ACADEMIA International Journal for Social Sciences
Volume 5, Issue 3, 2026 ISSN-L (Online): 3006-6638

Analysis of Students' Perceptions about Online Learning Experiences During COVID-19 in Public Universities at the Undergraduate Level in Karachi

Samreen Shakeel
Samreenshakeel49@gmail.com
M. Phil. Research Scholar, Department of Education, Faculty of Social Sciences, Benazir Bhutto Shaheed University Lyari, Karachi, Sindh, Pakistan

Dr. Safia Niazi
Dr.safianiazi@gmail.com
Assistant Professor in Education Department at Benazir Bhutto Shaheed University Lyari, Pakistan

Corresponding Author: Samreen Shakeel Samreenshakeel49@gmail.com

Received: 22-02-2026 **Revised:** 07-03-2026 **Accepted**: 19-03-2026 **Published:** 30-03-2026

ABSTRACT

The purpose of this study is to analyze undergraduate students' perceptions of online learning experiences during the COVID-19 pandemic across public sector universities in Karachi, Pakistan. Employing a quantitative, cross-sectional descriptive survey design, the study examined four core dimensions: students' level of knowledge regarding COVID-19, perceived effectiveness of online learning, level of satisfaction with online classes, and challenges encountered during online teaching and learning. From a target population of 779 undergraduate students enrolled across four public universities in Karachi—Benazir Bhutto Shaheed University Lyari (BBSUL), Federal Urdu University of Arts, Science and Technology (FUUAST), Sindh Madressatul Islam University (SMIU), and the University of Karachi—a sample of 250 students (87 males, 34.8%; 163 females, 65.2%) was selected using simple random sampling. Primary data were gathered via a self-structured 20-item five-point Likert scale questionnaire evaluated for face validity by domain experts and demonstrating acceptable internal consistency (Cronbach's alpha = 0.790). Descriptive statistics (frequencies, percentages, means, and standard deviations) and inferential statistics (independent sample t-tests) were computed using SPSS version 22.0. Empirical findings revealed that most undergraduate students accessed online classes via smartphones (72.4%) and connected through Wi-Fi networks (70.4%). Substantial majorities affirmed that online learning acquainted them with modern educational technology (68.4% agreement) and enabled them to make up missed lectures (61.2% agreement), yet 62.8% reported that online classes fostered social isolation, 73.6% believed learning requires direct interaction with professors, and 23.2% strongly disagreed with feeling comfortable in the online teaching-learning mode. Independent sample t-tests indicated no statistically significant gender differences in COVID-19 knowledge ($t(248) = 1.764$, $p = .079$), perceived effectiveness of online learning ($t(248) = 1.712$, $p = .088$), or online learning challenges ($t(248) = 0.144$, $p = .886$). However, a statistically significant gender difference emerged in satisfaction with online classes ($t(248) = 2.223$, $p = .027$), with male students reporting higher mean scores across all four constructs. These findings offer evidence-based guidance for university administrators, higher education policymakers, faculty, and technology developers to strengthen digital infrastructure and gender-inclusive online pedagogy.

Keywords: *Online Learning, COVID-19, Pandemic, Student Perception, Undergraduate Students, Public Universities, Karachi*

INTRODUCTION

Background of the Study

Corona virus Disease 2019 (COVID-19), which first emerged in the Chinese city of Wuhan at the end of 2019, precipitated one of the most severe global public health crises in modern history and

profoundly disrupted socioeconomic and educational systems worldwide. Officially declared a global pandemic by the World Health Organization (WHO) on March 11, 2020, the virus spreads primarily through close interpersonal contact, respiratory droplets, and contaminated environmental surfaces. By September 5, 2023, COVID-19 had affected 228 countries and territories, resulting in 610,457,828 confirmed cases, 587,358,890 recoveries, and 6,504,142 recorded fatalities globally (Worldometer, 2023). To contain transmission, national governments instituted stringent public health interventions, including bans on public gatherings, mandatory quarantine and isolation protocols, nationwide lockdowns, travel restrictions, mask mandates, social distancing, and the closure of educational institutions (WHO, 2020).

In Pakistan, the first two confirmed cases of COVID-19 were detected on February 26, 2020, in Karachi and Islamabad (Ali, 2020; Saqlain et al., 2020). By September 2022, national figures had reached 1,570,016 confirmed cases, 1,531,183 recoveries, and 30,591 deaths, rising to 1,575,424 confirmed cases and 30,635 deaths by December 2022 (COVID-PAK, 2022). To curb the spread of the virus, the Government of Pakistan issued a nationwide directive suspending in-person academic activities across all educational institutions on March 13, 2020, directly affecting more than 70 million learners across the country (Ali, 2020). In response to prolonged campus closures, the Higher Education Commission (HEC) of Pakistan instructed higher education institutions (HEIs) to adopt distance and online learning strategies, reschedule examinations, and provide continuous virtual academic support until epidemiological conditions stabilized. Universities rapidly deployed synchronous (live interactive) and asynchronous (pre-recorded and self-paced) instruction through digital platforms including Zoom, Google Meet, Google Classroom, YouTube, and WhatsApp.

The abrupt transition from conventional face-to-face classrooms to virtual environments expanded the population of online learners across diverse demographic groups, including gender and academic seniority. Prior scholarship has examined how demographic factors shape online learning trajectories (Boyte-Eckis et al., 2018). For instance, Alghamdi et al. (2020) observed that while female students often demonstrate stronger self-regulation in online settings, male students frequently report broader technical proficiency and varied digital learning strategies. Conversely, Harvey et al. (2017) found no significant gender differences in learning satisfaction among millennial online learners. As Basilaia and Kvavadze (2020) noted, while online education operates smoothly in digitally advanced nations, developing countries such as Pakistan remain in the nascent stages of virtual learning infrastructure. Initial institutional responses in Pakistan prioritized transferring course materials online rather than redesigning pedagogy for virtual delivery, while unstable internet connectivity and hardware constraints complicated student participation.

Statement of the Problem and Research Objectives

Although emergency e-learning mitigated the immediate instructional hiatus caused by COVID-19 campus closures, the rapid shift exposed critical gaps in digital readiness, pedagogical adaptation, and student engagement within public sector universities. Evaluating how undergraduate students perceive their online learning experiences is essential for raising educational quality and institutional resilience. Accordingly, this comparative study analyzes undergraduate students' perceptions of online learning experiences in public sector universities of Karachi during the COVID-19 pandemic. Specifically, the study addresses five core research objectives:

- **Objective 1:** To analyze undergraduate students' overall perceptions of online learning experiences in public universities of Karachi during COVID-19.
- **Objective 2:** To examine the level of knowledge regarding the COVID-19 pandemic among undergraduate university students in Karachi.
- **Objective 3:** To explore the perceived effectiveness of online learning during COVID-19 from the perspective of university-level students.

- **Objective 4:** To determine the level of student satisfaction with online classes offered by public universities in Karachi during the COVID-19 pandemic.
- **Objective 5:** To highlight the instructional, technological, and interpersonal challenges encountered by undergraduate students during online teaching and learning.

RESEARCH HYPOTHESES

To evaluate gender-based differences across the four core dimensions of the study, four directional research hypotheses were formulated and tested at the 0.05 level of significance:

- **H1:** There is a significant difference between male and female undergraduate students in their level of knowledge about COVID-19.
- **H2:** There is a significant difference between male and female undergraduate students' perceptions of the effectiveness of online learning during COVID-19.
- **H3:** There is a significant difference between male and female undergraduate students' level of satisfaction with offered online classes during COVID-19.
- **H4:** There is a significant difference between male and female undergraduate students regarding the online teaching and learning challenges faced during COVID-19.

Significance, Scope, and Delimitations of the Study

Investigating undergraduate students' perspectives on emergency online learning in Karachi provides empirical evidence on both the pedagogical utility of educational technologies and the structural barriers impeding equitable participation. The findings inform university administrators, curriculum designers, and higher education policymakers seeking to make virtual and hybrid learning more practical, engaging, and less stressful. Because of time, financial, and logistical constraints, the scope of the investigation was delimited to undergraduate students enrolled in four public sector universities in Karachi who actively participated in online coursework during the COVID-19 pandemic. Data collection spanned approximately three months to capture consistent student observations while minimizing longitudinal shifts in attitude.

LITERATURE REVIEW

Theoretical Foundations of Perception and Its Formation Process

Perception represents the cognitive gateway through which individuals observe, organize, and interpret environmental stimuli. Etymologically derived from the Latin roots 'per' (through) and 'capere' (to take or seize), perception is defined by the American Psychological Association (2020) as the process or result of becoming aware of objects, relationships, and events by means of the senses, encompassing recognition, observation, and discrimination. Robbins et al. (2010, p. 104) characterize perception as the process by which individuals organize and interpret their sensory impressions to assign meaning to their environment. Similarly, Usman and Ibrahim (2017) and William and William (2018) conceptualize perception as the conversion of sensory stimulation into organized, meaningful formal experience. Hermawan and Tyas (2019) emphasize that perception bridges an individual's interior cognition and exterior environment, explaining why subjective responses to identical educational settings often diverge from objective reality. At the neurocognitive level, Wang (2007, p. 1) defines perception as a set of subconscious internal cognitive processes that detect, relate, interpret, and retrieve internal information, functioning effectively as a human sixth sense. Bernhardt (2015) further equates perception with an appraisal or belief stronger than an immediate impression yet distinct from absolute knowledge.

Building on Ware (2019), Qiong (2017) delineates three sequential stages governing perception formation: (1) Selection of Stimuli, wherein the five sensory systems detect environmental inputs and transmit neural signals to the brain; (2) Organization, wherein incoming sensory data are structured by linking familiar patterns to prior schemas and stored experiences; and (3) Interpretation, wherein organized information is evaluated through personal assumptions and prior observations to generate actionable meaning and guide decision-making. In the context of higher education during a public health crisis, students' perceptions of online learning are shaped by how they select technological and instructional stimuli, organize them against prior face-to-face classroom norms, and interpret their academic efficacy and personal comfort.

Conceptualizing Distance Education, E-Learning, and Online Learning

Scholarly literature distinguishes carefully among distance education, electronic learning (e-learning), and online learning within a nested conceptual hierarchy. Anderson (2005) explains that distance education represents the broadest umbrella term, encompassing all instructional delivery that reaches learners physically separated from educational institutions through either electronic or non-electronic (print) media. E-learning constitutes a subset of distance learning that utilizes all forms of electronic media—including offline storage technologies such as CD-ROMs and DVDs alongside web-based tools—to support dispersed, online distant, and blended learning models (Maltz & DeBlois, 2005; Rusman & Riyana, 2011). Online learning, in turn, represents the internet-mediated core of e-learning. Singh and Thurman (2019, p. 302) define online learning as education experienced through internet-connected computers in synchronous or asynchronous virtual classrooms where learners interact with instructors and peers independent of physical location. Similarly, Saifuddin (2018) and Putra et al. (2020) define online learning as distance education in which learners access course materials and engage in academic communication over the internet while remaining geographically separated.

Synchronous and Asynchronous Modalities of Online Learning

As classified by Arkoful and Abaidoo (2014), online instruction operates primarily through asynchronous and synchronous modalities, or a hybrid combination of both. Asynchronous learning environments are temporally and geographically independent, relying on pre-recorded video lectures, discussion boards, blogs, and self-paced digital modules (Xie et al., 2018). While asynchronous instruction affords learners flexibility to engage with course content at their own pace, Hartnett (2015) and Kim et al. (2019) emphasize that academic success in recorded environments demands strong digital readiness, self-regulation, and sustained personal commitment to educational objectives.

Conversely, synchronous learning requires instructors and students to convene simultaneously via live videoconferencing or virtual classrooms, allowing real-time guidance, natural language interaction, and immediate formative assessment (Blau et al., 2017; Cabual, 2021). González-Lloret (2020) notes that synchronous web-based instruction facilitates active class discussions, collaborative group projects, and rapid resolution of student queries, which in turn motivates students to complete complementary asynchronous assignments. During the COVID-19 pandemic, university faculty widely combined synchronous and asynchronous tools—including Zoom, Google Classroom, WhatsApp groups, Google Meet, Skype, Webex, email, Edmodo, and CamStudio—to sustain instructional continuity (Fuadi et al., 2020).

Pedagogical Advantages and Structural Disadvantages of Online Learning

Kolloff (2011) and subsequent researchers highlight nine primary advantages of online education when supported by adequate infrastructure: (1) Place Flexibility, enabling participation from any geographic location; (2) Time Flexibility, providing 24/7 access to virtual classrooms and learning repositories; (3) Student-Centered Pedagogy, empowering learners to articulate their perspectives in virtual discussions while co-constructing knowledge; (4) Cost-Effectiveness, reducing institutional delivery overhead and eliminating student commuting and accommodation expenses; (5) Currency of

Information, allowing rapid curriculum updates and direct integration with digital libraries; (6) Interactivity, stimulating study motivation through multimedia resources; (7) Enhanced Comprehension, utilizing visual models, diagrams, and simulations to clarify complex concepts; (8) Instructional Synergy, fostering dynamic learner-instructor exchange; and (9) Creative, Self-Directed Learning, encouraging autonomous inquiry.

Notwithstanding these benefits, six structural disadvantages frequently impede online education in developing contexts: (1) Technology Availability and Affordability, as broadband internet and computing hardware remain unavailable or cost-prohibitive for many households; (2) Computer Proficiency Gaps, wherein insufficient digital literacy among either students or faculty undermines course execution; (3) Technical and Network Limitations, including device malfunctions, power outages, and unstable bandwidth; (4) Learner Self-Regulation Demands, as unmotivated or easily distracted students struggle without physical classroom supervision; (5) Instructor Pedagogical Transition, since excellence in face-to-face lecturing does not automatically translate into effective virtual facilitation; and (6) Curriculum Misalignment, because traditional syllabi require substantial redesign to fit remote instructional methodologies.

Empirical Evidence on COVID-19's Effects on Higher Education

During the COVID-19 pandemic, online instruction shifted from an optional supplement to an institutional necessity to prevent viral outbreaks and maintain social distancing (Rosell, 2020; Strielkowski, 2020). Several international studies documented positive educational outcomes from this transition. Lockman and Schirmer (2020) reported that well-structured online instruction matched or exceeded traditional methods in course completion, student engagement, and satisfaction. In Jordan, Soub et al. (2021) found high e-learning satisfaction among undergraduate chemistry students, while Haider and Al-Salman (2020) and Stern (2020) highlighted the value of 24/7 resource accessibility and future-oriented digital skill acquisition. Similarly, Baber (2021) observed high e-learning acceptance and satisfaction in South Korea, and Siripongdee et al. (2020) demonstrated that theoretical coursework could be delivered effectively through blended and IoT-supported virtual models.

At the same time, researchers documented severe negative repercussions associated with emergency remote teaching. Wu (2020) and Hodges et al. (2020) emphasized that many universities merely uploaded traditional content online without adapting pedagogy, while pandemic-induced economic layoffs deprived many families of the financial means to afford internet connectivity and digital devices (Markus, 2020; Ullah et al., 2021). Furthermore, Galea et al. (2020) and Wilczewski et al. (2021) demonstrated that prolonged campus closures, home quarantine, fear of infection, and the loss of face-to-face interaction with peers and professors generated acute social isolation, anxiety, frustration, and psychological distress. As Zhang et al. (2020) concluded, information technology can assist educational delivery, but it cannot replace the human mentorship and direct pedagogical presence of educators.

RESEARCH METHODOLOGY

Research Design

This study adopted a quantitative research approach utilizing a cross-sectional descriptive survey design. As defined by Maree (2012, p. 145), quantitative research employs systematic, objective procedures to collect and analyze numerical data from a representative sample in order to generalize findings to a target population. The research procedure progressed systematically through six operational stages: (1) problem identification, (2) research method formulation, (3) research design specification, (4) probability sampling, (5) primary data gathering, and (6) statistical data processing, hypothesis testing, and report synthesis.

Target Population and Sampling Technique

The target population of the study comprised undergraduate students enrolled in public sector universities operating in Karachi, Sindh, Pakistan, where conventional in-person instruction was suspended during the COVID-19 pandemic in favor of synchronous and asynchronous online learning. Specifically, the sampling frame encompassed 779 undergraduate students (209 males and 570 females) across four major public universities in Karachi: Benazir Bhutto Shaheed University Lyari (BBSUL), Federal Urdu University of Arts, Science and Technology (FUUAST), Sindh Madressatul Islam University (SMIU), and the University of Karachi. Table 1 presents the institutional and gender distribution of the target undergraduate population.

Table 1: Distribution of Target Undergraduate Student Population by Public University and Gender in Karachi (N = 779)

S. No.	Name of Public University	Male (n)	Female (n)	Total (N)	Share (%)
1	Benazir Bhutto Shaheed University Lyari, Karachi	37	98	135	17.3%
2	Federal Urdu University of Arts, Science & Technology, Karachi	100	168	268	34.4%
3	Sindh Madressatul Islam University, Karachi	29	86	115	14.8%
4	University of Karachi	43	218	261	33.5%
Total	Grand Total Across Four Public Universities	209	570	779	100.0%

Note. *Population figures reflect undergraduate enrollment within the target departments across the four public universities in Karachi.*

To select a representative sample from the population of 779 undergraduates, a simple random sampling technique was employed. As Bhardwaj (2019) notes, simple random sampling ensures that every member of the target population has an equal and independent probability of inclusion, minimizing selection bias. A total of 250 undergraduate students participated in the survey, comprising 87 male students (34.8%) and 163 female students (65.2%), closely mirroring the gender composition of the underlying university population.

Research Instrument, Conceptual Framework, Validity, and Reliability

Primary data were collected using a self-structured, closed-ended survey questionnaire divided into two sections. Section I captured respondent demographics (gender and academic year) and technology access characteristics (primary device used to log into online classes and internet connectivity mode). Section II comprised a 20-item perception measurement scale structured across four theoretical constructs of five items each: (1) Level of Knowledge about COVID-19 (items K1–K5), (2) Perceived Effectiveness of Online Learning (items E1–E5), (3) Level of Satisfaction with Offered Online Classes (items S1–S5), and (4) Challenges in Online Teaching and Learning (items C1–C5). Following Brown (2011), each statement was rated on a five-point Likert scale coded numerically as: 1 = Strongly Agree (SA), 2 = Agree (A), 3 = Neutral (N), 4 = Disagree (D), and 5 = Strongly Disagree (SD). Under this coding scheme, lower item mean scores (approaching 1.00) indicate stronger agreement with the statement, whereas higher item mean scores (approaching 5.00) indicate stronger disagreement. Figure 1 illustrates the conceptual framework linking the four constructs and hypotheses.



Figure 1. Conceptual Framework of Undergraduate Online Learning Experiences and Gender Hypotheses (H1–H4)

Instrument validity—the extent to which a measurement tool accurately assesses its intended construct (Blumberg et al., 2005; Robson, 2011)—was established through expert face and content validation. Two senior faculty experts from the Department of Education at Benazir Bhutto Shaheed University Lyari, Karachi, reviewed the draft items, and their revisions regarding clarity and construct alignment were incorporated into the final instrument. Internal consistency reliability—the stability and coherence of item responses across a construct (Cohen et al., 2007; Taber, 2018)—was evaluated using Cronbach's alpha in SPSS version 22.0. Across all 20 Likert items, the instrument yielded a Cronbach's alpha coefficient of 0.790 (and 0.790 based on standardized items), surpassing the minimum threshold of 0.50 and demonstrating 79.0% internal consistency, which is classified as highly acceptable for social science survey research (Jain & Angural, 2017).

Data Collection, Ethical Considerations, and Statistical Procedure

Formal ethical approval and an official fieldwork authorization letter were obtained from the Department of Education, Benazir Bhutto Shaheed University Lyari, Karachi. Prior permission was secured from the respective authorities of the participating public universities. Each respondent received an informed consent form detailing the study's purpose, voluntary participation, absence of psychological or academic risk, and strict confidentiality of responses. Questionnaires were administered via Google Docs and supplemented by personal campus visits, achieving a 100% response rate across the 250 sampled undergraduates. Collected data were analyzed in SPSS version 22.0 using descriptive statistics (frequencies, percentages, means, and standard deviations) to profile item and construct distributions, and independent sample t-tests (two-tailed, alpha = 0.05, df = 248) to test Hypotheses H1 through H4 across male and female students.

RESULTS AND DATA ANALYSIS

Demographic and Technological Access Profile of Respondents

Table 2 consolidates the demographic composition and technological access characteristics of the 250 participating undergraduate students (consolidating Tables 5–8 and Figures 5–8 of the thesis). Regarding gender distribution, female students constituted 65.2% (n = 163) of the sample, while male students accounted for 34.8% (n = 87) (note: while the narrative description in Chapter 4 of the thesis momentarily transposed the male and female labels, Table 2 and Table 5 of the thesis confirm 87 males [34.8%] and 163 females [65.2%]). Across academic seniority, first-year undergraduates represented the largest cohort at 44.0% (n = 110), followed equally by second-year and third-year students at 20.8% each (n = 52 per cohort), and fourth-year students at 14.4% (n = 36).

Table 2. Demographic Profile and Technological Access Characteristics of Sampled Undergraduate Students (n = 250)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	87	34.8%
Gender	Female	163	65.2%
Academic Year	First Year	110	44.0%
Academic Year	Second Year	52	20.8%
Academic Year	Third Year	52	20.8%
Academic Year	Fourth Year	36	14.4%
Device Used to Log Online Classes	Smartphone Only	181	72.4%
Device Used to Log Online Classes	Laptop Only	14	5.6%
Device Used to Log Online Classes	Both Laptop & Smartphone	53	21.2%
Device Used to Log Online Classes	Tablet Device	2	0.8%
Internet Mode Used to Connect	Wi-Fi Network	176	70.4%
Internet Mode Used to Connect	Mobile Data Package	74	29.6%
Total Sample	**All Participating Undergraduates**	**250**	**100.0%**

Note. *Data consolidated from Tables 5, 6, 7, and 8 of the thesis (N = 250).*

With respect to technological access, an overwhelming majority of respondents (72.4%, n = 181) relied exclusively on smartphones to attend online classes, while 21.2% (n = 53) utilized both a laptop and a smartphone, 5.6% (n = 14) used a dedicated laptop, and only 0.8% (n = 2) used a tablet device. This heavy reliance on mobile handsets aligns closely with empirical findings by Abbasi et al. (2020) in Pakistan and Bączek et al. (2021) in Poland, confirming that smartphones served as the primary portal for emergency remote learning among university students. For internet connectivity, 70.4% of respondents (n = 176) connected via broadband Wi-Fi, whereas 29.6% (n = 74) relied on cellular mobile data packages, corroborating Hermawan's (2021) findings regarding undergraduate connectivity patterns during the pandemic.

Descriptive Analysis of Level of Knowledge About COVID-19

The first core construct evaluated undergraduate students' epidemiological and clinical awareness of the COVID-19 pandemic across five statements (K1–K5). Table 3 synthesizes the item-level frequency distributions, percentages, means, and standard deviations (consolidating Tables 9–14 and Figures 9–13 of the thesis).

Table 3. Item-Level Frequency Distribution and Descriptive Statistics for Level of Knowledge About COVID-19 (n = 250)

Code & Item Statement	SA n (%)	A n (%)	N n (%)	D n (%)	SD n (%)	Mean	SD
K1: Minimum amount of people who are essentially chronically unwell may require ICU admission.	58 (23.2 %)	47 (18.8 %)	80 (32.0 %)	31 (12.4 %)	34 (13.6 %)	2.74	1.31
K2: Around less than 20% of patients might require hospitalization.	50 (20.0 %)	64 (25.6 %)	72 (28.8 %)	41 (16.4 %)	23 (9.2%)	2.69	1.22
K3: Over 80% of patients will not need treatment at all and will bounce back on their own.	73 (29.2 %)	70 (28.0 %)	34 (13.6 %)	42 (16.8 %)	31 (12.4 %)	2.55	1.38

K4: Elderly people and sick with prior problems have a greater chance to get serious illnesses.	106 (42.4 %)	67 (26.8 %)	40 (16.0 %)	19 (7.6%)	18 (7.2%)	2.10	1.23
K5: Coronavirus commonly known as COVID-19 first appeared in the Chinese city of Wuhan.	149 (59.6 %)	44 (17.6 %)	29 (11.6 %)	10 (4.0%)	18 (7.2%)	1.82	1.22
Construct Summary: Level of Knowledge About COVID-19	—	—	—	—	—	**2.38**	**0.816**

Note. *Scale: 1 = Strongly Agree (SA), 2 = Agree (A), 3 = Neutral (N), 4 = Disagree (D), 5 = Strongly Disagree (SD). Consolidated from Tables 9–14.*

As shown in Table 3, undergraduate students demonstrated strong foundational awareness of the origin and vulnerability profile of COVID-19, alongside moderate uncertainty regarding specific clinical hospitalization ratios. Specifically, on item K5, 77.2% of respondents agreed or strongly agreed (59.6% SA, 17.6% A; M = 1.82, SD = 1.22) that COVID-19 first appeared in Wuhan, China, while only 11.2% disagreed. Similarly, on item K4, 69.2% affirmed (42.4% SA, 26.8% A; M = 2.10, SD = 1.23) that elderly individuals and those with pre-existing chronic illnesses face a heightened risk of severe disease. On item K3, 57.2% agreed (29.2% SA, 28.0% A; M = 2.55, SD = 1.38) that over 80% of infected patients recover without formal medical intervention. Conversely, greater neutrality was observed on clinical severity thresholds: on item K2, while 45.6% agreed (20.0% SA, 25.6% A; M = 2.69, SD = 1.22) that fewer than 20% of patients require hospitalization, 28.8% remained neutral; and on item K1, 32.0% remained neutral while 42.0% agreed (23.2% SA, 18.8% A; M = 2.74, SD = 1.31) regarding intensive care unit (ICU) admission among chronically unwell patients. Across all five items, the overall construct mean was 2.38 (SD = 0.816), indicating positive overall knowledge of COVID-19.

Descriptive Analysis of Perceived Effectiveness of Online Learning

The second construct assessed students' perceptions of the pedagogical and technological effectiveness of online learning during the pandemic across five items (E1–E5). Table 4 summarizes the item distributions and construct statistics (consolidating Tables 15–20 and Figures 14–18 of the thesis).

Table 4. Item-Level Frequency Distribution and Descriptive Statistics for Perceived Effectiveness of Online Learning (n = 250)

Code & Item Statement	**SA n (%)**	**A n (%)**	**N n (%)**	**D n (%)**	**SD n (%)**	**Mean**	**SD**
E1: I can easily cooperate with classmates when engaging with online activities.	77 (30.8 %)	68 (27.2 %)	50 (20.0 %)	26 (10.4 %)	29 (11.6 %)	2.56	1.35
E2: In online studies, my knowledge and experience will be helpful to me.	69 (27.6 %)	66 (26.4 %)	51 (20.4 %)	32 (12.8 %)	32 (12.8 %)	2.56	1.35
E3: My proficiency with the computer keyboard enables me to work online.	88 (35.2 %)	59 (23.6 %)	55 (22.0 %)	24 (9.6%)	24 (9.6 %)	2.34	1.31
E4: Online classes advocate social isolation.	76 (30.4 %)	81 (32.4 %)	55 (22.0 %)	25 (10.0 %)	13 (5.2 %)	2.27	1.15
E5: Online learning gives us opportunity to get acquainted with modern technology	117 (46.8	54 (21.6	35 (14.0	20 (8.0%)	24 (9.6	1.12*	1.34

in learning.	%)	%)	%)		%)		
Construct Summary: Effectiveness of Online Learning	—	—	—	—	—	**2.35**	**0.828**

Note. *Consolidated from Tables 15–20 of the thesis. *Table 20 of the thesis reports M = 1.12 for E5 (the weighted arithmetic mean from the Table 19 frequencies is 2.12; the overall construct mean of 2.35 reflects the exact value reported in Table 20).*

The empirical results in Table 4 demonstrate that undergraduate students perceived substantial technological and collaborative utility in online education, while simultaneously recognizing its socially isolating nature. The highest agreement was recorded on item E5, where 68.4% of respondents (46.8% SA, 21.6% A; SD = 1.34) affirmed that online learning provided a valuable opportunity to become acquainted with modern educational technology, against only 17.6% who disagreed. Similarly, on item E3, 58.8% of students (35.2% SA [n = 88], 23.6% A [n = 59]; M = 2.34, SD = 1.31) reported that their proficiency with the computer keyboard enabled them to work effectively online. Peer collaboration and prior competence were also viewed favorably: 58.0% (30.8% SA, 27.2% A; M = 2.56, SD = 1.35) agreed on item E1 that they could easily cooperate with classmates during online activities, and 54.0% (27.6% SA, 26.4% A; M = 2.56, SD = 1.35) agreed on item E2 that their existing knowledge and experience supported their online studies. Notably, however, 62.8% of respondents (30.4% SA, 32.4% A; M = 2.27, SD = 1.15) concurred with item E4 that online classes promote social isolation, with only 15.2% disagreeing. Overall, the effectiveness construct recorded a composite mean of 2.35 (SD = 0.828).

Descriptive Analysis of Level of Satisfaction with Online Classes

The third construct examined students' satisfaction with offered online classes, focusing on comfort with virtual delivery, instructor responsiveness, internet accessibility, time and physical efficiency, and lecture recovery (items S1–S5). Table 5 presents the consolidated distribution (combining Tables 21–26 and Figures 19–23 of the thesis).

Table 5. Item-Level Frequency Distribution and Descriptive Statistics for Level of Satisfaction with Online Classes (n = 250)

Code & Item Statement	SA n (%)	A n (%)	N n (%)	D n (%)	SD n (%)	Mean	SD
S1: I am comfortable with the online mode of teaching-learning process.	60 (24.0 %)	38 (15.2 %)	48 (19.2 %)	46 (18.4 %)	58 (23.2 %)	3.02	1.49
S2: I am pleased with my instructor's response.	77 (30.8 %)	49 (19.6 %)	60 (24.0 %)	31 (12.4 %)	33 (13.2 %)	2.57	1.38
S3: I have simple web access whenever I need it for my education.	71 (28.4 %)	55 (22.0 %)	46 (18.4 %)	39 (15.6 %)	39 (15.6 %)	2.68	1.43
S4: Online learning consumes less time and less physical effort.	89 (35.6 %)	46 (18.4 %)	38 (15.2 %)	37 (14.8 %)	40 (16.0 %)	2.57	1.49
S5: I can make up my missed lectures through online education.	98 (39.2 %)	55 (22.0 %)	56 (22.4 %)	24 (9.6%)	17 (6.8%)	2.23	1.25
Construct Summary: Level of Satisfaction with Online Classes	—	—	—	—	—	**2.61**	**0.983**

Note. *Scale: 1 = Strongly Agree (SA), 2 = Agree (A), 3 = Neutral (N), 4 = Disagree (D), 5 = Strongly Disagree (SD). Consolidated from Tables 21–26.*

An inspection of Table 5 reveals a nuanced pattern across the five satisfaction indicators, yielding the highest composite mean score among the four constructs (M = 2.61, SD = 0.983), which reflects greater ambivalence and polarization regarding overall comfort. Specifically, item S1 ('I am comfortable with the online mode of teaching-learning process') exhibited a sharply divided distribution (M = 3.02, SD = 1.49): while 39.2% of students agreed (24.0% SA [n = 60], 15.2% A [n = 38]), a slightly larger combined proportion of 41.6% disagreed (18.4% D [n = 46], 23.2% SD [n = 58]), and 19.2% (n = 48) remained neutral. Similarly, on item S3 regarding simple and reliable web access whenever needed for education (M = 2.68, SD = 1.43), 50.4% agreed (28.4% SA, 22.0% A), whereas 31.2% expressed disagreement (15.6% D, 15.6% SD), underscoring persistent connectivity hurdles for nearly one-third of the student body.

By contrast, students expressed considerably higher satisfaction with the practical conveniences and instructor support associated with virtual classes. On item S5, 61.2% of respondents (39.2% SA [n = 98], 22.0% A [n = 55]; M = 2.23, SD = 1.25) confirmed that online education enabled them to make up missed lectures, with only 16.4% disagreeing. On item S4, 54.0% (35.6% SA, 18.4% A; M = 2.57, SD = 1.49) agreed that online learning consumes less time and less physical effort than commuting to campus. Likewise, on item S2, 50.4% of students (30.8% SA, 19.6% A; M = 2.57, SD = 1.38) reported being pleased with their instructor's responsiveness during online sessions, while 24.0% remained neutral and 25.6% disagreed.

Descriptive Analysis of Challenges in Online Teaching and Learning

The fourth construct investigated the pedagogical, behavioral, and communicative challenges encountered by undergraduates during emergency online learning (items C1–C5). Table 6 presents the consolidated item-level frequencies, percentages, means, and standard deviations (synthesizing Tables 27–32 and Figures 24–28 of the thesis).

Table 6. Item-Level Frequency Distribution and Descriptive Statistics for Challenges in Online Teaching and Learning (n = 250)

Code & Item Statement	SA n (%)	A n (%)	N n (%)	D n (%)	SD n (%)	Mean	SD
C1: During online learning, students are inclined to be dishonest in taking responsibility.	78 (31.2%)	68 (27.2%)	41 (16.4%)	42 (16.8%)	21 (8.4%)	2.44	1.31
C2: I am unable to get focused during online lectures.	76 (30.4%)	47 (18.8%)	63 (25.2%)	37 (14.8%)	27 (10.8%)	2.56	1.34
C3: I feel online learning reduces my communication skills.	84 (33.6%)	47 (18.8%)	39 (15.6%)	49 (19.6%)	31 (12.4%)	2.58	1.43
C4: I assume that learning requires direct interaction with my professors.	147 (58.8%)	37 (14.8%)	28 (11.2%)	18 (7.2%)	20 (8.0%)	1.91	1.31
C5: I have difficulties with nonverbal communication and online education collaboration.*	147 (58.8%)	37 (14.8%)	28 (11.2%)	18 (7.2%)	20 (8.0%)	2.39	1.27
Construct Summary: Challenges in Online Teaching & Learning	—	—	—	—	—	**2.37**	**0.928**

Note. *Consolidated from Tables 27–32. *In the original thesis, Table 31 lists frequencies identical to C4 (147, 37, 28, 18, 20), whereas Figure 28 and Table 32 reflect the distinct C5 distribution: SA = 33.2% (n = 83), A = 23.2% (n = 58), N = 20.4% (n = 51), D = 17.2% (n = 43), SD = 6.0% (n = 15), which yields the exact Table 32 mean of M = 2.39 (SD = 1.27).*

Table 6 highlights substantial pedagogical and interpersonal barriers experienced by undergraduates during virtual instruction (overall construct M = 2.37, SD = 0.928). Most prominently, on item C4, nearly three-quarters of the sample—73.6% (58.8% SA [n = 147], 14.8% A [n = 37]; M = 1.91, SD = 1.31)—affirmed that effective learning requires direct face-to-face interaction with professors, with only 15.2% disagreeing. Closely related communicative barriers were evident on item C5 ('I have difficulties with nonverbal communication and online education collaboration', M = 2.39, SD = 1.27), where 56.4% of respondents in Figure 28 (33.2% SA, 23.2% A; reported as 73.6% in Table 31) endorsed experiencing nonverbal and collaborative difficulties. Furthermore, on item C1, 58.4% of students (31.2% SA [n = 78], 27.2% A [n = 68]; M = 2.44, SD = 1.31) agreed that learners are inclined toward academic dishonesty and reduced personal accountability during online learning. On item C3, 52.4% (33.6% SA [n = 84], 18.8% A [n = 47]; M = 2.58, SD = 1.43) felt that online learning eroded their communication skills, while on item C2, 49.2% (30.4% SA [n = 76], 18.8% A [n = 47]; M = 2.56, SD = 1.34) reported an inability to maintain focus during online lectures, with another 25.2% (n = 63) remaining neutral.

Inferential Hypothesis Testing: Gender Comparisons Across Constructs

To evaluate Research Hypotheses H1 through H4, independent sample t-tests for equality of means were conducted comparing male (n = 87) and female (n = 163) undergraduate students across the summated five-item scale scores (ranging from 5 to 25 per construct). Table 7 synthesizes the inferential statistics across all four hypotheses (consolidating Tables 33–36 of the thesis), and Figure 2 visually contrasts the male and female summated construct means.

Table 7. Independent Sample t-Test Results Comparing Male (n = 87) and Female (n = 163) Students Across Constructs (df = 248)

Hypothesis & Construct	Male M	Female M	Mean Diff.	SE Diff.	t-Stat	p (2-tailed)	95% CI [Lower, Upper]	Decision
H1: Level of Knowledge About COVID-19	12.5	11.8	0.95205	0.53983	1.764	.079	[-0.11118, 2.01528]	Rejected
H2: Effectiveness of Online Learning	12.3	11.4	0.93837	0.54811	1.712	.088	[-0.14116, 2.01790]	Rejected
H3: Level of Satisfaction with Online Classes	14.0	12.5	1.44094	0.64810	2.223	.027*	[0.16445, 2.71740]	Accepted
H4: Online Teaching & Learning Challenges	11.9	11.8	0.08899	0.61778	0.144	.886	[-1.12776, 1.30575]	Rejected

Note. *Consolidated from Tables 33–36 of the thesis (N = 250, df = 248). *p < .05 indicates statistically significant gender difference.*

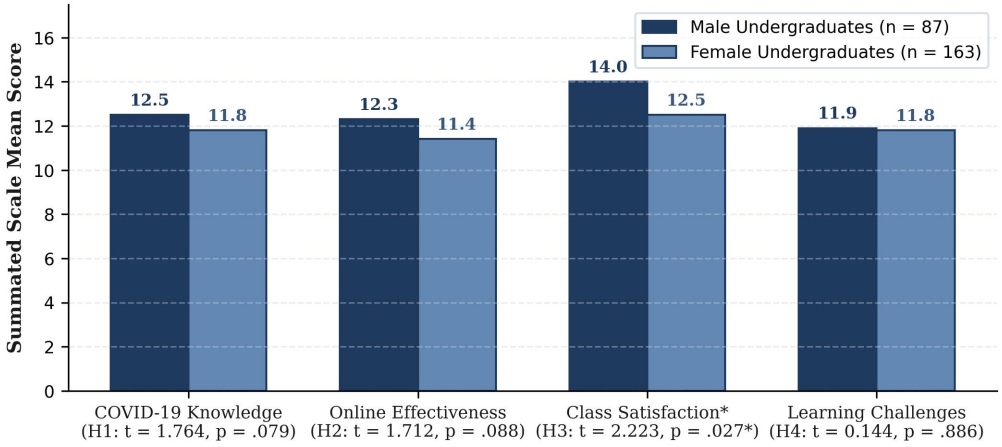


Figure 2. Comparison of Male (n = 87) and Female (n = 163) Summated Mean Scores Across the Four Study Constructs

The independent sample t-test results presented in Table 7 and Figure 2 reveal distinct inferential outcomes across the four hypotheses:

- **Hypothesis 1 (Level of Knowledge About COVID-19):** An independent sample t-test comparing male (M = 12.5) and female (M = 11.8) students yielded t(248) = 1.764, p = .079 (mean difference = 0.95205, SE = 0.53983, 95% CI [-0.11118, 2.01528]). Because the two-tailed p-value (.079) exceeds the alpha threshold of 0.05, H1 is rejected. Thus, while male undergraduates recorded a numerically higher mean score than females, there is no statistically significant gender difference in COVID-19 knowledge among undergraduate students in public universities of Karachi. This finding aligns with Labban et al. (2020), who reported broadly comparable pandemic awareness across demographic groups.

- **Hypothesis 2 (Perceived Effectiveness of Online Learning):** Comparing perceived effectiveness scores between male (M = 12.3) and female (M = 11.4) undergraduates produced t(248) = 1.712, p = .088 (mean difference = 0.93837, SE = 0.54811, 95% CI [-0.14116, 2.01790]). As p = .088 > 0.05, H2 is rejected. Although male students exhibited a slightly higher mean score than female students, the difference does not reach statistical significance at the 5% level.

- **Hypothesis 3 (Level of Satisfaction with Offered Online Classes):** The independent sample t-test evaluating satisfaction with online classes between male (M = 14.0) and female (M = 12.5) students yielded t(248) = 2.223, p = .027 (mean difference = 1.44094, SE = 0.64810, 95% CI [0.16445, 2.71740]). Because p = .027 < 0.05, H3 is accepted, confirming a statistically significant difference between male and female undergraduate students' level of satisfaction with online classes during COVID-19, with male students recording a significantly higher mean score than female students.

- **Hypothesis 4 (Challenges in Online Teaching and Learning):** Testing gender differences in online teaching and learning challenges between male (M = 11.9) and female (M = 11.8) students produced t(248) = 0.144, p = .886 (mean difference = 0.08899, SE = 0.61778, 95% CI [-1.12776, 1.30575]). Since p = .886 > 0.05, H4 is rejected, indicating that male and female undergraduates experienced virtually identical levels of instructional and technological challenges during emergency online education.

DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

Discussion of Findings

The empirical findings of this investigation demonstrate that in a rapidly changing global environment vulnerable to public health emergencies and natural disasters, online education served as an indispensable alternative to conventional classroom instruction during the COVID-19 pandemic. Consistent with social distancing and quarantine mandates (Rosell, 2020; Strielkowski, 2020; WHO, 2020), virtual platforms enabled public universities in Karachi to preserve instructional continuity. The finding that 72.4% of undergraduate learners accessed online classes solely via smartphones and 70.4% relied on Wi-Fi connections mirrors contemporary studies in developing and emerging economies (Abbasi et al., 2020; Bączek et al., 2021; Hermawan, 2021). Because mobile phones offer a compact, relatively affordable alternative to personal computers, optimizing learning management systems for mobile interfaces is critical for student inclusion.

Furthermore, the descriptive findings confirm that undergraduate students recognized substantial practical advantages in online education. Specifically, 68.4% of respondents affirmed that virtual classes acquainted them with modern educational technologies, 61.2% valued the ability to make up missed lectures, 58.8% leveraged keyboard proficiency for online coursework, and 54.0% appreciated the reduction in commuting time and physical effort. These positive perceptions corroborate Lockman and Schirmer (2020), Stern (2020), Haider and Al-Salman (2020), and Baber (2021), demonstrating that student-centered digital platforms can reduce transportation and accommodation costs while promoting independent learning, problem-solving skills, and flexible access to educational materials.

At the same time, the study exposes substantial pedagogical and socio-emotional challenges that tempered student comfort with emergency remote learning. Nearly three-quarters (73.6%) of surveyed undergraduates emphasized that meaningful learning requires direct interaction with professors, 62.8% reported that online classes foster social isolation, 58.4% noted heightened tendencies toward academic dishonesty and reduced student responsibility, 56.4% (73.6% in Table 31) struggled with nonverbal communication and virtual collaboration, 52.4% felt their communication skills declined, and 49.2% struggled to maintain focus during online lectures. Moreover, 41.6% of respondents disagreed or strongly disagreed (23.2% SD) with feeling comfortable in the online teaching-learning mode. These results reinforce the conclusions of Galea et al. (2020), Hodges et al. (2020), Wu (2020), Zhang et al. (2020), and Wilczewski et al. (2021), confirming that merely transferring lecture content online without interactive pedagogy cannot substitute for the mentorship, nonverbal feedback, and socialization of physical university campuses.

Regarding gender comparisons, the inferential analysis revealed that male and female undergraduates shared statistically comparable levels of COVID-19 knowledge ($p = .079$), perceived online learning effectiveness ($p = .088$), and online learning challenges ($p = .886$), whereas a statistically significant difference emerged in satisfaction with online classes ($p = .027$). Across all four constructs, male students recorded higher composite mean scores than female students (12.5 vs. 11.8 on knowledge; 12.3 vs. 11.4 on effectiveness; 14.0 vs. 12.5 on satisfaction; and 11.9 vs. 11.8 on challenges). As interpreted in the thesis, these differences highlight the need for targeted institutional support to ensure that both female and male undergraduates receive equitable technological training, engaging instructional design, and responsive academic mentorship.

CONCLUSION AND PRACTICAL IMPLICATIONS

In conclusion, undergraduate students across public sector universities in Karachi exhibited a generally constructive perception of online learning as an emergency educational response during the COVID-19 pandemic, valuing its technological exposure, scheduling flexibility, and lecture recovery capabilities. While no statistically significant gender differences were observed in COVID-19 awareness, perceived effectiveness, or instructional challenges, satisfaction with offered online classes

differed significantly across gender, and male students registered higher composite mean scores across all four measured dimensions. From a practical and policy standpoint, these findings provide an empirical benchmark for higher education stakeholders, curriculum planners, and government authorities to strengthen virtual learning platforms, develop customized digital instructional materials, and build resilient hybrid education systems capable of withstanding future public health or environmental disruptions.

RECOMMENDATIONS FOR STAKEHOLDERS AND FUTURE RESEARCH

Drawing directly upon the empirical findings of the study, actionable recommendations are proposed for five key stakeholder groups alongside directions for future scholarly inquiry:

- **Recommendations for University Administration:** University leadership should actively engage all stakeholders in deploying reliable, mobile-compatible online teaching applications; design targeted support and motivation initiatives for female and male undergraduates to bridge experiential gaps; institutionalize blended and online learning components across degree programs; collect systematic end-of-semester feedback from both instructors and learners; evaluate faculty digital teaching performance; and provide performance-based incentives to recognize dedicated online instruction.

- **Recommendations for Policymakers:** Higher education policymakers and government authorities should expand broadband internet and electricity infrastructure—particularly for public university students relying on mobile devices; sponsor large-scale evaluative research on digital education across Karachi and Sindh; expand professional development and financial incentives for faculty; modernize curricula with digital-native instructional content; and establish institutional contingency plans for future pandemics and natural disasters.

- **Recommendations for Teachers and Practice:** Following Martin (2020), instructors should anchor online pedagogy around five core pillars—instruction, material design, student motivation, interpersonal relationships, and mental health. Faculty should integrate interactive panel discussions, hands-on virtual activities, concise narrated instructional videos, and hypothesis-driven critical thinking assignments (Çavdar & Doe, 2012; Mastrian & McGonigle, 1999) to combat student distraction and social isolation.

- **Recommendations for Learners:** Undergraduate students should proactively utilize the time and place flexibility of digital platforms to strengthen their technological and academic competencies, incorporate interactive game-based learning tools such as Kahoot to boost engagement and language proficiency, and practice disciplined time management to minimize distractions from non-academic social networking sites (SNS).

- **Suggestions for Future Research:** Future investigators should employ qualitative and mixed-methods designs to uncover the root causes of student discomfort and distraction in virtual classrooms; conduct meta-analyses comparing conventional and distance learners; examine faculty satisfaction and administrative readiness in online higher education; and expand the sampling frame across private universities and multiple provinces of Pakistan to enhance national generalizability.

REFERENCES

Abbasi, S., Ayoob, T., Malik, A., & Memon, S. I. (2020). Perceptions of students regarding E-learning during Covid-19 at a private medical college. Pakistan Journal of Medical Sciences, 36(COVID19-S4), S57–S61.

Alghamdi, A., Karpinski, A. C., Lepp, A., & Barkley, J. (2020). Online and face-to-face classroom multitasking and academic performance: Moderated mediation with self-efficacy for self-regulated learning and gender. Computers in Human Behavior, 102, 214–222.

Ali, S., Habes, M., & Qamar, A. (2020). Accessing the political information through new media: A review study. Journal of Research and Reviews in Social Sciences Pakistan.

Al-Salman, S., & Haider, A. S. (2021). Jordanian university students' views on emergency online learning during COVID-19. Online Learning, 25(1), 286–302.

American Psychological Association. (2020). Perception. In APA Dictionary of Psychology. https://dictionary.apa.org/

Anderson, J. (2005). IT, e-learning and teacher development. International Education Journal, 5(5), 1–14.

Arkoful, V., & Abaidoo, N. (2014). The role of e-learning, the advantages and disadvantages of its adoption in higher education. International Journal of Education and Research, 2(12), 397–410.

Baber, H. (2021). Modelling the acceptance of e-learning during the pandemic of COVID-19—A study of South Korea. The International Journal of Management Education, 19(2), 100503.

Bączek, M., Zagańczyk-Bączek, M., Szpringer, M., Jaroszyński, A., & Wożakowska-Kapłon, B. (2021). Students' perception of online learning during the COVID-19 pandemic: A survey study of Polish medical students. Medicine, 100(7), e24821.

Basilaia, G., & Kvavadze, D. (2020). Transition to online education in schools during a SARS-CoV-2 coronavirus (COVID-19) pandemic in Georgia. Pedagogical Research, 5(4), em0060.

Bernhardt, V. L. (2015). Assessing perceptions using Education for the Future questionnaires. Education for the Future Initiative.

Bhardwaj, P. (2019). Types of sampling in research. Journal of the Practice of Cardiovascular Sciences, 5(3), 157–163. https://doi.org/10.4103/jpcs.jpcs_62_19

Blau, I., Weiser, O., & Eshet-Alkalai, Y. (2017). How do medium naturalness and personality traits shape academic achievement and perceived learning? An experimental study of face-to-face and synchronous e-learning. Research in Learning Technology, 25, 1974.

Blumberg, B., Cooper, D. R., & Schindler, P. S. (2005). Business research methods. McGraw-Hill Education.

Boyte-Eckis, L., Minadeo, D. F., Bailey, S. S., & Bailey, W. C. (2018). Age, gender, and race as predictors of opting for a midterm retest: A statistical analysis of online economics students. Journal of Business Diversity, 18(1), 17–28.

Brown, J. D. (2011). Likert items and scales of measurement. SHIKEN: JALT Testing & Evaluation SIG Newsletter, 15(1), 10–14.

Cabual, R. A. (2021). Learning styles and preferred learning modalities in the new normal. Open Access Library Journal, 8(4), 1–14.

Çavdar, G., & Doe, S. (2012). Learning through writing: Teaching critical thinking skills in writing assignments. PS: Political Science & Politics, 45(2), 298–306.

Cohen, L., Manion, L., & Morrison, K. (2007). Research methods in education (6th ed.). Routledge.

COVID-PAK. (2022). COVID-19 cases status in Pakistan. Government of Pakistan. http://covid.gov.pk/stats/pakistan

Dewi, W. A. F. (2020). Dampak Covid-19 terhadap implementasi pembelajaran daring di Sekolah Dasar. Edukatif: Jurnal Ilmu Pendidikan, 2(1), 55–61.

Fuadi, T. M., Musriandi, R., & Suryani, L. (2020). Covid-19: Penerapan pembelajaran daring di perguruan tinggi. Jurnal Dedikasi Pendidikan, 4(2), 193–200.

Galea, S., Merchant, R. M., & Lurie, N. (2020). The mental health consequences of COVID-19 and physical distancing: The need for prevention and early intervention. JAMA Internal Medicine, 180(6), 817–818.

González-Lloret, M. (2020). Collaborative tasks for online language teaching. Foreign Language Annals, 53(2), 260–269.

Habes, M., Ali, S., Khalid, A., Abou Haykal, H., Elareshi, M., Khan, T., & Ziani, A. (2021). E-learning acceptance during the Covid-19 outbreak: A cross-sectional study. In European, Asian, Middle Eastern, North African Conference on Management & Information Systems (pp. 65–77). Springer.

Haider, A. S., & Al-Salman, S. (2020). Dataset of Jordanian university students' psychological health impacted by using e-learning tools during COVID-19. Data in Brief, 32, 106104.

Hartnett, M. K. (2015). Influences that undermine learners' perceptions of autonomy, competence and relatedness in an online context. Australasian Journal of Educational Technology, 31(1), 86–99.

Harvey, H. L., Parahoo, S., & Santally, M. (2017). Should gender differences be considered when assessing student satisfaction in the online learning environment for millennials? Higher Education Quarterly, 71(2), 141–158.

Hashemi, A. (2021). Effects of COVID-19 on the academic performance of Afghan students and their level of satisfaction with online teaching. Cogent Arts & Humanities, 8(1), 1933684.

Hermawan, D. (2021). The rise of e-learning in Covid-19 pandemic in private university: Challenges and opportunities. IJORER: International Journal of Recent Educational Research, 2(1), 86–95.

Hermawan, S., & Tyas, F. I. W. N. (2019). Pengaruh nilai intrinsik, parental influence, dan persepsi mahasiswa dengan pendekatan theory karier Anne Roe terhadap pemilihan karir sebagai akuntan publik. JABE (Journal of Applied Business and Economic), 5(2), 112–129.

Hodges, C. B., Moore, S., Lockee, B. B., Trust, T., & Bond, M. A. (2020). The difference between emergency remote teaching and online learning. Educause Review.

Jain, S., & Angural, V. (2017). Use of Cronbach's alpha in dental research. Medico Research Chronicles, 4(3), 285–291.

Kim, H. J., Hong, A. J., & Song, H. D. (2019). The roles of academic engagement and digital readiness in students' achievements in university e-learning environments. International Journal of Educational Technology in Higher Education, 16(1), 1–18.

Kolloff, M. (2011). Strategies for effective student/student interaction in online courses. In 17th Annual Conference on Distance Teaching and Learning.

Labban, L., Thallaj, N., & Labban, A. (2020). Assessing the level of awareness and knowledge of COVID-19 pandemic among Syrians. Archives of Medicine, 12(3), 8.

Li, C., & Lalani, F. (2020, April). The rise of online learning during the COVID-19 pandemic. World Economic Forum.

Lin, Y. T. (2019). Impacts of a flipped classroom with a smart learning diagnosis system on students' learning performance, perception, and problem solving ability in a software engineering course. Computers in Human Behavior, 95, 187–196.

Liu, I. F., Chen, M. C., Sun, Y. S., Wible, D., & Kuo, C. H. (2010). Extending the TAM model to explore the factors that affect intention to use an online learning community. Computers & Education, 54(2), 600–610.

Lockman, A. S., & Schirmer, B. R. (2020). Online instruction in higher education: Promising, research-based, and evidence-based practices. Journal of Education and e-Learning Research, 7(2), 130–152.

Lu, H., Stratton, C. W., & Tang, Y. W. (2020). Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. Journal of Medical Virology, 92(4), 401–402.

Mailizar, A., Abdulsalam, M., & Suci, B. (2020). Secondary school mathematics teachers' views on e-learning implementation barriers during the COVID-19 pandemic: The case of Indonesia. Eurasia Journal of Mathematics, Science and Technology Education, 16(7), em1860.

Malik, M., Fatima, G., & Sarwar, A. (2017). E-learning: Students' perspectives about asynchronous and synchronous resources at higher education level. Bulletin of Education and Research, 39(2), 183–195.

Malkawi, E., Bawaneh, A. K., & Bawa'aneh, M. S. (2020). Campus off, education on: UAEU students' satisfaction and attitudes towards e-learning and virtual classes during COVID-19 pandemic. Contemporary Educational Technology, 13(1), ep283.

Maltz, L., & DeBlois, P. D. (2005). Top-ten IT issues, 2005. Educause Review, 40(3), 15–28.

Maree, K. (2012). First steps in research. Van Schaik Publishers.

Marinoni, G., Van't Land, H., & Jensen, T. (2020). The impact of COVID-19 on higher education around the world: IAU global survey report. International Association of Universities.

Markus, D. (2020). Is the online learning good in the midst of Covid-19 pandemic? The case of EFL learners. Jurnal Sinestesia, 10(1), 1–10.

Martin, A. (2020). How to optimize online learning in the age of coronavirus (COVID-19): A 5-point guide for educators. UNSW Newsroom.

Mastrian, K. G., & McGonigle, D. (1999). Using technology-based assignments to promote critical thinking. Nurse Educator, 24(1), 45–47.

Merriam-Webster. (2020). Pandemic. In Merriam-Webster.com Dictionary. https://www.merriam-webster.com/dictionary/pandemic

Nandedkar, T. (2019). Student's perception towards effectiveness of e-learning. UNNAYAN: International Bulletin of Management and Economics, 10, 122–130.

Oguguo, B. C., Ocheni, C. A., & Adebayo, F. K. (2021). Students' achievement in online test and measurement course in synchronous and asynchronous e-learning platform. European Journal of Open Education and E-learning Studies, 6(2), 15–28.

Pokhrel, S., & Chhetri, R. (2021). A literature review on impact of COVID-19 pandemic on teaching and learning. Higher Education for the Future, 8(1), 133–141.

Putra, P., Liriwati, F. Y., Tahrim, T., Syafrudin, S., & Aslan, A. (2020). The students learning from home experience during Covid-19 school closures policy in Indonesia. Jurnal Iqra': Kajian Ilmu Pendidikan, 5(2), 30–42.

Qiong, O. U. (2017). A brief introduction to perception. Studies in Literature and Language, 15(4), 18–28.

Robbins, S., Judge, T., & Sobral, F. (2010). Comportamento organizacional: Teoria e prática no contexto brasileiro. Pearson Prentice Hall.

Robson, C. (2011). Real world research (3rd ed.). Wiley-Blackwell.

Rosell, C. (2020). COVID-19 virus: Changes in education. CAE Computer Aided E-Learning.

Rusman, D. K., & Riyana, C. (2011). Pembelajaran berbasis teknologi informasi dan komunikasi. Rajawali Pers.

Saifuddin, M. F. (2018). E-learning dalam persepsi mahasiswa. Jurnal Varidika, 29(2), 102–109.

Saqlain, M., Munir, M. M., Ahmed, A., Tahir, A. H., & Kamran, S. (2020). Is Pakistan prepared to tackle the coronavirus epidemic? Drugs & Therapy Perspectives, 36(5), 213–214.

Sarwar, H., Akhtar, H., Naeem, M. M., Khan, J. A., Waraich, K., Shabbir, S., Hasan, A., & Khurshid, Z. (2020). Self-reported effectiveness of e-learning classes during COVID-19 pandemic: A nation-wide survey of Pakistani undergraduate dentistry students. European Journal of Dentistry, 14(S01), S34–S43.

Singh, V., & Thurman, A. (2019). How many ways can we define online learning? A systematic literature review of definitions of online learning (1988–2018). American Journal of Distance Education, 33(4), 289–306.

Siripongdee, K., Pimdee, P., & Tuntiwongwanich, S. (2020). A blended learning model with IoT-based technology: Effectively used when the COVID-19 pandemic? Journal for the Education of Gifted Young Scientists, 8(2), 905–917.

Soub, T. F. A., Alsarayreh, R. S., & Amarin, N. Z. (2021). Students' satisfaction with using e-learning to learn chemistry in light of the COVID-19 pandemic in Jordanian universities. International Journal of Instruction, 14(3), 1011–1024.

Stern, J. (2020). Introduction to online teaching and learning. West Los Angeles College.

Strielkowski, W. (2020). COVID-19 pandemic and the digital revolution in academia and higher education. Preprints, 2020040290, 1–6.

Suharsa, H., Soleh, D. J. A., & Miftahuddin, A. (2022). Persepsi publik tentang pembelajaran daring dari jejak digital Twitter: Analisis sentiment positif, netral, dan negatif dari Drone Emprit. Jurnal Aparatur, 6(1), 33–43.

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. Research in Science Education, 48(6), 1273–1296.

Tarman, B. (2020). Reflecting in the shade of pandemic. Research in Social Sciences and Technology, 5(2), i–iv.

Ullah, A., Ashraf, M., Ashraf, S., & Ahmed, S. (2021). Challenges of online learning during the COVID-19 pandemic encountered by students in Pakistan. Journal of Pedagogical Sociology and Psychology, 3(1), 36–44.

Usman, M. K., & Ibrahim, H. (2017). Urban housing and sensational interpretation for experience. Journal of Education and Social Sciences, 6(2), 278–286.

Wang, Y. (2007). On the cognitive processes of human perception with emotions, motivations, and attitudes. International Journal of Cognitive Informatics and Natural Intelligence, 1(4), 1–13.

Ware, C. (2019). Information visualization: Perception for design (4th ed.). Morgan Kaufmann.

Wilczewski, M., Gorbaniuk, O., & Giuri, P. (2021). The psychological and academic effects of studying from the home and host country during the COVID-19 pandemic. Frontiers in Psychology, 12, 644096.

William, N. D., & William, E. (2018). Perception. In Encyclopaedia Britannica.

World Health Organization. (2020). Responding to community spread of COVID-19: Interim guidance (WHO/COVID-19/Community_Transmission/2020.1). World Health Organization.

Worldometer. (2023, September 5). COVID-19 coronavirus pandemic. https://www.worldometers.info/coronavirus/

Wu, Z. (2020, March 16). How a top Chinese university is responding to coronavirus. World Economic Forum.

Xie, H., Liu, W., & Bhairma, J. (2018). Analysis of synchronous and asynchronous e-learning environments. In Proceedings of the 2018 3rd Joint International Information Technology, Mechanical and Electronic Engineering Conference (JIMEC 2018) (pp. 270–274). Atlantis Press.

Zhang, W., Wang, Y., Yang, L., & Wang, C. (2020). Suspending classes without stopping learning: China's education emergency management policy in the COVID-19 outbreak. Journal of Risk and Financial Management, 13(3), 55.