HUMAN INTELLIGENCE IN THE AI AGE: A QUALITATIVE STUDY OF STAKEHOLDER ADAPTATIONS TO ONLINE AND HYBRID EDUCATION DURING COVID-19

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ABSTRACT

Purpose. This research explores the difficulties and methods of coping utilized by principal participants in Nepal's educational framework following the abrupt shift from traditional classroom teaching to online and hybrid learning formats due to the COVID-19 crisis.

Methodology, approach, and design. To accurately reflect the experiences of stakeholders, this study implemented a qualitative narrative approach. Data were gathered via open-ended interviews and conversations involving students, parents, educators, and institutional leaders. Thematic analysis was employed to evaluate the gathered narratives, aiming to identify recurring themes regarding challenges, reactions, and coping strategies shared among the diverse groups of participants.

Findings. The findings reveal interrelated challenges such as inadequate availability of digital tools and reliable internet, low levels of digital skills, decreased motivation among students, increased responsibilities for parents, and institutional limitations concerning policies and resources. Students encountered hurdles related to independent learning and feelings of social disconnection. Educators modified their teaching and assessment methods. In spite of these challenges, participants adapted by employing flexible approaches, integrating technology, collaborating with others, and enhancing coordination between home and school.

Constraints of the Study. Since the research is grounded in qualitative insights from a limited set of individuals in Nepal, the findings may not be generalizable to a broader audience. Future studies could be enriched by embracing a wider range of perspectives and methodologies.

Practical Implications. The outcomes highlight the necessity of being technologically equipped, fostering collaborative efforts, and creating flexible educational frameworks during crises, illustrating that human intelligence in these situations faces both substantial opportunities and intricate challenges.

Uniqueness/significance. This research provides an in-depth, context-oriented exploration of the transformation of education in Nepal during the pandemic.

Keywords: Human intelligence; AI era; Online and hybrid learning; Stakeholder response; COVID-19 crisis

Introduction

The COVID-19 crisis caused an extraordinary upheaval in education systems worldwide, disrupting learning at all levels and forcing a rapid departure from conventional classroom instruction toward online and blended formats. At the height of global shutdowns, over 1.6 billion learners were affected, underscoring the magnitude of the disruption (UNESCO, 2023). What began as a temporary emergency soon became a large-scale educational transformation.

To sustain teaching and learning, institutions swiftly integrated digital platforms and technological tools. This rapid pivot reshaped pedagogical approaches, altered patterns of student engagement, and restructured institutional management (Dhawan, 2020). Although the transition exposed weaknesses in infrastructure and preparedness, it also demonstrated the capacity of education systems to respond creatively under intense pressure. In doing so, it illuminated the dynamic relationship between human capability, technological advancement, and resilience within an increasingly AI-oriented educational landscape.

Educational Challenges and Adaptations during COVID-19

The immediate replacement of physical classrooms with online and hybrid models marked a fundamental change in instructional delivery. Initially characterized as emergency remote teaching, these efforts gradually matured into more organized and adaptable digital learning systems (Dhawan, 2020). Teachers incorporated both live (synchronous) and self-paced (asynchronous) methods, employed diverse digital applications, and adjusted academic calendars to maintain participation. This phase accelerated technological adoption and stimulated experimentation in teaching strategies (UNESCO, 2023).

However, outcomes differed significantly across social and geographic contexts. Learners from economically disadvantaged backgrounds encountered substantial obstacles, including inadequate devices, unstable internet connections, and limited academic assistance (OECD, 2022). Moreover, remote learning demanded stronger self-discipline and intrinsic motivation, intensifying cognitive and emotional pressures on students (Dhawan, 2020).

To address these challenges, educational organizations enhanced digital communication networks, expanded teacher training initiatives, and implemented hybrid structures that combined virtual instruction with selective in-person engagement. These measures underscored

the value of flexibility, cooperation, and proactive human involvement in sustaining educational continuity (UNESCO, 2023).

Societal and Psychological Impacts of the Pandemic

Beyond instructional concerns, the pandemic significantly affected students' psychological and social well-being. Extended school closures were associated with heightened loneliness, stress, and emotional strain among children and adolescents (Loades et al., 2020). The loss of peer interaction and consistent routines particularly affected vulnerable groups, highlighting schools' broader function as environments for socialization and emotional growth.

Simultaneously, economic instability and public health challenges deepened pre-existing educational disparities. Household financial pressures and employment disruptions influenced students' academic engagement and performance (OECD, 2022). Although closures were critical for safeguarding public health, their consequences disproportionately burdened marginalized communities (Viner et al., 2020). These realities emphasize the necessity of comprehensive responses that integrate academic provision with psychosocial support.

Educational Transformations and Emerging Challenges during COVID-19

The extensive reliance on digital platforms revealed both the strengths and shortcomings of online and blended systems. Virtual technologies ensured instructional continuity and offered flexible learning pathways despite physical restrictions (Dhawan, 2020). Nevertheless, persistent digital inequities exposed structural barriers to equal access (OECD, 2022).

Moving forward, strengthening technological infrastructure, advancing teacher readiness, and promoting inclusive policy development remain essential priorities. The crisis also catalyzed enduring innovation by encouraging blended learning experimentation and technology-enhanced pedagogy (UNESCO, 2023). Collectively, these experiences highlight how adaptability, collaboration, and human-centered judgment underpin educational resilience. Within an evolving AI-driven context, such insights demonstrate how human intelligence—expressed through problem-solving, shared responsibility, and innovation—continues to shape sustainable educational transformation during times of disruption.

Methodological Approach

This study employs a qualitative, interpretive research design grounded in narrative inquiry to examine participants' lived experiences in depth. Participants are selected purposively, with additional respondents identified through snowball sampling to enrich the dataset and broaden perspectives.

Data are analyzed using a descriptive and systematic approach to ensure rigor, credibility, and meaningful interpretation of findings. The research is guided by social change theory, which emphasizes the increasing role of technology and global interconnectivity in shaping responses to contemporary challenges. In this context, the study also reflects on how human intelligence interacts with technological systems to influence adaptation in online and hybrid education during and beyond the COVID-19 period

Problem Statement

The COVID-19 pandemic triggered an unprecedented and rapid transition from conventional face-to-face education to online and hybrid learning systems, exposing both the resilience and structural weaknesses of global education systems. While digital technologies enabled the continuation of instruction during school closures, they also highlighted significant inequalities in access to devices, digital literacy, and institutional readiness among students, teachers, and families. In the growing context of technology-enhanced and AI-supported education, there remains an insufficient understanding of how key stakeholders cognitively, emotionally, and socially adjusted to these abrupt changes in learning environments. Research shows that such emergency transitions placed substantial demands on learners' self-regulation, teachers' instructional adaptation, and parental involvement, all of which became central to sustaining learning continuity (Bozkurt et al., 2020).

Moreover, although artificial intelligence and digital learning platforms increasingly shape modern education systems, the role of human intelligence—including judgment, collaboration, and adaptive decision-making—remains underexplored in explaining how effective learning was maintained during the pandemic. Studies emphasize that emergency remote teaching was not merely a technological shift but a deeply human process involving rapid reconfiguration of pedagogical practices and stakeholder relationships (Hodges et al., 2020). However, there is still limited qualitative evidence on how these human-centered adaptations influenced the success or limitations of online and hybrid education models. This study therefore

seeks to investigate the lived experiences of stakeholders to better understand how human intelligence and collaborative adaptation strategies supported educational continuity and transformation during COVID-19.

Objectives of the Study

This study has got objectives as follows:

1. To explore how students, teachers, and parents adapted to online and hybrid learning environments during the COVID-19 pandemic.
2. To examine the role of human intelligence, collaboration, and digital engagement in shaping educational continuity and learning experiences during emergency remote education.

Research Questions

The research questions designed for this study are as follows:

1. How did key educational stakeholders (students, teachers, and parents) adapt to the transition from face-to-face to online and hybrid learning during COVID-19?
2. In what ways did human intelligence and stakeholder collaboration influence the effectiveness and sustainability of online and hybrid education during the pandemic?

Review of Related Literature

The review for this study is made as follows:

Perceptions of Online Education

Ojha and Rahman (2020) explored attitudes toward online courses in the United States using quantile regression techniques. Their findings revealed that individuals with prior exposure to online learning, full-time employment, older age, and female gender tended to express more positive perceptions. In contrast, participants with higher levels of formal education were generally more critical. The study emphasizes the influence of background characteristics and prior experience on attitudes toward digital learning.

Technology Acceptance and System Quality

Thongsri et al. (2019) investigated Thai undergraduates' views of the Class Start platform through the UTAUT model and the DeLone and McLean Information Systems Success Model. Survey data from 307 students indicated that expectations of enhanced academic performance, along with strong system and information quality, significantly shaped students' intentions to use online platforms. Their work highlights the necessity of reliable systems, quality content, and accessible design for successful digital learning.

Online Instruction during Crisis

Chen et al. (2020) conducted a mixed-methods investigation in Chinese universities during the pandemic, examining the effectiveness of live-streamed teaching. Responses from 6,291 students and interviews with 1,160 instructors suggested that online delivery maintained academic continuity during the emergency. The study also proposed improvements for future online and blended models, recognizing digital education as a strategic response to crisis situations.

Impact of Educational Technologies

Almasri et al. (2019) demonstrated that digital tools and multimedia resources can strengthen engagement, collaboration, and learner independence. Their findings stress the importance of teachers' technological proficiency and positive attitudes, recommending continuous professional development to facilitate effective integration.

Huang et al. (2020) examined blended learning and mobile technologies in higher education. Their research showed that integrating in-person teaching with digital tools enhanced flexibility and student satisfaction. Mobile learning supported individualized pacing, though issues such as digital distraction and unequal access remained concerns. The study affirms that thoughtfully designed, inclusive digital tools can enrich learning outcomes.

Technology in Developing Contexts

Woldab (2019) analyzed ICT implementation in Ethiopian higher education. Although infrastructural barriers such as unreliable electricity and limited digital literacy posed challenges, both students and faculty generally maintained favorable attitudes toward technology. Expanded

access to computers and internet services improved engagement and academic performance, illustrating both the promise and constraints of digital education in developing settings.

Artificial Intelligence and Adaptive Learning

Chien et al. (2020) examined the role of artificial intelligence and adaptive systems in secondary education. Their findings indicated that AI-enabled platforms supported personalized instruction by helping teachers identify learning patterns and deliver timely support. While not considered a replacement for educators, AI was viewed as a valuable complement to enhance individualized learning and student autonomy.

Long-Term Implications of the Digital Shift

Adedoyin and Soykan (2020) compared conventional and online education, emphasizing how the pandemic accelerated the global transition toward digital learning. Learning management systems, video conferencing tools, and online assessments became critical for continuity. While some institutions adapted successfully, others struggled due to inadequate infrastructure, limited training, and insufficient inclusive policies. The authors advocate for sustained investment, digital equity, and strategic planning to strengthen future e-learning frameworks.

Human–AI Collaboration in Post-Pandemic Education

The rapid integration of artificial intelligence (AI) into education has significantly transformed the role of human intelligence, particularly during and after the COVID-19 pandemic, when institutions transitioned rapidly to online and hybrid learning systems. While AI technologies enhance accessibility, personalization, and data-informed instructional decision-making, human intelligence remains indispensable for ethical reasoning, contextual interpretation, and socio-emotional engagement in learning environments. The pandemic period required students, educators, and administrators to adapt quickly to digital platforms, revealing both the strengths and limitations of technology-supported education. Rather than replacing educators, AI functioned as a complementary tool that supported instructional design, learning analytics, and adaptive feedback, while teachers maintained central roles in pedagogy, motivation, and evaluation (Zawacki-Richter et al., 2019; Holmes et al., 2022).

Contemporary research highlights that effective educational transformation in the AI era depends on a hybrid intelligence framework, where human and machine capabilities are combined to improve learning outcomes. AI systems are particularly effective in processing large-scale educational data, identifying learning patterns, and personalizing instruction, whereas humans contribute creativity, ethical judgment, critical thinking, and relational understanding that are essential for meaningful learning experiences (Chen et al., 2020; Luckin & Cukurova, 2019). Furthermore, studies on AI adoption in higher education show increasing use of intelligent tutoring systems, automated assessment tools, and learning analytics platforms to enhance flexibility and engagement in post-pandemic hybrid learning environments, while also raising important concerns regarding ethics, transparency, and pedagogical dependence on automation (Chen et al., 2020; Holmes et al., 2022). Overall, the COVID-19 experience accelerated the convergence of human intelligence and AI technologies, demonstrating that sustainable educational innovation depends not on replacement, but on balanced and ethically guided human–AI collaboration.

Synthesis of Current Literature

Across the reviewed literature, there is broad agreement that perceptions of and engagement with online education are shaped by a combination of individual, institutional, and technological factors, though the emphasis varies across contexts. Studies such as Ojha and Rahman (2020) highlight demographic and experiential influences on attitudes, showing that prior exposure and employment status foster more positive perceptions, whereas higher education levels can lead to greater critique. In contrast, Thongsri et al. (2019) and Almasri et al. (2019) shift the focus toward system-related and pedagogical factors, emphasizing that technology acceptance is strongly driven by perceived usefulness, system quality, and teachers' digital competence. Similarly, Huang et al. (2020) and Woldab (2019) both acknowledge contextual constraints—such as digital distraction, infrastructure limitations, and unequal access—while still reporting overall positive attitudes toward blended and ICT-supported learning. During crisis conditions, Chen et al. (2020) and Adedoyin and Soykan (2020) demonstrate that online systems ensured educational continuity, yet also expose disparities in readiness and institutional capacity. Extending this discussion, research on AI integration (Chien et al., 2020; Holmes et al., 2022) introduces a shift toward adaptive, data-driven learning

environments, positioning AI as a complementary tool that enhances personalization but raises concerns about ethics, transparency, and over-reliance on automation.

Despite these converging insights, key gaps remain. First, much of the existing research treats online learning, blended learning, and AI-driven education as separate domains, with limited integrative frameworks that examine their combined effects on pedagogy and learner experience. Second, while many studies identify positive attitudes or intentions to use technology, fewer investigate long-term learning outcomes or sustained behavioral change beyond initial adoption. Third, research from developing contexts remains limited in AI-specific applications, with most evidence focusing on infrastructure challenges rather than advanced adaptive systems. Finally, although recent literature acknowledges human–AI collaboration, there is insufficient empirical work on how this "hybrid intelligence" operates in everyday classroom practice, particularly regarding teacher agency, ethical decision-making, and socio-emotional dimensions of learning. These gaps suggest a need for more holistic, context-sensitive, and longitudinal studies that connect technological adoption with pedagogical transformation and equity outcomes in digital education.

Data Presentation and Analysis

This section presents and interprets the study's findings by drawing on the viewpoints of students, teachers, parents, and school leaders. It examines the difficulties linked to virtual learning, the strategies stakeholders used to manage these challenges, and their comparative opinions regarding online instruction and traditional classroom teaching. The following subsections integrate participants' experiences to provide a comprehensive understanding of educational change during the pandemic.

Students' Perspectives

> *The move to online education created significant obstacles for students. Participation in virtual platforms such as Zoom, Microsoft Teams, and Google Meet depended on access to smartphones or similar digital devices, which placed a heavy financial burden on many households, particularly those with limited income. Extended screen exposure often caused eye discomfort, headaches, and mental fatigue. Submitting assignments became complicated, especially when students had to photograph handwritten tasks and upload*

them digitally. In addition, unreliable electricity, weak internet connections, and economic hardship frequently interrupted attendance. Many learners experienced online education as isolating and financially stressful.

Emerging Themes from Students' Experiences

The following themes are analysed through the perspectives of the students:

Technical Barriers

Active participation in virtual classes relied on having suitable digital devices. However, many existing gadgets were incompatible with required platforms, compelling families to purchase new equipment at high cost. Frequent power cuts and unstable internet connections—combined with expensive data packages—further limited consistent engagement. As a result, expectations of seamless online instruction clashed with persistent infrastructural constraints.

Economic Hardship

Financial limitations strongly influenced students' educational experiences. Low-income families struggled to afford devices and reliable connectivity, revealing sharp disparities in access to learning. The abrupt transition to digital instruction widened the gap between students who could adjust smoothly and those hindered by economic disadvantage.

Physical and Psychological Strain

Long hours in front of screens led to physical discomfort, including eye strain and headaches, along with emotional effects such as stress, exhaustion, and burnout. The absence of face-to-face interaction intensified feelings of loneliness. Even when technology functioned properly, the lack of shared classroom spaces weakened peer relationships and reduced social engagement.

Difficulties in Assignment Submission

Activities that were once simple became more demanding in virtual settings. Students were frequently required to convert handwritten work into digital form by photographing and uploading it, a process dependent on technical competence, functional devices, and stable

internet service. Unequal access to these resources resulted in delays, frustration, and heightened academic pressure.

Language and Emotional Expression

Students' accounts reflected strong emotional undertones, revealing frustration and fatigue. Phrases such as "extremely challenging," "expensive for low-income families," and "mentally draining" illustrate the intensity of their experiences. Repeated mentions of financial hardship and prolonged online sessions highlight the magnitude of these concerns.

Narrative Progression and Key Insights

Students' narratives move from describing technological and financial obstacles to explaining their physical and emotional consequences. Together, these accounts demonstrate perseverance amid adversity and reveal the complexity of adapting to sudden educational shifts. Their stories vividly depict online learning realities during the pandemic, showing how technological barriers, economic inequality, and human resilience intersect. The emotional depth of these experiences underscores the urgency of reducing digital disparities, strengthening infrastructure, and ensuring mental health support during crises. As McLaughlin et al. (2010) suggest, abrupt disruptions can heighten anxiety and uncertainty, intensifying psychological strain. The rapid shift to remote education reflects this pattern, illustrating how sudden contextual changes test both intellectual capacity and emotional stability, and highlighting the need for supportive learning systems.

The guardians showed responses as follows:

Guardians' Perspectives

> *The pandemic created unexpected hardships for families. Lockdowns led to job losses and declining household income, limiting many parents' ability—particularly those from disadvantaged backgrounds—to provide necessary devices and internet access for their children's education. These difficulties were especially pronounced in households with multiple school-aged children. Financial strain increased as numerous institutions continued charging tuition fees despite reduced family earnings. Although parents*

generally regarded face-to-face instruction as more effective, they acknowledged that digital competence is now essential in contemporary education.

Key Challenges Faced by Parents

The perspectives of parents are made clear through the following themes:

Economic Pressures

During the pandemic, many parents experienced severe financial strain. Lockdowns resulted in unemployment and reduced income, making it difficult to cover daily living expenses alongside educational costs. Continued tuition fees further intensified household financial stress.

Technological Barriers

The rapid move to online learning revealed substantial technological gaps. Many families lacked adequate digital devices, and unstable internet connections frequently disrupted lessons. Households with several children found it challenging to provide multiple devices, compounding both economic and organizational difficulties. Additionally, monitoring children's academic progress became more complex, as online platforms offered less direct supervision than traditional classrooms.

Comparing Learning Modalities

Both in-person and virtual education present unique advantages and limitations. Conventional classroom teaching is often preferred for its direct interaction, immediate feedback, active engagement, and social development opportunities. However, health concerns during the pandemic made physical attendance unsafe. Online learning ensured educational continuity and offered flexibility and self-paced study, though it lacked the immediacy and interpersonal connection of face-to-face instruction.

Physical and Online Instruction: A Comparative Perspective

Online education provides adaptable scheduling and access to digital materials, whereas classroom-based learning fosters meaningful engagement, prompt responses, and experiential activities. Rather than functioning in opposition, these approaches can complement one another within modern educational systems.

Physical Instruction

Strengths. Strong teacher–student interaction, structured environments, and consistent academic support.

Limitations. Health risks and mobility restrictions limited feasibility during the pandemic.

Online Instruction

Strengths. Maintained learning continuity and offered flexible study options.

Limitations. Limited preparedness, digital inequality, insufficient technological skills, and challenges in monitoring student achievement.

The Need for Technological Integration

The pandemic emphasized the importance of embedding information and communication technologies (ICT) within education systems. To enhance preparedness for future disruptions, institutions must invest in robust digital infrastructure, reliable connectivity, and the development of technological skills among teachers and students.

Initially identified in Wuhan, China, in late 2019, COVID-19 triggered worldwide lockdowns that disrupted economies, healthcare services, and education systems (Alhammadi, 2021). Schools and universities were compelled to transition quickly to online instruction, encountering issues related to engagement, readiness, and connectivity. Financial constraints weakened institutional capacity, leading to budget cuts, staff reductions, and limited learning resources. Health protocols reshaped conventional teaching practices, while longstanding social and educational inequalities became increasingly visible, disproportionately affecting marginalized learners.

Overall, the crisis exposed structural weaknesses in education systems, particularly in financial sustainability and technological access. Although face-to-face learning remains widely valued, the swift move to digital platforms accelerated ICT adoption. Addressing these challenges requires comprehensive policy reform, sustained investment in infrastructure, and targeted measures to promote equitable access to quality education. When effectively

implemented, technology can enhance learning outcomes, broaden access, and support personalized educational pathways (Henderson, Selwyn, & Aston, 2017).

Context and Overview

The COVID-19 pandemic caused widespread disruption across sectors, with education among the most affected. Parents and educators faced unprecedented responsibilities during the rapid transition to remote learning. This section thematically explores parents' experiences, emphasizing financial challenges, adaptation to digital tools, and perceptions of the relative effectiveness of in-person and virtual instruction.

Teachers' Views

Teachers showed their perspectives as follows:

> *The period of teaching during the COVID-19 crisis was marked by both disruption and transformation. Educators were suddenly required to move from conventional classroom settings to virtual platforms, often without sufficient preparation or technical guidance. Unstable internet connections, recurring electricity failures, and students' limited availability of digital devices frequently interrupted instructional activities and made it difficult to maintain consistency. Sustaining student participation and tracking academic progress were equally challenging, as many learners chose to keep their cameras turned off and submitted assignments inconsistently or past deadlines.*
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> *Beyond instructional difficulties, teachers also faced additional financial strain and emotional stress due to the need to acquire technological equipment and cope with expanded workloads. Despite these hardships, the experience strengthened teachers' digital skills and highlighted the growing relevance of educational technology. Nevertheless, most educators continued to regard face-to-face instruction as more conducive to meaningful engagement and effective learning.*

Teachers' perspectives show the following themes:

Difficulties Encountered by Teachers

Based on experiential accounts, educators experienced multiple obstacles during the transition to online learning. These challenges largely fell into technological, instructional, financial, and structural categories.

Technological Barriers

Persistent connectivity issues and power interruptions represented major impediments. Such disruptions frequently disturbed live classes and weakened instructional continuity. Teachers were often obliged to justify these interruptions to students, parents, and school authorities, even though the underlying problems were beyond their control.

Student Participation and Supervision

Online teaching limited teachers' capacity to observe and guide students effectively. With many learners keeping their cameras off, visual interaction was restricted, making it harder to gauge attentiveness and comprehension. The absence of non-verbal communication cues increased the risk of distraction, particularly through social media platforms, thereby diminishing academic engagement.

Assessment Constraints

Evaluating student performance in virtual environments proved complicated. Irregular and late submission of assignments made consistent grading difficult. Additionally, concerns about originality, credibility, and punctuality of student work raised questions regarding academic integrity.

Financial Pressures on Educators

To facilitate remote teaching, many educators had to invest in personal devices such as laptops and smartphones. These unanticipated expenditures intensified financial burdens and made adaptation to online instruction more demanding.

Perceived Effectiveness of Online Instruction

Although most teachers viewed online teaching as less effective than traditional classroom-based learning, they recognized the increasing necessity of incorporating Information and Communication Technology (ICT) into educational practice. Despite its limitations, digital

learning was acknowledged as an inevitable element of education in an increasingly technology-driven society.

Wider Educational Implications

While the pandemic intensified these issues, many of them reflect pre-existing structural weaknesses within education systems. Similar to constraints observed in other public sectors, deficiencies in infrastructure, limited resources, and persistent social inequalities continue to hinder equitable access to quality education. In disadvantaged communities, these obstacles are compounded by poverty, limited educational backgrounds, and unstable living conditions. Addressing such systemic disparities is crucial for enhancing educational inclusion and promoting students' overall development.

Contextual Background

The COVID-19 outbreak caused unprecedented disruption to education systems globally. The abrupt adoption of virtual learning created new responsibilities and challenges for both educators and parents. This section considers parental experiences, particularly focusing on financial strain, technological adjustment, and perceptions of online learning compared to conventional classroom instruction.

The institutional management team provided the following reflections:

Perspectives of Management

> *The transition period presented sudden and extensive challenges. From an administrative standpoint, the shift to online education generated significant operational and pedagogical concerns. Monitoring teachers and staff remotely proved difficult, while frequent inquiries and complaints from students and parents increased administrative pressure. Reduced participation among teachers and students, combined with financial difficulties such as unpaid tuition fees and ongoing rental obligations, further complicated institutional management. Although face-to-face instruction was still regarded as the most effective mode of delivery, the experience highlighted the importance of preparedness for digital education.*

Management representatives noted that the rapid move to virtual platforms revealed weaknesses in supervising academic operations and personnel from a distance. Stakeholder dissatisfaction intensified workloads, while financial instability and declining motivation among educators and learners diminished the overall effectiveness of online instruction. These experiences exposed structural gaps in managing emergency-driven digital transitions.

The following themes show clear views of the management team:

Institutional and Administrative Challenges in Remote Governance

Management representatives observed that the abrupt transition to virtual platforms exposed significant weaknesses in overseeing academic operations and personnel from a distance. Supervising teachers and responding to stakeholder concerns within an online environment revealed limitations in existing remote governance mechanisms. Frequent dissatisfaction from students and parents further increased administrative workloads. These experiences highlighted structural deficiencies in managing emergency-driven digital transitions and demonstrated the lack of preparedness for large-scale remote supervision.

Financial Strain and Institutional Sustainability

Economic pressures emerged as a major concern during the transition. Delayed or unpaid tuition fees, ongoing rental obligations, and broader financial instability placed institutions under considerable strain. These fiscal challenges not only threatened organizational sustainability but also negatively affected staff morale and operational efficiency. The financial burden intensified the overall complexity of managing online education during the crisis.

Declining Engagement and Instructional Effectiveness

Management reported reduced motivation among both teachers and students, which significantly diminished the effectiveness of online instruction. Limited oversight, screen fatigue, and unreliable internet connectivity contributed to lower levels of student participation and engagement. Stakeholder dissatisfaction, combined with technological barriers, further weakened instructional outcomes. Collectively, these factors reinforced the perception that virtual instruction was less effective than traditional face-to-face teaching.

Structural Weaknesses in Emergency Digital Transitions

The pandemic revealed interconnected technological, administrative, financial, and motivational challenges within educational institutions. These overlapping constraints exposed systemic gaps in institutional capacity to respond effectively to crisis-driven digital shifts. The experience underscored the need for more coordinated strategies to manage sudden educational disruptions.

Preference for Face-to-Face Instruction and the Need for Digital Readiness

Despite recognizing the expansion of distance education and innovative models such as blended and remote learning, management consistently expressed a preference for traditional classroom instruction due to its stronger interactive and learning outcomes. However, the crisis emphasized the urgency of developing adaptable and resilient digital systems. Strengthening online infrastructure, enhancing institutional preparedness, and building flexible learning frameworks were identified as essential steps to ensure educational continuity and maintain instructional quality during future disruptions.

As mentioned above, several recurring themes emerged from management reflections. First, supervising staff and responding to stakeholder concerns in a virtual environment revealed shortcomings in remote governance systems. Second, reduced student engagement—often associated with screen fatigue and unreliable internet connectivity—made sustaining participation in online classes particularly difficult. Third, economic challenges, including delayed fee payments and rental commitments, placed institutions under considerable strain, affecting sustainability and staff morale. Despite these obstacles, management consistently favored traditional classroom teaching for its stronger interactive and learning outcomes. At the same time, they acknowledged the necessity of improving digital infrastructure and preparedness to ensure resilience in future crises.

Overall, management recognized that online education during the pandemic revealed interconnected technological, financial, administrative, and motivational challenges. Limited oversight, stakeholder dissatisfaction, technological barriers, and economic strain collectively reduced the perceived effectiveness of virtual instruction compared to in-person teaching. Supporting this perspective, Soykan, Bastas, and Çakici (2023) argue that the pandemic

accelerated the expansion of distance education and stimulated innovative strategies such as blended and remote learning to address economic and technological constraints.

Although traditional classroom instruction remains the preferred approach for maximizing engagement and instructional quality, the pandemic emphasized the urgent need for adaptable and robust digital learning systems. Strengthening online readiness is essential to maintain educational continuity, protect instructional standards, and support institutions, educators, and students during unexpected disruptions.

Findings

The findings are presented as follows:

Personal and Experiential Factors Influence Views on Online Learning

Research demonstrates that learners' perceptions of online education are strongly shaped by their demographic backgrounds and previous experiences with technology. Those who have earlier exposure to digital learning, are employed full-time, are older, or are female generally display more positive attitudes, while individuals with advanced educational qualifications tend to adopt more critical perspectives (Ojha & Rahman, 2020). This suggests that technological familiarity and life circumstances significantly condition acceptance of virtual education, indicating that attitudes toward online learning are socially and contextually formed rather than universal.

Technology Adoption Depends on System Effectiveness and Expected Benefits

Studies based on the Unified Theory of Acceptance and Use of Technology and the Information Systems Success Model reveal that students' willingness to use online platforms is closely connected to system dependability, quality of information, and beliefs about improved academic outcomes (Thongsri et al., 2019). Platforms that are stable, easy to navigate, and enriched with relevant content foster stronger engagement. In contrast, inadequate infrastructure and poorly structured systems reduce trust and discourage active participation.

Crisis-Driven Online Learning Sustained Education but Revealed Institutional Gaps

The shift to remote instruction during the COVID-19 crisis played a crucial role in preserving educational processes. Empirical evidence from Chinese higher education institutions

indicates that live-streamed and online modalities enabled continued teaching during lockdown periods (Chen et al., 2020). Nonetheless, the abrupt change exposed weaknesses such as insufficient preparedness, limited infrastructure, and unequal access to resources. The rapid global move toward digital education illustrated both institutional adaptability and underlying structural vulnerabilities (Adedoyin & Soykan, 2020).

Educational Technologies Promote Interaction and Customized Learning

Existing literature highlights that tools such as multimedia resources, blended learning models, mobile applications, and artificial intelligence systems can enhance participation, cooperation, adaptability, and personalized instruction (Almasri et al., 2019; Huang et al., 2020). In particular, artificial intelligence contributes to adaptive learning by detecting student performance trends and enabling timely support, serving as an aid rather than a substitute for educators (Chien et al., 2020). These outcomes emphasize the potential of strategically implemented technologies to strengthen instructional practices.

Persistent Digital Divides Challenge Equitable Educational Access

Although many stakeholders express support for integrating technology into education, substantial infrastructural and socioeconomic limitations remain, especially in developing regions. Issues such as unstable electricity supply, weak internet connectivity, and limited digital competencies hinder effective ICT integration (Woldab, 2019). Furthermore, entrenched social inequalities—magnified during the pandemic—continue to restrict fair access to educational opportunities (Henderson et al., 2017). Achieving sustainable digital advancement therefore depends on policy reform, infrastructure development, and inclusive measures aimed at reducing technological disparities.

Technological and Infrastructural Barriers Limited Effective Online Learning

Across all stakeholder groups, technological constraints emerged as a dominant challenge. Students struggled with inadequate devices, unstable internet connections, and frequent power interruptions, which disrupted participation and assignment submission. Teachers encountered similar connectivity problems that interrupted instruction and limited their capacity to monitor learners' engagement and performance. Guardians reported difficulties in securing sufficient digital tools and reliable internet access, particularly in families with multiple

school-aged children. Management also faced obstacles in supervising academic activities remotely and maintaining institutional efficiency. These shared experiences demonstrate that weak digital infrastructure significantly diminished the overall effectiveness of online education (Adedoyin & Soykan, 2020).

Economic Pressures Intensified Educational Inequality and Institutional Strain

Financial hardship was widely experienced among students, families, educators, and institutions. Many students were unable to access appropriate devices or stable internet services due to limited household income. Guardians faced reduced earnings during the pandemic while continuing to bear tuition and technology-related costs. Teachers incurred additional personal expenses to facilitate remote teaching, and institutions struggled with delayed fee payments and ongoing operational obligations. Such overlapping financial burdens widened educational disparities and strained institutional sustainability (Woldab, 2019).

Reduced Engagement but Growing Recognition of Digital Necessity

Although online instruction was often perceived as less interactive and less effective than face-to-face learning, stakeholders acknowledged its critical role during crisis conditions. Students reported isolation, fatigue, and reduced peer interaction, while teachers observed lower participation levels and challenges in maintaining academic integrity. Guardians and management favored traditional classroom settings for their stronger supervision and engagement benefits. Despite these concerns, all groups recognized that digital literacy and technological integration are indispensable in contemporary education, underscoring the importance of strengthening blended and flexible learning systems (Henderson et al., 2017).

Human Intelligence in the AI Age: Challenges and Opportunities

Recent research highlights that the rise of artificial intelligence in education is reshaping, rather than replacing, the role of human intelligence. Studies show that while AI systems enhance efficiency, personalization, and data-driven decision-making, they also create challenges related to reduced human interaction, over-reliance on automated systems, and ethical concerns in educational decision-making (Zawacki-Richter et al., 2019; Holmes et al., 2022). At the same time, opportunities are emerging for educators to focus more on higher-order skills such as critical thinking, creativity, emotional support, and ethical judgment—areas where human

capabilities remain essential. This evolving partnership suggests that the future of education depends on a balanced "hybrid intelligence" model, where AI supports instructional tasks while human educators maintain central roles in meaning-making, motivation, and socio-emotional engagement.

Discussion

The study indicates that online education was often viewed by students, teachers, and parents as more expensive and challenging than traditional learning, especially during the COVID-19 pandemic when many lacked readiness for platforms such as Zoom, Microsoft Teams, and Google Meet. It also led to social isolation and exposed limited digital literacy, affecting assessment and monitoring. Despite these issues, some adapted well, and online learning is increasingly seen as important for future-oriented skills (OECD, 2009). However, education systems must maintain quality in all modes, supported by infrastructure, training, blended learning, and stronger digital support (Department for Education and Skills, 2011).

The discussion is presented under the themes as follows:

Economic Hardship

Participants reported financial challenges during the pandemic, particularly in managing online learning costs, worsened by job losses and rising expenses. This reflects Ritzer's (2010) concept of the "global age," characterized by diversity, complexity, and a shift toward digital societies, experienced unevenly. El-Ojeili and Hayden (2006) emphasize that economic inequality is a critical global issue, highlighting social disparities. Participants' struggles with online learning technologies demonstrate the daily impact of globalization. The pandemic amplified these pressures, exposing financial barriers and marginalizing those with limited access, showing how globalization shapes social, economic, and political experiences.

Psychological Effects

Prolonged lockdowns and social isolation caused significant emotional and mental strain, including loneliness and reduced well-being. Schwab et al. (2002, cited in Susilo, 2020) note that technological changes disrupt traditional family roles, while Carvalho et al. (2015, cited in

Susilo, 2020) found excessive screen time negatively affects family bonding. These findings show that digital dependency during the pandemic impacted mental health and family dynamics.

Social Effects

The shift to online learning disrupted normal social interactions and isolated children from families and communities. Health measures like mask-wearing and vaccination further increased social separation. As Ritzer (2010) highlights, globalization affects people differently, and the pandemic produced uneven social outcomes, benefiting some while creating challenges for others. This underscores the growing reliance on technology and the need for adaptability in changing social environments.

The Importance of Technology Use

Participants acknowledged the challenges of learning new technologies but stressed the necessity of digital literacy. Access to ICT resources—computers, mobile devices, and reliable internet—is critical for effective online education. The pandemic highlighted the essential role of these tools. Ritzer (2010) notes that digital systems standardize social experiences ("globalization of nothing"), which can complicate personalized learning and monitoring if teachers lack ICT training. Competence with technology has become essential in navigating today's digital world.

Despite challenges such as technological limitations, pedagogical difficulties, and financial constraints, online education has highlighted the importance of digital tools. Strategic approaches can enhance accessibility, inclusivity, and overall quality, creating a more resilient education system. The pandemic, while disruptive, also fostered innovation, emphasizing the need for flexible and sustainable online learning frameworks. Rapid adoption of digital platforms demonstrated adaptability, creativity, and investment in educational technology while revealing gaps in support for students, teachers, and families.

Although online learning cannot fully replicate traditional classrooms, digitalization offers unprecedented access to resources across locations and time zones. The experience reinforces the importance of maintaining academic standards, ensuring equitable access, and implementing alternative learning strategies. Lessons learned are shaping a more inclusive,

flexible, and innovation-focused educational landscape aligned with global digital transformation.

Conclusion

The findings indicate that key stakeholders—students, teachers, and parents—frequently perceive online learning as costlier as and more demanding than traditional classroom-based instruction. The global outbreak of COVID-19 profoundly disrupted education systems, leaving many learners and educators insufficiently prepared to navigate digital platforms such as Zoom, Microsoft Teams, and Google Meet. This sudden migration to virtual modes of instruction heightened students' experiences of social and emotional isolation. At the same time, limited digital competence created difficulties in conducting assessments and monitoring academic progress within online environments (World Bank, 2020).

Ongoing globalization has further transformed education by compelling systems to respond to rapid technological and economic shifts. While some learners and educators adapted effectively to digital formats, many found it challenging to satisfy the expectations of technology-mediated instruction. Nevertheless, online education is increasingly valued for its alignment with evolving labor market demands. Parents, in particular, are showing stronger interest in institutions that cultivate practical skills and career-oriented competencies suited to a globally competitive environment (OECD, 2023).

Educational excellence remains fundamental to national progress, as robust systems foster innovation and economic advancement. Schools are therefore expected to maintain consistent academic standards across both virtual and in-person modalities. Preparing teachers, students, and families for alternative instructional approaches has become essential, especially in addressing concerns related to academic integrity in online assessments (UNESCO, 2023).

Strengthening digital education calls for focused investment in infrastructure, including dependable internet connectivity and stable electricity. Greater student engagement can be promoted through interactive teaching strategies and innovative digital tools. Establishing standardized online assessment mechanisms may enhance efficiency, transparency, and timely feedback. Financial assistance, such as technology grants for educators, can ease the economic

strain of digital instruction, while blended learning models offer increased flexibility. Ongoing professional development is vital to enhance teachers' digital pedagogical skills (OECD, 2023).

Although infrastructural limitations, pedagogical barriers, and financial constraints persist, the pandemic accelerated digital integration in education. It revealed both the promise of expanded access and significant preparedness gaps among institutions and families. Simultaneously, it stimulated innovation and underscored the necessity of resilient, inclusive, and flexible systems capable of serving diverse learners in an era of continuous digital transformation (UNESCO, 2023).

Implications

The implications of this study are as follows:

Economic and Technological Considerations

Online learning often incurs higher costs than traditional education, highlighting the need for support measures such as subsidies or financial assistance. Further research is required to evaluate the long-term economic feasibility of digital education and identify ways to reduce costs without compromising quality.

Social and Emotional Dimensions

Feelings of isolation and disengagement among learners emphasize the need to address social and emotional impacts. Virtual community-building, mental health support, and meaningful online interactions are essential for student well-being.

Quality Assurance and Digital Readiness

Challenges adapting to online environments underscore the need for accessible, effective, and inclusive digital platforms. Schools should strengthen online systems, improve digital literacy, and ensure academic integrity. Research on best practices in online instruction can guide efforts to enhance educational quality.

Directions for Future Research

The expansion of digital education calls for continued study of innovative teaching models, hybrid strategies, and the broader effects of technology on learning. Large-scale research

can inform institutions on how to leverage opportunities and address challenges in an increasingly digital educational landscape.

Contributions of the Study

The key contributions of this study are as follows:

Reaffirming the centrality of human intelligence in AI-enabled education

This study makes a significant theoretical contribution by clarifying that human intelligence remains fundamental in AI-supported and online learning environments. While artificial intelligence enhances personalization, assessment efficiency, and instructional delivery, essential human attributes—such as ethical reasoning, empathy, creativity, and reflective judgment—continue to define meaningful educational practice. The findings reinforce the view that AI should function as a complementary tool that strengthens, rather than replaces, human agency in education (UNESCO, 2023).

Identifying structural and human adaptation challenges in digital learning

The research provides comprehensive empirical insight into the barriers affecting effective participation in AI-based and online education. It highlights critical challenges, including limited digital literacy, inadequate infrastructure, financial pressures, and insufficient preparedness—issues that became especially visible during the COVID-19 disruption. The study also emphasizes learners' social and emotional isolation and the complexities of maintaining assessment quality in virtual contexts. These findings contribute to a deeper understanding of systemic readiness gaps and stakeholder concerns (World Bank, 2020).

Advancing policy and practice for sustainable human–AI collaboration

The study offers practical contributions by outlining strategies to support balanced human–AI integration in education. It stresses the importance of infrastructure development, ongoing professional training for teachers, financial support mechanisms, and blended learning models. By aligning digital transformation with labor market demands while safeguarding academic standards and integrity, the research supports the development of resilient, inclusive, and future-oriented education systems in a rapidly evolving global landscape (OECD, 2023).

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Appendix

Interview Schedule

Students' Perspectives – Follow-up Questions

1. What specific challenges did you face when attending online classes regularly?
2. How did limited access to devices or internet affect your academic performance?
3. Which subjects or types of lessons were hardest to understand in the online format, and why?
4. What coping strategies did you use when you faced technical or financial difficulties?
5. Do you feel online learning helped you develop any useful skills? If yes, which ones?
6. What improvements would make online learning more effective for students in the future?

Guardians' Perspectives – Follow-up Questions

1. How did you prioritize educational expenses (devices, internet, tuition) during financial difficulties?
2. What challenges did you face in supporting multiple children studying online at the same time?
3. Did you receive enough guidance from schools about how to assist your children with online learning?
4. How did online education affect your child's motivation and discipline at home?
5. In what ways did your views on digital learning change during the pandemic?
6. What kind of support do you think schools or the government should provide in similar situations?

Teachers' Views – Follow-up Questions

1. What kind of training or support would have helped you adapt better to online teaching?

2. Which online teaching methods worked best for engaging students?
3. How did you assess student learning and participation in a fair and effective way?
4. What were the biggest emotional or professional challenges you experienced during this transition?
5. Do you feel your digital skills improved significantly? In what areas specifically?
6. What lessons from online teaching would you like to integrate into future classroom practice?

Management Perspectives – Follow-up Questions

1. What immediate steps did your institution take when shifting to online education?
2. How did you address financial challenges such as unpaid fees and operational costs?
3. What systems were used to monitor teacher performance and student engagement remotely?
4. What were the main complaints or concerns received from parents and students during this period?
5. How did this experience influence your long-term planning for digital infrastructure?

What policies would you implement to improve preparedness for future disruptions?