no effect on the quality	13%	10
Greatly improved the quality	12%	9
Greatly hindered the quality	5%	4

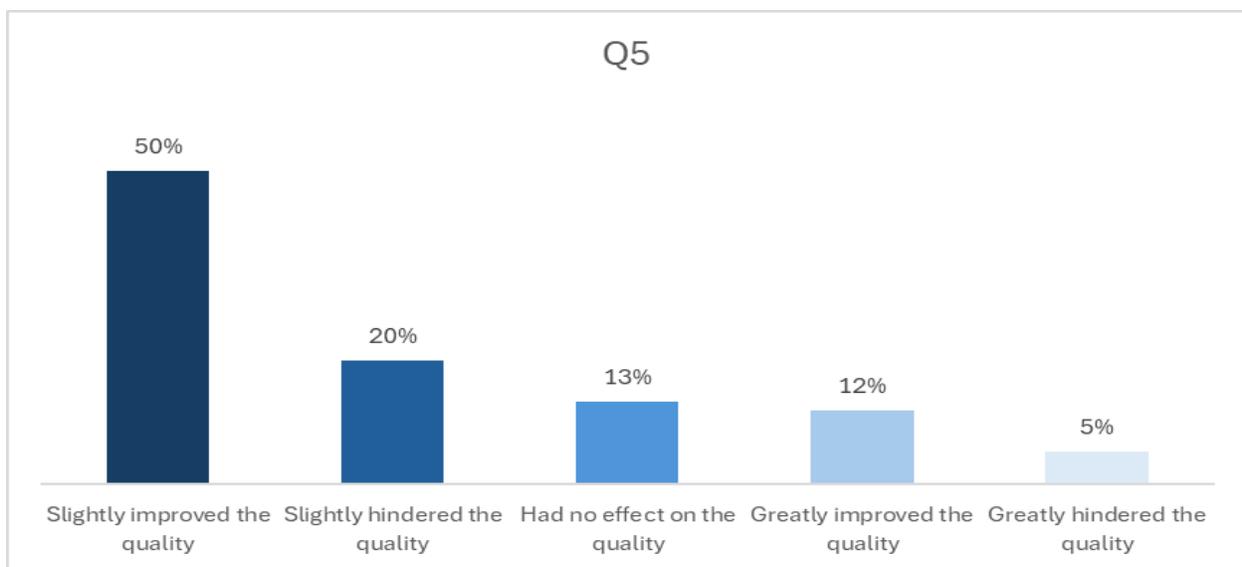


Figure 5: Perceived Impact of E-learning on Educational Quality

This question assessed whether students felt e-learning improved or hindered the quality of their education. Half of the participants (50%) believed it “slightly improved the quality,” reflecting general satisfaction with the transition. A smaller group (12%) reported it “greatly improved” their learning. Meanwhile, 20% felt it “slightly hindered” the quality, and 5% said it was “greatly hindered,” revealing that some experienced negative effects. Thirteen percent noted “no effect,” suggesting a neutral experience. Overall, the findings imply that most students found e-learning to have a positive or neutral impact on their education during the pandemic, though a notable minority faced challenges that affected their learning outcomes.

Q6. What was your main barrier (hinderance) of learning during this time? (Select all that you experienced)

Table 6: Main Barriers to Learning During COVID-19

Difficulty focusing at home	20%	29
Limited interaction with lecturers/peers	17%	24
Unfamiliar or difficult-to-use technology	14%	20
Mental health or emotional stress	14%	20
Lack of motivation	13%	18
Poor internet connection	8%	12
Lack of access to devices (e.g., laptop, software)	8%	11
None - I had no major barriers	6%	9

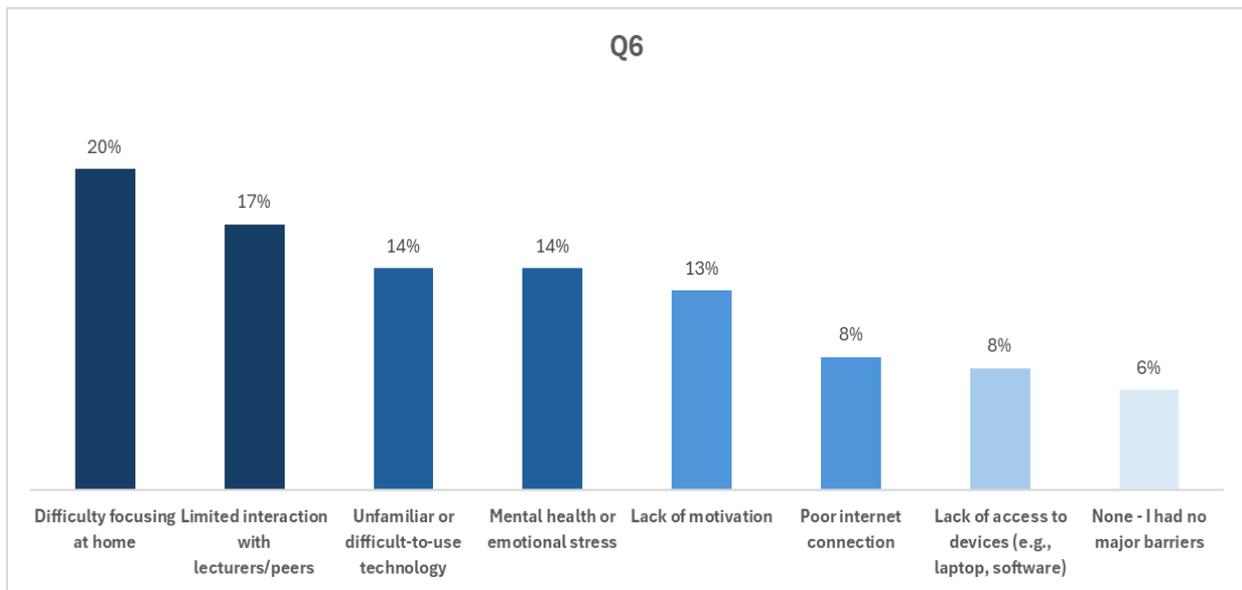


Figure 6: Main Barriers to Learning During COVID-19

A total of 143 barrier selections were recorded across 76 participants. The most cited issue was “difficulty focusing at home” (29 responses), reflecting distractions in home environments. “Limited interaction with lecturers/peers” (24) was also significant, highlighting the loss of classroom engagement. Both “unfamiliar technology” and “mental health/emotional stress” were each reported by 20 respondents, suggesting equal technological and emotional challenges. “Lack of motivation” (18), “poor internet” (12), and “lack of access to devices” (11) were less common

but still notable. Only 9 participants selected “no major barriers.” These results indicate that both personal factors (e.g., focus, mental health) and technical constraints (e.g., access, connectivity) contributed to learning difficulties during the pandemic (Didenko et al., 2021; Rosário & Dias, 2022).

Q7. Did the digital tools used (e.g. Moodle, Blackboard, Zoom, etc.) help you understand course content better?

Table 7: Effectiveness of Digital Tools for Learning

Agree	42%	32
Neutral	33%	25
Disagree	14%	11
Strongly agree	9%	7
Strongly disagree	1%	1

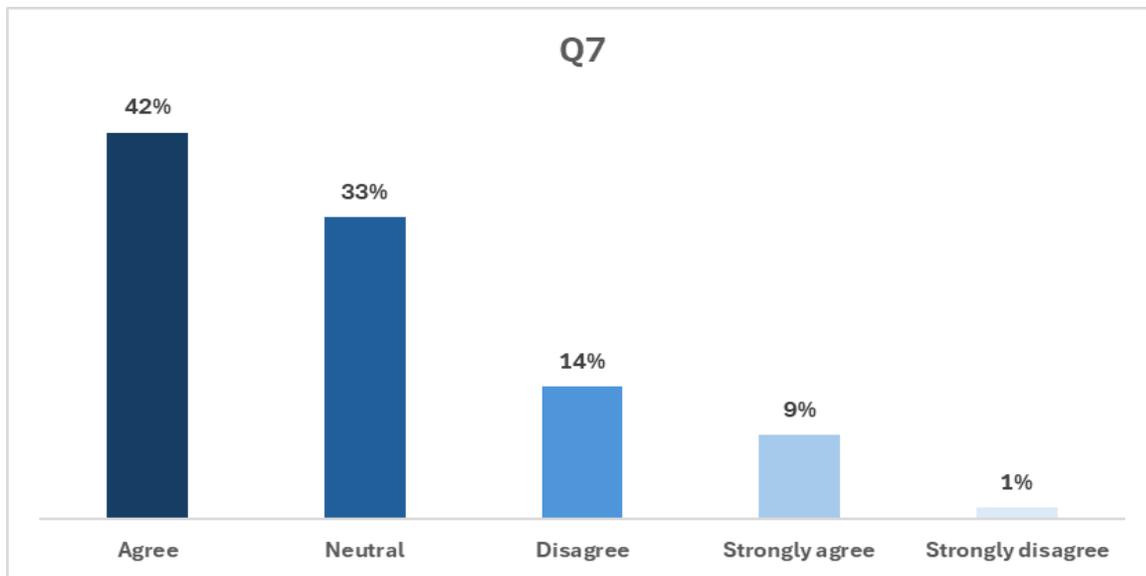


Figure 7: Effectiveness of Digital Tools for Learning

A majority of participants reported that digital tools enhanced their understanding of course content. Specifically, 51% either agreed or strongly agreed that platforms such as Blackboard, Moodle and Zoom supported better comprehension. Meanwhile, 33% remained neutral, indicating no significant change. A smaller group (15%) disagreed, with only one participant (1%) strongly disagreeing. Overall, the data suggests that more than half of the respondents found digital tools

beneficial to their learning during the COVID-19 pandemic (Qiao & Yijun, 2023; Xu & Xue, 2023).

Question 8: Were you given any training or guidance on how to use the online platforms?

Table 8: Training and Guidance on Online Tools

No training or support	20%	15
Only written instructions	26%	20
Yes, basic training	43%	33
Yes, comprehensive training	8%	6
I don't remember	3%	2

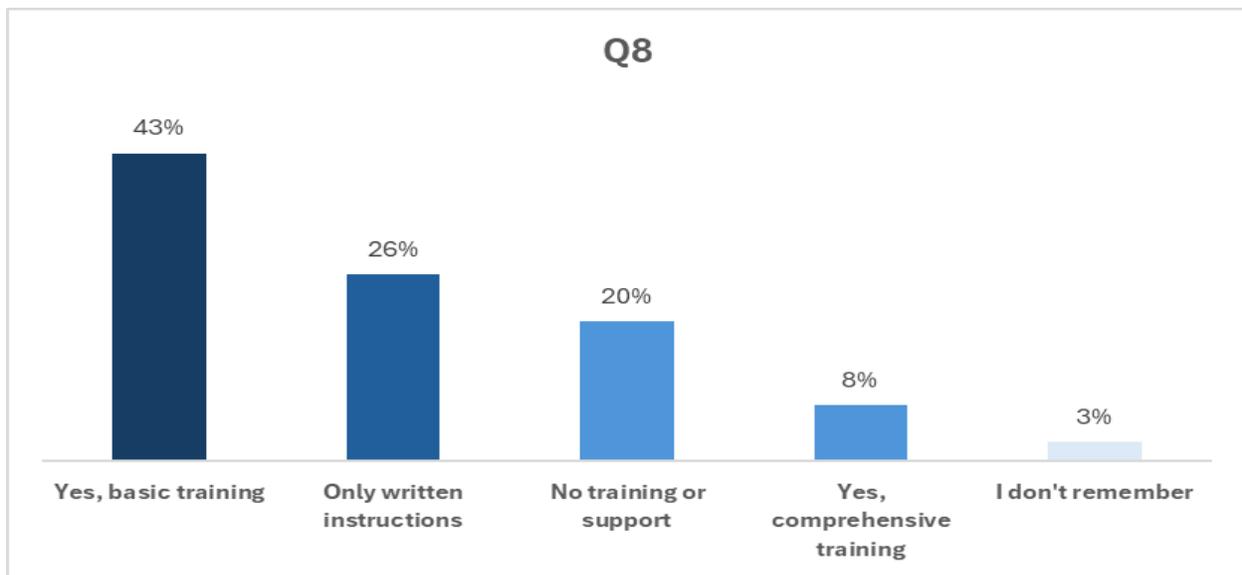


Figure 8: Training and Guidance on Online Tools

43% of respondents stated they received basic training on using online learning platforms. Another 26% were provided with only written instructions, while 20% reported receiving no training or support at all. Only 8% benefited from comprehensive training. A small group (3%) did not recall whether they received any guidance. These findings indicate that although most students had some form of orientation, the training provided was often limited, pointing to a lack of adequate preparation for remote learning environments (Önöral & Kurtulmus-Yilmaz, 2020).

Q9. Did you have reliable access to a device (laptop, desktop, tablet) for learning?

Table 9: Access to Digital Learning Devices

Yes, most of the time	36%	27
Occasionally	24%	18
Yes, always	24%	18
Rarely	16%	12
Never	1%	1

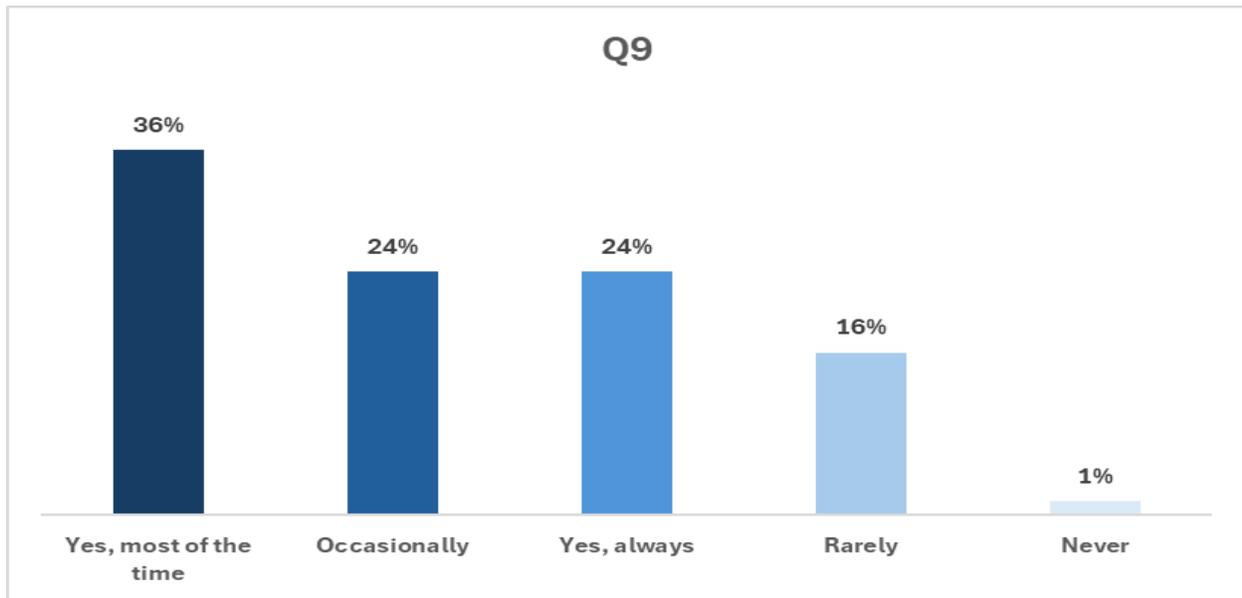


Figure 9: Access to Digital Learning Devices

Regarding access to devices, 36% of students reported having reliable access most of the time, while 24% always had access. Another 24% said their access was occasional, and 16% reported rarely having access. Just 1% had no access at all. These findings highlight that while a majority had consistent access to digital devices, a substantial minority faced intermittent or limited availability, which likely hindered their ability to fully engage in online learning activities during the pandemic. This confirms findings in the literature (Selvanathan et al., 2023; Toquero, 2020).

Q10. Which type of technology-based activities were most helpful to your learning? (Select all that apply)?

Table 10: Most Helpful Technology-Based Activities for Learning

Recorded video content	31%	35
Online quizzes/interactive tests	27%	31
Live video lectures	21%	24
Discussion forums/chat features	19%	22
None of the above	1%	1

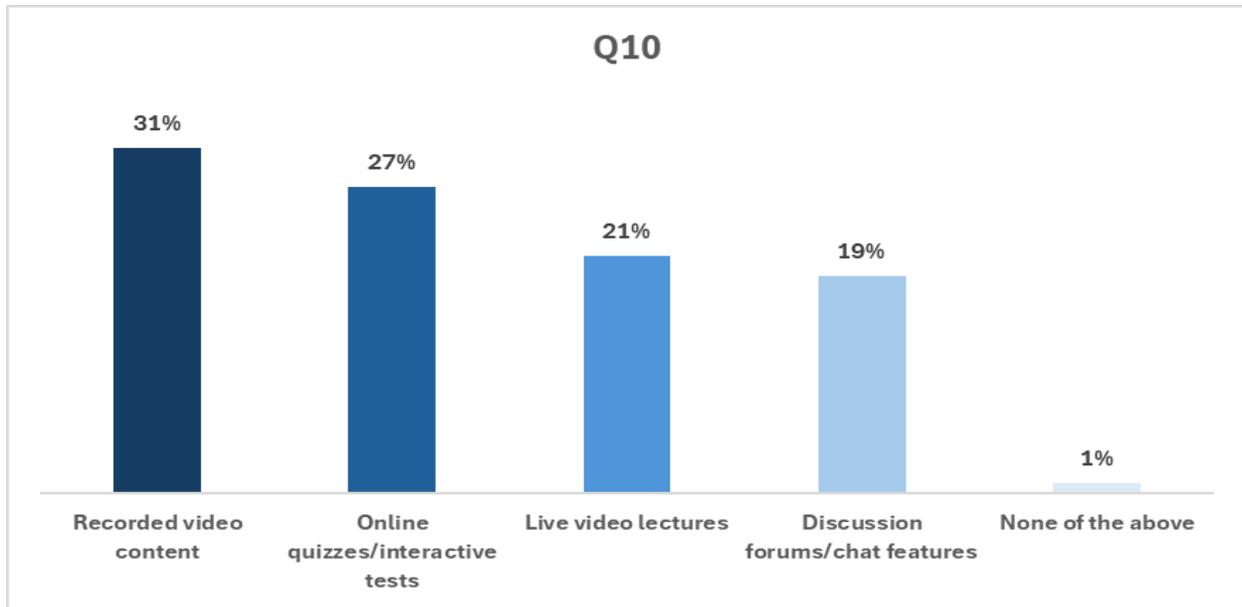


Figure 10: Most Helpful Technology-Based Activities for Learning

A total of 113 selections were recorded from 76 participants, as multiple responses were allowed. Recorded video content was the most frequently chosen, with 35 respondents selecting it as the most helpful activity. Online quizzes and interactive tests followed closely with 31 votes. Live video lectures (24) and discussion forums/chat features (22) were also identified as beneficial. Only one participant selected “none of the above.” These findings suggest that recorded videos and interactive assessments were the most effective tools in supporting student learning during the COVID-19 remote instruction (Longhurst et al., 2020; Rani et al., 2025).

Q11. How would you rate your lecturers’ ability to use the digital tools effectively?

Table 11: Lecturer Digital Competence

Good	38%	29
Fair	34%	26
Excellent	12%	9
Poor	11%	8
Very poor	5%	4

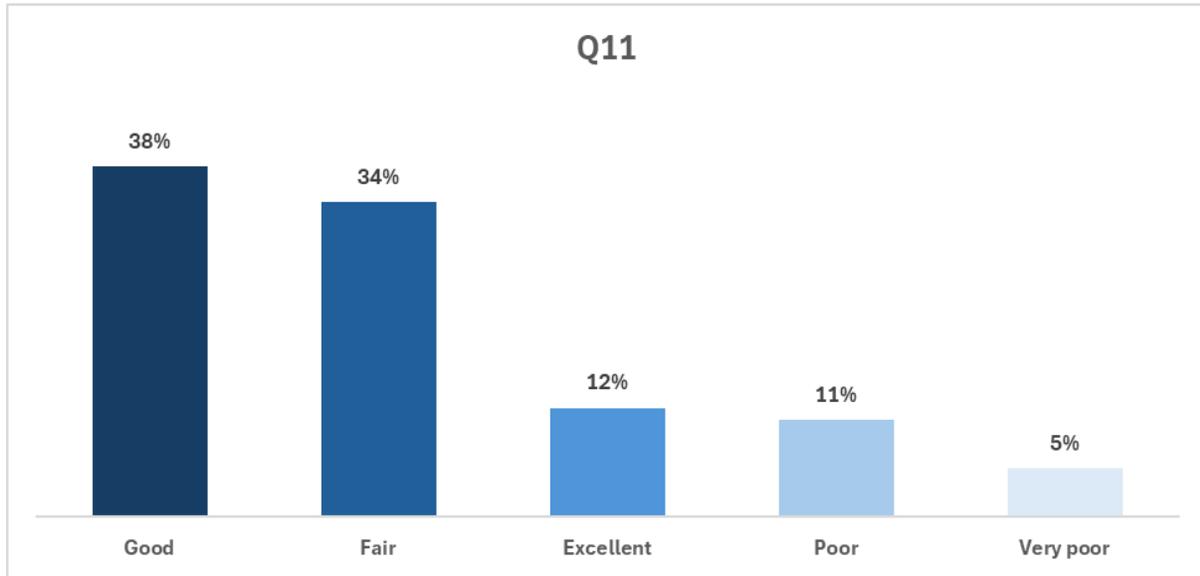


Figure 11: Lecturer Digital Competence

A total of 38% of students rated their lecturers' digital competence as good, while 34% rated it as fair. Another 12% described their lecturers as excellent, while 11% and 5% rated them as poor and very poor respectively. In total, 84% of respondents believed the abilities of their lecturers ranged from fair to excellent. However, the presence of a significant minority who expressed dissatisfaction suggests that some lecturers struggled with effectively using digital tools, which may have negatively impacted the learning experiences of their students (Falode et al., 2020; Önöral & Kurtulmus-Yilmaz, 2020).

Q12. How often did you participate in online learning activities (e.g., class discussions, chats, group work)?

Table 12: Frequency of Participation in Online Learning Activities

Often	33%	25
Sometimes	30%	23
Always	18%	14
Rarely	16%	12
Never	3%	2

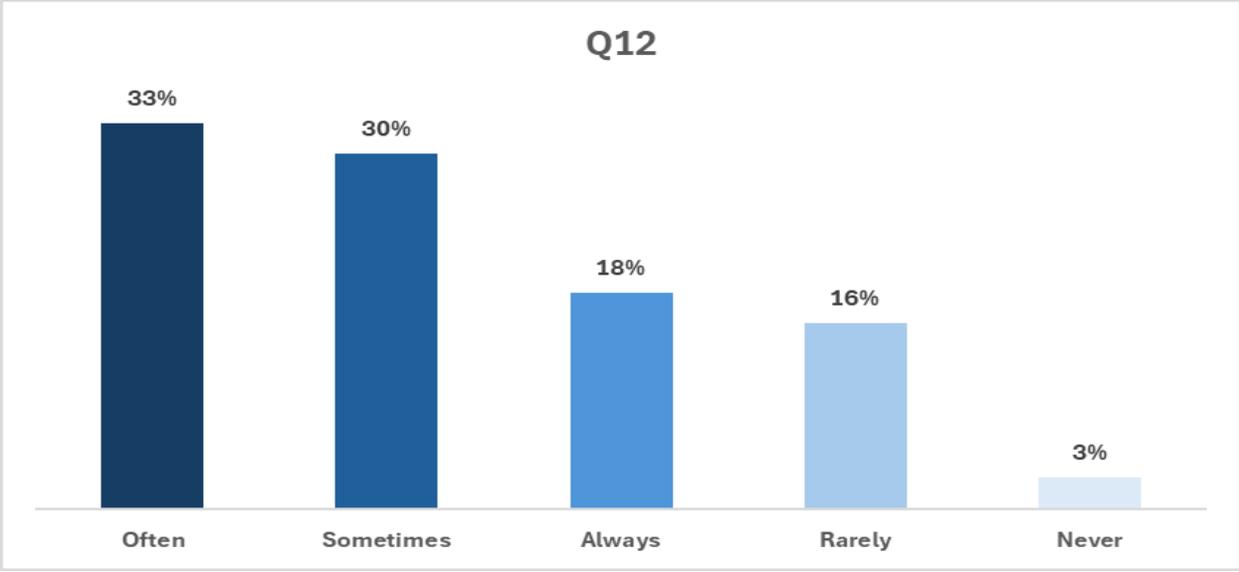


Figure 12: Frequency of Participation in Online Learning Activities

Among the 76 respondents, 33% reported participating often in online learning activities such as discussions and group work. Another 30% participated sometimes, while 18% always engaged. However, 16% said they rarely participated, and 3% never did. These results show that while most students engaged in online learning at least occasionally, around one in five students participated rarely or not at all, indicating varying levels of engagement that may influence learning outcomes and overall academic experience during remote education (Selvanathan et al., 2023).

Q13. Did you feel supported and connected to your classmates during online learning?

Table 13: Peer Support and Connection

Agree	34%	26
Neutral	30%	23
Disagree	22%	17

Strongly disagree	8%	6
Strongly agree	5%	4

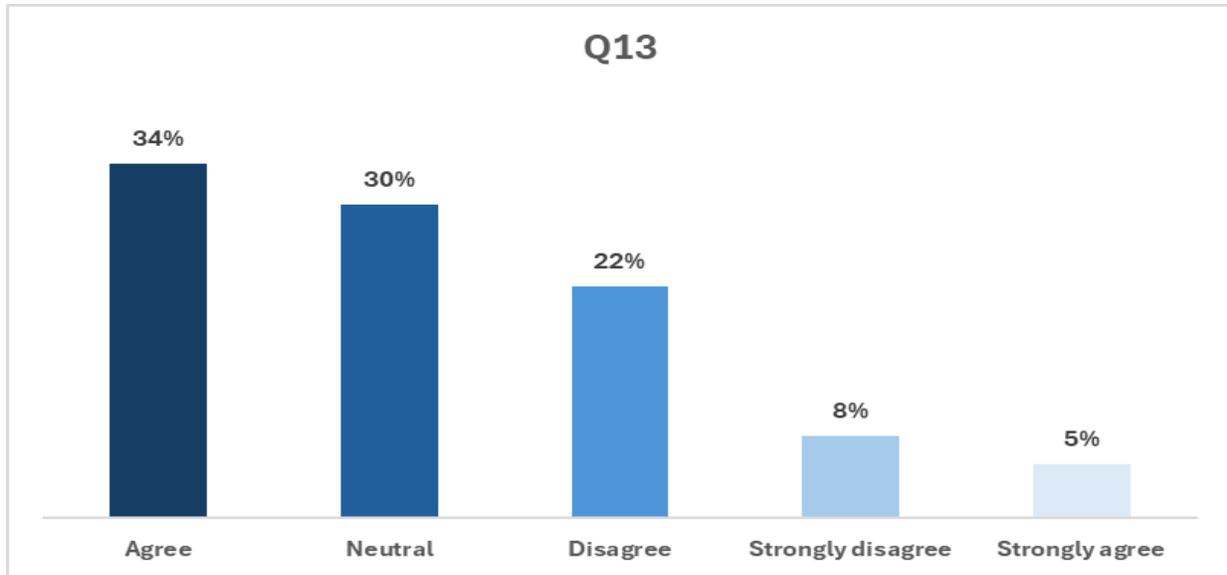


Figure 13: Peer Support and Connection

Participants were asked if they felt supported and connected to their classmates during online learning. In total, 26 agreed and 4 strongly agreed, while 23 remained neutral. Conversely, 17 disagreed and 6 strongly disagreed. This suggests that just under 40% of students felt a sense of peer connection, while approximately 30% were uncertain and another 30% felt disconnected. The results indicate that feelings of isolation may have affected a significant number of students during remote learning (Selingo et al., 2021; Mulder et al., 2023).

Q14. How would you rate your learning outcomes during the period of fully online learning?

Table 14: Perceived Learning Outcomes

About the same	38%	29
Slightly worse than usual	26%	20
Much better than usual	24%	18

Poor	9%	7
Much worse than usual	3%	2

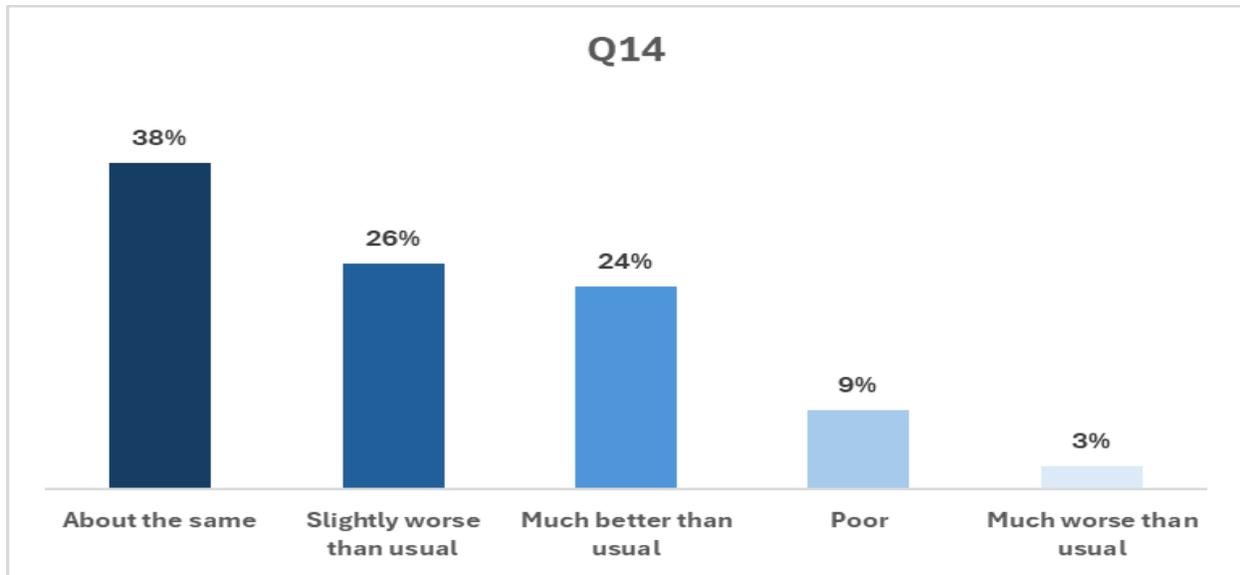


Figure 14: Perceived Learning Outcomes

When asked to evaluate their learning outcomes, 38% said they remained about the same during online learning, while 26% felt they were slightly worse. A notable 24% indicated that their outcomes were much better than before. Meanwhile, 9% rated their performance as poor, and 3% as much worse. These findings suggest that most students either maintained or improved their academic outcomes during remote learning, although a minority experienced a noticeable decline, likely due to challenges with adaptation and learning environment (Dempsey et al., 2020).

4.3 Cross-Tabulation

Figure 15: Lecturer Digital Competence and Perceived Tool Usefulness (Q11 vs Q7)

Q11 * Q7 Crosstabulation

Count		Q7					Total
		Agree	Disagree	Neutral	Strongly agree	Strongly disagree	
Q11	Excellent	6	0	0	3	0	9
	Fair	9	1	16	0	0	26
	Good	16	2	6	4	1	29
	Poor	1	6	1	0	0	8
	Very poor	0	2	2	0	0	4
Total		32	11	25	7	1	76

The analysis reveals a strong positive relationship between students' perceptions of their lecturers' digital competence and the perceived usefulness of digital tools. Students who rated their lecturers as "Excellent" or "Good" were more likely to find tools such as Blackboard, Moodle and Zoom effective for learning. Conversely, those who rated their lecturers as "Fair" or "Poor" tended to be neutral or negative about these tools. This is consistent with Belt and Lowenthal (2023), who found that digital competence in educators correlates with higher student satisfaction and engagement. Similarly, (Dennen & Jones, 2023) observed that when lecturers lacked digital skills, students were more likely to have a diminished perception of the e-learning process and its effectiveness.

Figure 16: Online Participation and Academic Performance (Q12 vs Q4)

Q12 * Q4 Crosstabulation

Count		Q4					Total
		About the same	Much better than before	Much worse than before	Slightly better than before	Slightly worse than before	
Q12	Always	2	6	1	4	1	14
	Never	0	0	0	1	1	2
	Often	9	3	2	11	0	25
	Rarely	4	0	2	1	5	12
	Sometimes	7	6	0	6	4	23
Total		22	15	5	23	11	76

A positive relationship was observed between students' frequency of online participation and their reported academic performance. Those who actively engaged in group discussions, chats, and class

activities were more likely to report improved academic results. This supports findings by Martin and Borup (2022), who argue that student participation is a key factor in online learning success. Additionally, Masalimova et al. (2022) highlight that learner–learner and learner–content interactions are strongly linked to academic achievement in virtual learning environments, strengthening the value of consistent participation in supporting academic success during remote education.

Figure 17: Peer Connection and Learning Outcomes (Q13 vs Q14)

Q13 * Q14 Crosstabulation

Count

		Q14					Total
		About the same	Much better than usual	Much worse than usual	Poor	Slightly worse than usual	
Q13	Agree	7	7	0	3	9	26
	Disagree	7	3	1	2	4	17
	Neutral	12	7	0	0	4	23
	Strongly agree	2	0	1	1	0	4
	Strongly disagree	1	1	0	1	3	6
Total		29	18	2	7	20	76

Unlike participation, peer connection did not show a strong or consistent relationship with reported learning outcomes. Students across all levels of perceived peer support reported mixed academic results. This contrasts with research by Richardson and Lowenthal (2017), who suggest that peer interaction enhances satisfaction and motivation. However, Bozkurt and Stracke (2022) argue that while social presence supports engagement and well-being, it does not always improve academic performance. These findings imply that, although peer connection contributes to emotional and social support, it may not be a direct determinant of learning outcomes in online education.

DISCUSSION OF FINDINGS

5.1 Introduction

This chapter introduces and interprets findings from a descriptive quantitative survey investigating how technology impacted learning for undergraduate and postgraduate students in Irish universities during the COVID-19 pandemic. Although the intended sample was 150, data from 77 respondents offered valuable insights into students' experiences with emergency remote education. The chapter examines these students' perceptions of educational quality, engagement, access challenges, and the usability of digital tools and instructor competence. It presents these findings through frequency tables and figures, offering a clear overview of how students navigated online learning and the barriers they faced during that unprecedented period.

5.2 Objective 1: To evaluate the perceived impact of online technology on the quality of education received by third-level students during the COVID-19 pandemic

The findings of this study suggest that most students perceived technology as having a positive impact on the quality of their education during the COVID-19 pandemic. In Figure 1, 41% of students reported the impact as “somewhat positive,” while 24% rated it “very positive.” Similarly, Figure 5 shows that 50% believed e-learning “slightly improved” educational quality, and 12% reported a “great” improvement. These figures reflect widespread student approval of online learning tools and platforms, aligning with the view of Qiao and Yijun (2023), who found that digital technologies provided students with improved access to resources and increased flexibility in learning. Academic performance outcomes (Figure 4) reinforce this perception. A combined 50% of students reported their academic performance was “slightly” or “much better” than before, which is consistent with findings by Angellika et al. (2022), who attributed performance gains to recorded lectures and the flexibility of self-paced learning. Additionally, Figure 3 indicated that 39% of students found technology-enabled learning “slightly more effective” than traditional methods, while 24% found it equally effective. This supports the work of Belt and Lowenthal (2023), who suggest that online learning, when well-structured, can equal or exceed traditional methods in quality. However, the findings also reveal mixed experiences. For example, 21% of respondents felt that lecture quality was “slightly worse,” and 26% reported their performance was “slightly worse than usual.” These results highlight the challenges some students faced, such as

adapting to digital platforms or reduced engagement. As Stankovska et al. (2021) and Martin and Borup (2022) observed, while digital platforms offer many benefits, their success depends heavily on user readiness, instructional design, and digital fluency. Importantly, while the majority of students viewed the transition positively, 20% felt it “slightly hindered” quality, and 5% “greatly hindered” it. This suggests that while online learning technologies supported many, they also excluded or challenged others, echoing the digital divide concerns raised by Toquero (2020). In conclusion, the data indicate that the perceived impact of online technology on education quality during the pandemic was largely positive. However, differences in student experiences suggest the need for equitable digital access, thoughtful instructional design, and continued investment in digital readiness to ensure quality learning across diverse student populations.

5.3 Objective 2: To assess student engagement levels during synchronous online classes and their participation in virtual learning activities

The findings from the survey reflect mixed levels of student engagement during synchronous online classes. As shown in Figure 12, 33% of students reported often participating in online learning activities, 30% sometimes, and 18% always. However, 16% rarely participated and 3% never did. This suggests that while the majority of students engaged in online learning at least occasionally, a significant minority remained disengaged. These engagement patterns are critical, as existing literature emphasises the role of active participation in enhancing academic performance and satisfaction in online environments (Martin & Borup, 2022). A positive correlation was observed between engagement frequency and academic performance (Figure 16). Students who reported frequent participation also tended to report either stable or improved academic outcomes during remote learning. This aligns with Masalimova et al. (2022), who argue that both learner–learner and learner–content interactions are essential for student achievement in online learning environments. Despite these positive connections, barriers such as technological difficulties, lack of motivation, or mental stress may have contributed to low engagement levels for some students (Rosário & Dias, 2022). While online platforms enabled flexibility, the lack of real-time interaction may have hindered the establishment of a learning community, contributing to passive learning behaviors in some students. Interestingly, peer connection (Figure 13) did not strongly predict academic success (Figure 17). While 30% of students agreed or strongly agreed that they felt supported by peers, 30% disagreed, and 30% remained neutral. This finding contrasts

with Richardson and Lowenthal (2017) who suggest that social presence and peer support contribute to motivation and retention in online learning. However, the data from this study suggest that student engagement with course content and instructor interaction may have a more direct influence on academic outcomes than peer connection alone. In summary, the study indicates that while many students actively engaged in virtual learning activities, others struggled to participate meaningfully. These findings underline the importance of designing online courses that promote active engagement and include collaborative elements that foster community. Institutions must also recognize and address the underlying barriers to participation, whether technological, motivational, or psychological, to ensure equitable learning experiences in virtual environments.

5.4 Objective 3: To identify the most common technological, environmental, or personal barriers students faced in accessing and benefiting from online education

Figure 6 provides valuable insight into the challenges students encountered during online learning. A total of 143 barrier selections across 76 respondents show that the most common issue was “difficulty focusing at home,” chosen by 29 participants. This highlights the environmental challenge of studying in non-academic, often distracting settings. The second most cited barrier, “limited interaction with lecturers/peers” (24 responses), highlights the loss of traditional classroom engagement and real-time feedback, critical components of the learning process (Belt & Lowenthal, 2023). Two barriers, “unfamiliar or difficult-to-use technology” and “mental health/emotional stress”, were each selected by 20 participants. This suggests that both technical literacy and psychological well-being equally hindered students' ability to adapt to remote learning. These findings are supported by Didenko et al. (2021), who observed that both cognitive load and digital fatigue significantly impair online academic performance. Personal motivation was another important factor, with 18 students citing “lack of motivation” as a barrier, consistent with research by Mulder et al. (2023), who stress the demotivating effects of isolation and lack of structured learning environments. Additional challenges included poor internet connectivity (12 responses) and lack of access to digital devices (11 responses). Though these barriers affected a minority, their presence points to ongoing digital inequality. This digital divide, particularly access to stable connectivity and adequate devices, was a key concern in global studies of pandemic learning (Toquero, 2020; Selvanathan et al., 2023). Only 9 students reported “no major barriers,” supporting the finding that most students encountered at least one significant challenge during

remote learning. These barriers align with literature on emergency remote teaching, which distinguishes between planned online education and crisis-driven implementations (Bozkurt & Sharma, 2020). In conclusion, the data suggest that a combination of environmental distractions, lack of digital fluency, emotional strain, and limited engagement with educators created significant obstacles. Addressing these challenges requires a multi-pronged approach. Institutions must provide digital skills training, offer mental health support, and invest in equitable access to technology. Most importantly, online learning environments must be designed with inclusive pedagogy in mind, accounting for the diverse circumstances students face outside traditional classrooms.

5.5 Objective 4: To examine student and lecturer perceptions of the usability, interactivity, and pedagogical effectiveness of the online learning platforms used

Student and lecturer perceptions of online platform usability and effectiveness were varied but generally leaned toward positive experiences. According to Figure 7, 51% of students either agreed or strongly agreed that digital tools (e.g., Zoom, Blackboard and, Blackboard, Zoom) improved their understanding of course content, while 33% remained neutral, and only 15% disagreed. This suggests that for a majority of students, platforms supported effective learning, a finding supported by Qiao and Yijun (2023), who argue that well-integrated digital tools can enhance comprehension and engagement. However, Figure 8 reveals a concerning gap in training and preparedness. Only 8% of respondents reported receiving comprehensive training on using these platforms, while 43% received basic training, and 20% received no training at all. These findings align with Öñöral and Kurtulmus-Yilmaz (2020), who stress that insufficient training limits both student and instructor ability to maximise digital tools' pedagogical value. Limited training likely affected students' initial attitudes toward usability and may have led to passive or surface-level platform engagement. Lecturer digital competence was also crucial. In Figure 11, 38% of students rated their lecturers' digital skills as good, while 34% rated them as fair. Only 12% said "excellent," and a combined 16% rated them "poor" or "very poor." When cross-compared with students' ratings of digital tool effectiveness (Figure 15), a clear trend emerged: students who viewed their lecturers as digitally competent were more likely to find online tools pedagogically useful. This supports Coman et al. (2020), who argue that lecturers' digital competence significantly predicts student satisfaction and perceived learning. In terms of interactivity, platforms (e.g., Zoom and Microsoft Teams)

facilitated real-time engagement through chat features, breakout rooms and polls. However, students noted that these features were often underutilised, as many lecturers defaulted to traditional lecture formats without adapting to the medium (Falode et al., 2020). This aligns with the Technological Pedagogical Content Knowledge (TPACK) framework, which emphasises the need for integration between content, pedagogy, and technology (Dennen & Arslan, 2022). In summary, while platforms were generally seen as usable and beneficial, their effectiveness depended heavily on how they were implemented. The findings suggest that both platform design and user training play critical roles. For long-term success, institutions must invest in ongoing professional development for lecturers and user-friendly digital platforms tailored for educational use rather than adapted from corporate tools.

CONCLUSION

6.1 Introduction

This chapter provides the conclusion to this study, a descriptive quantitative survey investigating how technology impacted learning for undergraduate and postgraduate students in Irish universities during the COVID-19 pandemic.

6.2 Summary of Key Findings

1. Perceived Impact on Educational Quality

The study found that the majority of students perceived online technology to have a positive or neutral impact on the quality of their education during the pandemic. A combined 65% of respondents rated the impact as either “somewhat” or “very positive” (Figure 1), and similar trends were observed regarding perceived lecture quality and academic performance. Figures 3, 4, and 5 indicated that most students viewed online learning as equally or more effective than traditional face-to-face instruction. These results are in line with Qiao and Yijun (2023) and Angellika et al. (2022), who found that access to recorded materials and the flexibility of online learning enhanced educational outcomes. However, the findings also highlighted a notable minority (approximately 25%) who experienced a decline in lecture quality and academic performance, pointing to inconsistencies in student experiences and the importance of equitable digital readiness.

2. Student Engagement in Online Learning Activities

Participation in synchronous and asynchronous online activities varied widely. While 81% of students reported participating at least sometimes in virtual learning activities (Figure 12), approximately one in five reported rare or no engagement. A positive correlation emerged between frequent participation and improved academic outcomes (Figure 16), supporting the work of Martin and Borup (2022) and Masalimova et al. (2022) on the importance of learner–content and learner–learner interaction in online success. Notably, however, peer support and connection (Figure 13) did not show a clear relationship with academic achievement, challenging the findings of Richardson and Lowenthal (2017) and suggesting that engagement with content and instructors

may have played a more central role than peer interaction in academic outcomes during emergency remote education.

3. Technological, Environmental, and Personal Barriers

Barriers to learning were widespread. The most frequently cited issues were environmental distractions (e.g., difficulty focusing at home) and limited real-time interaction with lecturers and peers (Figure 6). Technology-related barriers, including unfamiliar platforms, poor connectivity, and limited access to devices, also emerged as significant, though less common, obstacles. Equally important were personal challenges, such as mental health strain and lack of motivation, confirming the diverse nature of barriers in emergency remote learning. These findings echo studies by Didenko et al. (2021), Toquero (2020), and Rosário & Dias (2022), all of whom emphasise the importance of a supportive digital and emotional learning environment for online education to be effective.

4. Perceptions of Platform Usability and Lecturer Competence

A key theme in the findings was that the usability and perceived pedagogical effectiveness of digital tools depended significantly on how well lecturers adapted to the technology. While over half of students found tools like Moodle and Zoom helpful for understanding course content (Figure 7), this perception was closely tied to their views of lecturer digital competence (Figure 15). Only a small percentage rated their lecturers as “excellent” in digital skills, and 20% reported receiving little or no training on how to use platforms (Figures 8 and 11). This highlights the critical role of instructor readiness and confirms the findings of Belt and Lowenthal (2023) and Dennen and Jones (2023), who argue that educator proficiency with technology is central to successful online learning.

6.3 Implications

The findings of this study carry important implications for the design and delivery of online education in higher institutions. Firstly, while students generally viewed technology as enhancing educational quality, disparities in experience suggest that blanket assumptions about the success of online learning are misguided. The differences in access, engagement, and outcomes point to the need for more inclusive and adaptable online education strategies. Secondly, student

engagement, particularly with course content and lecturers, emerged as a stronger predictor of academic success than peer support. This challenges existing assumptions and calls for instructional designs that prioritise interaction with content and instructor presence. Thirdly, the presence of significant environmental and psychological barriers, in addition to technical issues, demonstrates the need for institutions to adopt holistic approaches to student support. Learning is not only influenced by digital tools but also by the student's home environment, mental health and access to resources. Finally, the study reaffirms the centrality of lecturer competence. Even the most advanced tools will fall short without adequate training and pedagogical adaptation by educators.

6.4 Recommendations and Future Research

Based on the findings, the following recommendations are proposed:

1. Invest in Comprehensive Digital Training

Both students and lecturers would benefit from regular and structured training on using educational technologies effectively. This should go beyond technical functionality to include pedagogical strategies that fit with digital environments.

2. Enhance Engagement through Interactive Design

Institutions should encourage lecturers to incorporate more interactive features into online teaching (e.g., discussion boards, live polls, breakout rooms). This would promote student engagement and active learning.

3. Address Barriers with Tailored Support Services

Support systems, including mental health services, motivational coaching, and access to digital tools, should be integrated into institutional strategies for online learning.

4. Ensure Equitable Access to Digital Resources

Universities must prioritise equitable access by offering device loan programmes, subsidies for internet data, and accessible content formats to bridge the digital divide.

5. Promote Research on Long-Term Impacts

Future studies should investigate the long-term academic, social, and emotional effects of remote learning, with particular attention to disadvantaged groups. Mixed-methods research combining survey data with interviews or focus groups could enrich understanding.

6.5 Limitations

While the study provides valuable insights, several limitations must be acknowledged. The sample size of 77 falls short of the targeted 150, potentially limiting the generalisability of the findings. Moreover, the use of a self-reported questionnaire may introduce bias, as responses are based on subjective perceptions rather than objective performance measures. The study is also geographically limited to Irish third-level institutions, and results may not reflect the experiences of international students or those in other countries with different educational and technological infrastructures. Finally, the survey focused predominantly on the student perspective, with limited input from lecturers or administrators, which could have offered a more comprehensive view of online education dynamics.

6.6 Conclusion

In conclusion, this study offers a detailed evaluation of how technology implementation impacted students' learning in third-level education during the COVID-19 pandemic in Ireland. While the findings generally point to a positive perception of online learning, significant differences in access, engagement, and outcomes demonstrate the complexity of emergency remote education. The results reaffirm the importance of instructor digital competence, interactive course design, and student support mechanisms in optimising the effectiveness of online learning. Moving forward, higher education institutions must adopt a more inclusive, flexible, and holistic approach to digital education, one that acknowledges and addresses the diverse realities of students and staff alike.

BIBLIOGRAPHY

Abu Talib, M., Bettayeb, A.M., & Omer, R.I. (2021). Analytical study on the impact of technology in higher education during the age of COVID-19 Systematic literature review. *Education and Information Technologies*, 26, 6719–6746. <https://doi.org/10.1007/s10639-021-10507-1>

Akram, H., Yingxiu, Y., Al-Adwan, A. S., & Alkhalifah, A. (2021). Technology integration in higher education during COVID-19: An assessment of online teaching competencies through technological pedagogical content knowledge model. *Frontiers in Psychology*, 12(736522), 1–11. <https://doi.org/10.3389/fpsyg.2021.736522>

Alenezi, M. (2023). Digital learning and digital institution in higher education. *Educational Sciences*, 13(1), 88. <https://doi.org/10.3390/educsci13010088>

Ali, W. (2020). Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. *Higher Education Studies*, 10(3), 16–25. <https://doi.org/10.5539/hes.v10n3p16>

Angellika, V., Purnomo, C., Handoyo, R., & Hanif, A.A. (2022). The effectiveness of online education during Covid19 pandemic in Indonesia. *Advances in Social Science, Education and Humanities Research*, 655, 1911-1916. Retrieved from: <https://www.atlantispress.com/proceedings/ticash-21/125973258>

Azhari, A., & Ramadan, Z. H. (2022). The intensity of visiting the school library as an indicator of students' reading interest in elementary schools. *International Journal of Elementary Education*, 6(2), 290–296. <https://doi.org/10.23887/ijee.v6i2.46584>

Bailey, D. R., Almusharraf, N. & Almusharraf, A. (2022). Video conferencing in the e-learning context: Explaining learning outcome with the technology acceptance model. *Education and Information Technologies*, 27, 7679–7698. <https://doi.org/10.1007/s10639-022-10949-1>

Belt, E. S., & Lowenthal, P. R. (2023). Synchronous video-based communication and online learning: An exploration of instructors' perceptions and experiences. *Education and Information Technologies*, 28, 4941–4964. <https://doi.org/10.1007/s10639-022-11360-6>

Bhandari, P. (2022) ‘A note on survey research methods levels of measurement: foundational basis for quantitative analysis of survey data. *Dhaulagiri: Journal of Sociology & Anthropology*, p. 16. <https://doi.org/10.3126/dsaj.v16i01.50982>

Bond, M., & Bedenlier, S. (2019). Facilitating student engagement through educational technology: Towards a conceptual framework. *Journal of Interactive Media in Education*, 2019(1), 1–14. <https://doi.org/10.5334/jime.528>

Bozkurt, A., & Sharma, R. C. (2020). Emergency remote teaching in a time of global crisis due to CoronaVirus pandemic. *Asian Journal of Distance Education*, 15(1), i–vi. Retrieved from: <https://www.asianjde.com/ojs/index.php/AsianJDE/article/view/447>

- Bozkurt, A., & Stracke, C. M. (2022). The shift toward openness in education and the implications for learning ecosystems and ecologies. In M. Kerres, D. Otto, & O. Zawacki-Richter (Eds.), *Distributed learning ecosystems: Repositories, resources and practices*. Springer Nature.
- Bray, A., Ni Chorcora, E., Maguire Donohoe, J., Banks, J., & Devitt, A. (2020). *Post-primary student perspectives on teaching and learning during COVID-19 school closures: Lessons learned from Irish students from schools in a widening participation programme*. Dublin: Trinity College Dublin. <https://hdl.handle.net/2262/93107>
- British Educational Research Association (BERA). (2018). *Ethical guidelines for educational research* (4th ed.). London: Author. Retrieved from: <https://www.bera.ac.uk/publication/ethical-guidelines-for-educational-research-2018-online>
- Bryman, A. (2016). *Social research methods* (5th ed.). UK: Oxford University Press.
- Buchanan, D. and Bryman, A. (2007) 'Contextualizing methods choice in organisational research. *Organisational Research Methods*, 10(3), 483–501.
- Choi, H., Arslan, Ö., Adolfson, D., & Screws, B. (2021). The international other in online learning: Four stories from a graduate program. In *Reshaping international teaching and learning in higher education* (pp. 162–174). Routledge.
- Christensen, C. M., Horn, M., & Johnson, C. (2011). *Disrupting class, expanded edition: How disruptive innovation will change the way the world learns*. New York: McGraw-Hill Education.
- Christensen, D. (2024). *The history of technology in education*. Retrieved from: <https://www.hmhco.com/blog/the-history-of-technology-in-education>
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage.
- Czerniewicz, L. (2020). *What we learnt from “going online” during university shutdowns in South Africa*. Retrieved from <https://onedtech.philhillaa.com/p/what-we-learnt-from-going-online-during-university-shutdowns-in-south-africa>
- Debeş, G. (2021). Distance learning in higher education during the COVID-19 pandemic: Advantages and disadvantages. *International Journal of Current Instruction*, 13, 1109-1118.
- Dempsey, S., Lyons, S., & McCoy, S. (2020). Early mobile phone ownership: influencing the wellbeing of girls and boys in Ireland? *Journal of Children and Media*, 1-18.
- Dennen, V. P., & Arslan, Ö. (2022). The visual performance of online identity: Instructor presence and persona across tools and settings. *Studies in Technology Enhanced Learning*. <https://doi.org/10.21428/8c225f6e.9e975efc>.

- Dennen, V. P., & Jones, M. K. (2023). The role of the online instructor. In O. Zawacki-Richter, & I. Jung (eds) *Handbook of open, distance and digital education*. Singapore: Springer. https://doi.org/10.1007/978-981-19-2080-6_62
- Despitasari, N. W. P., & Joni, I. D. A. S. (2025). Online learning and effective communication during the pandemic. *Jurnal Pustaka Komunikasi*, 8(1), 174-183. <https://doi.org/10.32509/pustakom.v8i1.4725>
- Didenko, I., Filatova, O., & Anisimova, L. (2021). COVID-19 lockdown challenges or new era for higher education. *Propósitos y Representaciones*, 9, e914. <https://doi.org/10.20511/pyr2021.v9nsp1.914>
- Dubey, P., & Pandey, D. (2020). Distance learning in higher education during pandemic: Challenges and opportunities. *International Journal of Indian Psychology*, 8(2), 43-46. <https://doi.org/10.25215/0802.204>
- Dunne, C., O'Dalaigh, C., & Marcus-Quinn, A. (2020). *Report of the Independent Review Group (IRG) on the use of tablet devices in Ratoath College (RC)*. Retrieved from: https://www.ratoathcollege.ie/images/pdfs/ParentLetters/Report_of_the_Independent_Review_Group_03_03_2020.pdf
- Easterby-Smith, M., Thorpe, R. Jackson, P. and Lowe, A. (2008) *Management research* (3rd edn) 'London: Sage.
- Falode, O. C., Chukwuemeka, E. J., Bello, A., & Baderinwa, T. (2020). Relationship between flexibility of learning, support services and students' attitude towards distance learning programme in Nigeria. *European Journal of Interactive Multimedia Education*, 1, e02003. <https://doi.org/10.30935/ejimed/8320>
- Farrell, A. M., Buckley, K., Glynn, M., Lowney, R., Smyth, S., & Stone, S. (2021). *Moving large classes online: Illuminating the experience of the sudden transition of large, face-to-face programmes to the online environment in Dublin City University, in response to the COVID-19 crisis*. Dublin, Ireland: Dublin City University.
- Gaba, A. K., Bhushan, B., & Kant Rao, D. (2021). Factors influencing the preference of distance learners to study through online during COVID-19 pandemic. *Asian Journal of Distance Education*, 16.
- Gómez-Rey, P., Barbera, E., & Fernández-Navarro, F. (2017). Student voices on the roles of instructors in asynchronous learning environments in the 21st century. *International Review of Research in Open and Distributed Learning*, 18(2), 234-251. <https://doi.org/10.19173/irrodl.v18i2.2891>.
- Gravetter, F. J., Wallnau, L. B. and Forzano, L.-A. B. (2020) *Essentials of statistics for the behavioral sciences (10th ed.)* 'Cengage Learning.

Hashemi, A., Si Na, K., Noori, A. Q., & Orfan, S. N. (2022). Gender differences on the acceptance and barriers of ICT use in English language learning: Students' perspectives. *Cogent Arts & Humanities*, 9(1), 1-20. <https://doi.org/10.1080/23311983.2022.2085381>

HSE. (2020a). *Minding your mental health during the coronavirus pandemic*. Dublin: Health Service Executive. Retrieved from: <https://www2.hse.ie/wellbeing/mentalhealth/covid-19/minding-your-mental-health-during-the-coronavirusoutbreak.html>

HSE. (2020b). *Outsmart the exam monster*. Dublin: Health Service Executive, Retrieved from: <https://www2.hse.ie/healthy-you/outsmart-the-exam-monster.html>

HSE. (2020c). *Stress - causes of stress and how it can impact on you*. Dublin: Health Service Executive. Retrieved from <https://www2.hse.ie/wellbeing/mentalhealth/stress.html>

Khawaja, S., Anjos, E., & Qureshi, F. (2023). The impact of the pandemic (COVID-19) on higher education students: Challenges, adaptations, and future perspectives. *Creative Education*, 14, 2207–2227. <https://doi.org/10.4236/ce.2023.1411140>

Liberman, J., Levin, V., & Luna-Bazaldua, D. (2020). Are students still learning during COVID-19? Formative assessment can provide the answer. *World Bank Blogs*. <https://blogs.worldbank.org/education/are-students-still-learning-during-covid-19-formative-assessment-can-provide-answer>

Longhurst, G. J., Stone, D. M., Duloherly, K., Scully, D., Campbell, T., & Smith, C. F. (2020). Strength, weakness, opportunity, threat (SWOT) analysis of the adaptations to anatomical education in the United Kingdom and Republic of Ireland in response to the COVID-19 pandemic. *Anatomical Sciences Education*, 13(3), 301–311. <https://doi.org/10.1002/ase.1967>

Martin, F., & Borup, J. (2022). Online learner engagement: Conceptual definitions, research themes, and supportive practices. *Educational Psychologist*, 1–16. <https://doi.org/10.1080/00461520.2022.2089147>.

Masalimova, A. R., Khvatova, M. A., Chikileva, L. S., Zvyagintseva, E. P., Stepanova, V. V., & Melnik, M. V. (2022). Distance learning in higher education during COVID-19. *Frontiers in Education*, 7(822958). <https://doi.org/10.3389/feduc.2022.822958>

Mazurek, E. (2022). Higher education during the COVID-19 pandemic in the opinions of students in Poland. *Tuning Journal for Higher Education*, 10(5), 264–286. <https://doi.org/10.18543/tjhe1012022>

McGuire, P. (2023, February 21). 'A decade of progress will be lost': Concerns mount over learning deficit due to Covid school closures. *The Irish Times*. Retrieved from: <https://www.irishtimes.com/ireland/education/2023/02/21/a-decade-of-progress-will-be-lost-concerns-mount-over-learning-deficit-due-to-covid-school-closures/>

- McManus, R., Logan, A., Wilders, D., & Pennycook, C. (2024). "A world of possibilities": The future of technology in higher education, insights from the COVID-19 experience. *Education Sciences*, 14(1), 63. <https://doi.org/10.3390/educsci14010063>
- Mmakola, S., & Maphalala, M. C. (2023). Blended teaching and learning in South African secondary schools in the post-COVID-19 pandemic era. *International Journal of Innovative Technologies in Social Science*, 4(40). https://doi.org/10.31435/rsglobal_ijitss/30122023/8081
- Mulder, R., Bone, E., French, S., & Connelly, F. (2023). *Navigating the transition to online teaching at the University of Melbourne during COVID-19: Approaches, reflections and insights*. Victoria, Australia: Melbourne Centre for the Study of Higher Education, The University of Melbourne. <https://doi.org/10.26188/23995932>
- OECD. (2023). *Shaping digital education: Enabling factors for quality, equity and efficiency*. Paris: OECD Publishing. <https://doi.org/10.1787/bac4dc9f-en>
- Önöral, Ö., & Kurtulmus-Yilmaz, S. (2020). Influence of COVID-19 pandemic on dental education in Cyprus: Preclinical and clinical implications with E-learning strategies. *Advances in Education*, 7, 69–77.
- Qiao, W., & Yijun, C. (2023). The role of live transcripts in synchronous online L2 classrooms: Learning outcomes and learner perceptions. *Education and Information Technologies*, 28, 14783–14804. <https://doi.org/10.1007/s10639-023-11784-8>
- Rani, S., Danu, A., & Himanshu (2025). Does digital competence really matter? The impact of attitude and ICT on research performance. *Journal of Applied Research in Higher Education*. Emerald. <https://doi.org/10.1108/JARHE-07-2024-0351>
- Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2021). Balancing technology, pedagogy and the new normal: Post-pandemic challenges for higher education. *Postdigital Science and Education*, 3(3), 715–742. <https://doi.org/10.1007/s42438-021-00249-1>.
- Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144. <https://doi.org/10.1016/j.compedu.2019.103701>.
- Richardson, J. C., & Lowenthal, P. (2017). Instructor social presence: Learners' needs and a neglected component of the community of inquiry framework. In A. L. Whiteside, A. G. Dikkers, & K. Swan (Eds.), *Social presence in online learning: Multiple perspectives on practice and research* (pp. 86–98). Stylus.
- Rosário, A. T., & Dias, J. C. (2022). *Learning management systems in education: Research and challenges*. <https://doi.org/10.4018/978-1-6684-4706-2.ch003>

Samat, M. F., Awang, N. A., Hussin, S. N. A., & Nawi, F. A. M. (2020). Online distance learning amidst COVID-19 pandemic among university students: A practicality of partial least squares structural equation modelling approach. *Asian Journal of University Education*, 16, 220–233.

Saunders, M. N. K., Lewis, P., Thornhill, A. and Bristow, A. (2016) ‘Understanding research philosophy and approaches to theory development’, in Saunders, M. N. K., Lewis, P. and Thornhill, A. (eds.) *Research methods for business students* (7th edn.) ‘Harlow: Pearson Education, pp. 122–161.

Saunders, M., Lewis, P. and Thornhill, A. (2019) ‘*Research methods for business students* (8th edn) ‘UK: Pearson Education Limited, Financial Times.

Selingo, J., Clark, C., Noone, D., & Wittmayer, A. (2021). *The hybrid campus: Three major shifts for the post-COVID university*. Deloitte Insights.

Selvanathan, M., Hussin, N. A. M., & Azazi, N. A. N. (2023). Students learning experiences during COVID-19: Work from home period in Malaysian Higher Learning Institutions. *Teaching Public Administration*, 41(1), 13–22. <https://doi.org/10.1177/0144739420977900>

Shahin, M. (2021). Opinions of university students on effects of distance learning in Turkey during the COVID-19 pandemic. *African Educational Research Journal*, 9, 526–543. <https://doi.org/10.30918/aerj.92.21.082>

Shoaib, M. H., Sikandar, M., Yousuf, R. I., Parkash, M., Kazmi, S. J. H., Ahmed, F. R., Ahmed, K., Saleem, M. T., & Zaidi, S. H. (2023). Graduate and postgraduate educational challenges during the COVID-19 pandemic period: Its impact and innovations, a scoping review. *Systematic Reviews*, 12(195), 1–25. <https://doi.org/10.1186/s13643-023-02359-2>

Stankovska, G., Dimitrovski, D., & Ibraimi, Z. (2021). Online learning, social presence and satisfaction among university students during the COVID-19 pandemic. In *Annual International Conference of the Bulgarian Comparative Education Society (BCES)* (pp. 181–188).

Stracke, C. M., Sharma, R. C., Bozkurt, A., Burgos, D., Swiatek, C., Inamorato dos Santos, A., ... Truong, V. (2022). Impact of COVID-19 on formal education: An international review on practices and potentials of Open Education at a distance. *The International Review of Research in Open and Distributed Learning*.

Stracke, C. M., Sharma, R. C., Swiatek, C., Burgos, D., Bozkurt, A., Karakaya, Ö., ... Conole, G. (2021). How COVID-19 has an impact on formal education: A collective international evaluation of open education in distance learning. In *Proceedings of the 14th annual international conference of education, research and innovation (ICERI)* (pp. 4270–4275). <https://doi.org/10.5281/zenodo.5764585>

Svihus, C. L. (2024). Online teaching in higher education during the COVID-19 pandemic. *Education and Information Technologies*, 29, 3175–3193. <https://doi.org/10.1007/s10639-023-11971-7>

Taherdoost, H. (2022) 'Different types of data analysis; data analysis methods and techniques in research projects', *International Journal of Academic Research in Management*, 9(1), 1-9. <https://hal.science/hal-03741837/document>

Toquero, C. M. (2020). Challenges and opportunities for higher education amid the COVID-19 pandemic: The Philippine context. *Pedagogical Research*, 5, em0063. <https://doi.org/10.29333/pr/7947>

Tugun, V., Bayanova, A. R., Erdyneeva, K. G., Mashkin, N. A., Sakhpova, Z. M., & Zasova, L. V. (2020). The opinions of technology supported education of university students. *International Journal of Emerging Technologies in Learning*, 15, 4–14. <https://doi.org/10.3991/ijet.v15i23.18779>

Xu, T., & Xue, L. (2023). Satisfaction with online education among students, faculty, and parents before and after the COVID-19 outbreak: Evidence from a meta-analysis. *Frontiers in Psychology*, 14, 1128034. <https://doi.org/10.3389/fpsyg.2023.1128034>