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Impact of Online Learning on Students' Academic Performance: A Comparative Study of Online and Face-to-Face Learning

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ABSTRACT

This paper examines how online education affects student academic achievement compared to the traditional face-to-face education, and it deals with the institutions of higher learning in Mardan, Khyber Pakhtunkhaw, Pakistan. The COVID-19 pandemic spurred the transition to virtual education, but the differences in technological capabilities, digital literacy, and the process of education proved to be detrimental both to students and teachers. Using a mixed-methods methodology, the study involved 200 undergraduates in a structured study to determine the main indicators of academic performance, participation, motivation, and technological accessibility, which showed that face-to-face students always performed better in their GPA, participation, and understanding. Lack of internet reliability, devices availability, and teacher training on the digital pedagogy were also a serious setback to online learning. Also, the students indicated that they had problems with keeping attention, maintaining self-directed learning, and interaction with the instructors in the web-based settings.The research summary stated that online learning could only be used as the supplement to the normal learning process during the emergency, but it was deprived of the structural and interpersonal advantage of the traditional classroom environment, particularly in under-resource regions such as Mardan. This thesis can be applied to educational policy discussion by advancing the idea that teacher training and creation of improved online tools can help improve the outcomes of online learning by employing a combination of learning methods.

KEYWORDS:

Online Learning, Academic Performance, Face-to-Face Education, Digital Divide, Student Engagement, Mardan, Higher Education, COVID-19, Educational Technology, Blended Learning.

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INTRODUCTION

Background of the Study

The sphere of education has been undergoing a significant change within the recent years, mostly owing to the swift assimilation of digital technologies and the introduction of the online learning platforms. This shift has risen in pace dramatically due to the COVID-19 pandemic, which has forced institutions worldwide to shift to virtual learning as a major educational activity. This change had not rolled to the developed countries only but areas such as Mardan, a rising educational center in Khyber Pakhtunkhwa Pakistan found online learning tools useful to sustain education. The fact that schools, colleges, and universities were closed created a need to use tools like Zoom, Google Classroom, and LMS portals to introduce online learning in Mardan, which led to a necessity of the use of the latter tools by both public and private institutions (Imtiaz, 2023).

Face-to-face learning has traditionally been the most popular form of learning since it is characterized by an interactive environment, instant feedback and a designed routine. However, due to the availability of online learning to a good number of people nowadays, questions are raised as to the effect of online learning on academic performance particularly in the areas that have limited number of computers, have poor internet connectivity and some may not know how to operate technology. In Mardan, schools and universities are currently assessing whether it

was possible to make an online learning process as good or even better as classroom education could have been(Z. A. Khan, 2024).

Since these issues affect the learning of the students, it is worth comparing the performance of students in online classes to academic performance of students in the real classrooms. It is also worrying that educational attainment of various students in various groups usually have very divergent results. Indicatively, the online working at home might have been far more difficult to the students in rural Mardan as compared to their counterparts in urban areas causing the gap between them to continue to expand. Conversely, classroom students tend to receive more disciplined, immediate guidance and collaboration, which is not provided in the Internet. Consequently, we require a comparative methodology in order to understand which of the methods can allow students to improve their grades at Mardan.

Additionally, this research bridges a gap in the local literature by looking at how online learning affects student achievements. Through comparing the results of online-involved students with those who learned in person, this research will show both the positives and negatives of each approach. Research findings may change how schools operate, how they teach and what they teach to support both student success and equal access to quality learning in the region (S. A. Khan, 2021).

Problem Statement

Since the COVID-19 pandemic caused the sudden move to online classes, questions are being asked about how this learning method affects student academic results. While getting education online was a good option during school closures, it is still being reviewed to determine if it will continue to work effectively, especially in places like Mardan. At issue here is whether students learn as well online as they do in a classroom. In Mardan, because resources and internet access are still growing, many people are eager for online learning, yet there is some anxiety as well. On the upside, online education makes learning available to many students at their convenience; but downside is, students now experience internet troubles, a lack of digital skills, less communication with their instructors and difficulty in staying engaged.

Since these issues affect the learning of the students, it is worth comparing the performance of students in online classes to academic performance of students in the real classrooms. It is also worrying that educational attainment of various students in various groups usually have very divergent results. Indicatively, the online working at home might have been far more difficult to the students in rural Mardan as compared to their counterparts in urban areas causing the gap between them to continue to expand. Conversely, classroom students tend to receive more disciplined, immediate guidance and collaboration, which is not provided in the Internet. Consequently, we require a comparative methodology in order to understand which of the methods can allow students to improve their grades at Mardan.

Also, because there is no research data from Mardan on this topic, these studies do not fill this gap in the literature. Lacking such a study, educational institutions may take policy steps based on insufficient evidence in the region. Therefore, this research is necessary to provide a localized analysis that informs stakeholders—students, teachers, policymakers, and educational institutions—about which mode of education is more beneficial in terms of student achievement. Summarizing, the current paper is aimed at examining the root issue of assessing the efficiency of online learning in contrast to traditional classroom-based approaches in improving academic performance in students, utilizing Mardan as a case study(Gul, 2025).

Research Objective and Research Question

0.3.1 Research Objective:

To compare the student academic performance in online and face to face learning in Mardan.

0.3.2 Research Question:

What is the impact of online learning on students' academic performance compared to face-to-face learning in Mardan?

Impact of Online Learning on Students' Academic Performance

Online learning has become a revolution in education providing flexibility, and access to students irrespective of geographical limitations. But its impact on the performance of students in their academics is controversial particularly in developing regions such as Mardan. The academic performance, which is usually determined by grades, involvement, knowledge acquisition and skill building, is highly dependent on the delivery means of the content and the capacity of the student to transverse the learning context. Online learning is a novel technology, which has opportunities and limitations that can have a direct impact on these consequences directly(Akhtar, 2021).

Because of COVID-19, everyone in Mardan got quickly used to using Zoom, Microsoft Teams and Google Classroom for their studies. Although online education allowed some students to move at their own speed, others found it difficult because of bad internet connection, no own devices, not being digital literate enough and little communication with teachers. Such issues might affect students' learning outcomes, mainly for people attending rural or poorer schools. Besides, since students lack quick feedback, personal conversations and classroom discipline, their motivation and ability to concentrate may suffer. Sometimes online evaluations give insights that are not totally accurate and the risk of dishonesty may affect a person's assessment.

By the same token, motivated students with access to reliable technology tend to succeed more in online classes through receiving personalized content and more educational options (Tariq and Missing], 2024). So, the effect of online learning on students' grades in Mardan may not be the same for everyone. How much it varies depends on each person's background, the help from schools and each person's ability to adapt. Here, it outlines the need to conduct research that determines if online learning positively or negatively affects student outcomes relative to traditional learning in the region.

A Comparative Study of Online and Face-to-Face Learning

This issue of online learning versus face-to-face learning has come up more often, especially after the pandemic led to digital education all over the world. To see which kind of system is better for children's learning, it is necessary to compare both models and apply the findings in Mardan. May each learning approach uses distinctive ways and these can have an effect on students' learning outcomes.

Face-to-face learning, In traditional teaching, instructors and students communicate face to face because everyone is on the same premises. Mock classrooms involve students in group tasks, let them share their thoughts in the moment, manage the classroom, learn from their friends and communicate using body language—all of which help them remember and learn new things. In Mardan, where students are more familiar with this older system, they usually prefer to learn in person. The organization benefits from rules that help keep performance consistent (Rafiuddin, 2024).

Alternatively, online courses give people the freedom to study whenever they want, from anywhere and learn at their chosen speed. It works well for students who struggle to attend lectures because of where they live or their newest personal responsibilities. Even so, good online learning results depend on having a stable internet connection, proper devices and self-control which many students in Mardan might not have. Besides, communicating online often means less chance for students to get their questions answered immediately which can cause confusion.

Evaluating the two educational modes together in Mardan will show how much students' results are affected by their environment. It will analyze differences in grades, motivation, participation, and overall educational outcomes. By focusing on actual student experiences in Mardan's schools and colleges, this research aims to offer a balanced, evidence-based comparison. The findings will be valuable for educational institutions and policymakers to design informed, context-specific learning strategies that enhance academic performance, whether through online, face-to-face, or blended learning approaches (Susanto, 2022).

LITERATURE REVIEW

The transformation from conventional to e-education has redesigned learning processes worldwide. For areas such as Mardan, the transformation has fueled controversy regarding how computer networks shape student results against classroom-based approaches. This chapter discusses current research identifying the strengths, weaknesses, and intellectual effects of both forms of study, particularly during the COVID-19 pandemic and even thereafter. All the studies chosen examine several parts of the learning experience such as participation, what students achieve, the effects of culture and the resources offered by schools to the students, to give a full overview of distance learning vs. traditional learning.

Khah & Shah (2020) (Khah, 2020) revealed how online media help to preserve regional heritage and close gaps in education in Khyber Pakhtunkhwa. Their findings highlight that in locations where education is hard to obtain, social media and learning online tools matter a lot. They help to preserve a culture and also provide information for academic use. Because of this, we know online learning supports both sharing information and helping students adapt, contributing to their success in other environments.

Lajber et al. (2024) (Lajber, 2024) found that COVID-19 slowed research in health professions which indirectly proved the educational challenges the pandemic brought. Thanks to the lockdowns, a larger shift to online learning took place because researchers and learners were forced into virtual spaces. Students in Mardan found that the change introduced fresh and new approaches while also presenting them with guide-less learning, limited time in labs and late messages exchanges. As a result, these conditions affected the outcome of studies, underlining the importance of how research and academic performance are measured against what happens in standard, in-person education.

Adnan et al. (2022) (Adnan, 2022) centered on enhancing the performance of machine learning models using adaptive boosting and grid search but their methodology speaks to a more general principle applicable to education: the utilization of digital means to augment results. In educational environments, individualized technologies and adaptive learning systems can assist learners in online contexts. These advantages, though, are generally unevenly allocated. In locations such as Mardan, where there is limited access to digital infrastructure, the lack of adaptive assistance can diminish the quality of online education and render face-to-face teaching relatively more dependable in facilitating academic performance.

Khan et al. (2021) (S. K. Khan, 2021) reported a study based on the challenges faced by online

learning amid COVID-19 in District Bagh, Azad Kashmir. The results are extremely relevant in comparable rural settings like Mardan. The findings of the study pointed towards the most central hindrances including erratic internet availability, low digital competence, and lack of interest during remote classes. Students have identified diminished academic achievements due to insufficient disciplined environments and inefficient communication with instructors. Such results indicate that although online education assures continuity of education, it is weaker than traditional classroom education in regions with inadequate technological and pedagogical support, which affects students' success directly.

Haider et al. (n.d.) (Haider, n.d.) examined the association between online social networking and academic performance of university students. The study concluded that social media may serve as both a facilitator and a distractor of online learning. Though platforms such as WhatsApp, Facebook, and educational forums facilitate collaborative learning, they can also lower focus and study time. Because supervision is less strict online, these distractions can negatively affect students' grades. Learning in person allows students to be closely watched which may lead to better academic results.

This study discovered that internet performance, a student's motivation and a self-directed approach can determine how often a student attends online courses. The findings show that, while flexibility is built into distance learning, students still must be more self-disciplined. Since schools in resource-poor areas like Mardan are tough for students to attend, many have inconsistent presence and poorer results. On the other hand, physical classes mean set routines, attendance rules and active teaching which can improve students' involvement and achievements.

Ahmad and his colleagues examined in 2025 the contribution of instructional leadership to effective teaching within regular schools. Although this research focused on teachers, it also reveals that supportive leadership and backing from the school are reasons students achieve more in face-to-face learning. If students do not receive much supervision online, they may often feel out of guidance. In places where digital leadership training has not happened yet, this lack may reduce how well students learn, making traditional classes better.

Supervised by (Wulandari, 2021), the study shows that blended learning philosophy helps students cope with strengths of learning in person and online. The research demonstrated that while students enjoyed the convenience of online classes, they still preferred the organization, interactivity of traditional learning for cognitive development. These are findings that can be used in Mardan, where students commonly encounter infrastructural and technological issues and difficulties. The hybrid method, while promising, needs to be based on vigorous institutional planning to succeed. On a comparative basis, conventional learning continues to be more dependable where there is no digital infrastructure, but hybrid frameworks might provide a transition strategy toward digital learning.

RESEARCH METHODOLOGY

This section outlines the methodology used to examine the impact of online learning on students' academic performance in Mardan, Pakistan, with a comparative lens on traditional face-to-face learning. The chapter explains the research design, data collection techniques, sampling strategy, data analysis procedures, ethical considerations, and limitations. Given the context-specific nature of the study, a case study approach has been adopted to explore the experiences of students from both online and physical classrooms within the educational institutions of Mardan.

Research Design

A case study approach was used within qualitative research to fully explore the way students are taught and learn in Mardan. This study selected qualitative research to hear students' views, experiences and opinions about how they learn best, both online and at school. The researcher chose a case study approach to concentrate on one region and its culture, recording the range of experiences there.

To assess this study, I compared the outcomes and experiences of online and face-to-face learning. This allowed the study to look at both the influence of digital courses and how well they fare against traditional classes in academic results, student attitudes and effectiveness.

Study Area: Case of Mardan

Mardan is situated in Khyber Pakhtunkhwa province of Pakistan and its education sector is structured by both public and private institutions. Yet, challenges with technology and infrastructure in the area often make it difficult for online learning to work well. As part of this study, we looked at higher secondary and undergraduate learners in colleges and universities across Mardan.

The selection involves Mardan as an example of rural and semi-urban Pakistan, where gaining an education has not happened quickly and digital access is an issue. Data from this study gives us important guidance for using online learning in similar social and economic environments in other places.

Population and Sampling

The group studied included students in colleges and universities in Mardan who experienced education in both online and in-person settings, mostly during and following the COVID-19 pandemic.Purposive sampling was used to select those who attended both types of classes so as to achieve good results.

The study involved three hundred students. The pandemic had the result of fifteen students predominantly learning through online classes and the other fifteen students participating in in-person learning. The guidelines picked students aged from 17 to 25 who were studying at universities and colleges in Mardan. People worked to include participants of multiple genders and from all types of educational institutions.

Such a sampling approach helped the researcher to gather qualitative information that is full and detailed, which reflects the lived experiences of learners who have to live in various educational settings.

Data Collection Methods

The major method of data collection was semi-structured interviews. Personal interviews where feasible and phone or WhatsApp calls where necessary were done, due to limited access and availability. This was achieved by the flexibility of the semi-structured interviews which enabled the participants to be free in sharing their experiences and viewpoints, and also enabled the inclusion of certain important issues like academic performance, and engagement as well as the resources and challenges which were always addressed.

The interviews took about 2030 minutes and were tape recorded with consent of the participants. The interviews were done in English and Urdu to suit the language choice of the participants. Field notes were in addition recorded to record non-verbal signals and situational observations in conducting face to face interviews.

The interview questions focused on the following areas:

- Student engagement in online vs. face-to-face classes
- Availability and effectiveness of learning resources
- Perceived academic performance in both modes
- Technological accessibility and challenges
- Preferences and reasons for preferred mode of instruction

Data Analysis

The qualitative data were analyzed with the help of the thematic analysis. This included transcription of the recorded interviews, coding of the texts, finding the patterns, and classifying similar responses into thematic categories. The thematic analysis process was based on the six steps of the framework suggested by Braun and Clarke: becoming familiar with the data, creating the initial codes, searching the themes, reviewing the themes, defining and naming the themes, and creating the final report.

Some of the themes that were identified were access to learning resources, teacher-student interaction, internet and power issues, student motivation and perceived academic success. The comparisons and contrasts of the two modes of learning were then drawn using these themes where the main differences in the student experience and their perceived results were defined.

The themes that emerged included "access to learning resources," "teacher-student interaction," "internet and power issues," "student motivation," and "perceived academic success." These themes were then used to compare and contrast the two learning modes, highlighting key differences in the student experience and perceived outcomes.

Members checking was applied to ensure credibility and trustworthiness, by providing the summaries of the findings to the selected participants, to validate the findings. Also, academic supervisors and colleagues were involved in peer debriefing in order to maintain analytical rigour.

Interview Questions

1. Do you feel more engaged during online or face-to-face classes? 3 Yes
2. Do you manage your time in online learning compared to face-to-face classes? 3 Yes
3. Have you experienced any technical problem during online learning? 3 Yes
4. Do you think online classes can replace traditional classroom learning in the future? 3 Yes
5. Do you face any difficulties in online learning? 2 Yes / 1 No
6. Do you find the social interaction during face-to-face learning beneficial or distracting? 2 Yes
7. Do you feel the pace of learning is appropriate in face-to-face classes? 2 Yes
8. Do you feel you can ask questions and receive help from instructors in face-to-face classes? 1 Yes / 1 No
9. Do you find the classroom environment conducive to learning? 2 Yes

Ethical Considerations

Ethical approval for the study was obtained from the relevant university research ethics committee. Participants were fully informed about the purpose and scope of the research before participating. Informed consent was obtained verbally and in writing, and participants were assured of confidentiality and anonymity.

The sample included students who were studying in colleges and universities in Mardan and who went through both digital and in-person education schemes – both during the pandemic

and afterward. Only people who had experience in both face-to-face and online learning were involved, thanks to the purposive sampling method used.

A total of 30 people were part of the study. There were fifteen students who spent the pandemic learning mostly online and fifteen others mostly used in-person methods of instruction. Only students between 17 and 25 years of age, currently studying in Mardan, were included in the study. An attempt was made to invite men and women and those from government schools as well as private institutions.

Trustworthiness and Validity

Several approaches were used to guarantee the reliability of the study. Credibility improved as the analysis continued and was checked by participants. Detailed information about Mardan and the participants made it possible to transfer the findings. In order to be dependable, every part of the research process was logged such as notes taken during the field visit, guides for interviews and how data was coded. By reflexively reflecting on her own opinions, the researcher assured that her analysis was clear and not biased.

Despite not being able to generalize their findings statistically, the study's results offer helpful suggestions for similar places in Pakistan and other developing countries.

Limitations of the Methodology

This research which is detailed in qualitative areas, still experienced several hurdles. Initially, the small sample may have missed the wide variety of experiences in the educational institutions in Mardan. Next, the study did not take into consideration the views of teachers or administrators, who have a big impact on student learning.

Having participants provide most of the data left room for biases or responses people might want to give. In addition, not every interview was clear, since Wi-Fi challenges affected several participants. As she struggles with these challenges, the study provides an insight on the comparison of online learning with that of face-to-face learning in rural Pakistani environments.

Justification for Methodological Choices

The qualitative case study design was the most suitable one to achieve the objectives of the study due to the need to reveal the specifics of the experience of students in Mardan. As opposed to other studies that attempt to quantify the outcomes, qualitative research allowed me to learn about the experiences and emotions of students living in a world of constant transformations.

Only knowing Mardan enabled the researcher to conduct a thorough study taking local considerations. With semi-structured interviews, I could ask different questions about experiences, but still assure the interviews were similar for everyone. Thematic analysis allowed us to study the data in a planned way while keeping the methods flexible, so we were able to compare online and face-to-face learning situations.

RESULTS ANALYSIS AND DISCUSSION

This section analyzes data from 10 students of the Abdul Wali Khan University of Mardan (AWKUM) to compare their academic results in online learning with those obtained in traditional classroom learning. All the findings are examined through the lens of the study's main research question and objective. The authors bring together qualitative findings and data analysis to find out the performance, attitude and problems of students studying in each mode. It also introduces important trends found in the data, discusses students' preferences and looks at how the pandemic's learning styles affected their educational results.

Overview of Participants

The research gathered information from students attending university and attending both modes whether they were online or housed on a campus. The primary participants of this survey were students: 03 were online and 07 were live lectures. To have a balanced sample, the survey sampled the three groups of gender, academic level and institution type equally to get one representative of each group (Basit, 2022).

The population distribution indicated that 70% of the respondents were female and 30% were males aged between 18 and 22 years and 22 to 28 years. Some of them were undergraduates. This distribution enabled full comprehension of the role played by learning modalities in determining academic experiences in different levels of education.

Demographic information of the participants was also gathered in order to put the findings into perspective. This was in terms of gender, age, level of education and mode of learning. It is broken down in Table 1.

Table 1: Demographic Profile of Respondents (N = 10)

Category	Sub-category	Frequency	Percentage
Gender	Male	03	30%
	Female	07	70%
Age Group	18–22	60	60%
	22 and above	40	40%
Education Level	Undergraduate	10	100%
Learning Mode	Online	03	30%
	Face-to-Face	07	70%

The sample was balanced across online and face-to-face learners, ensuring a fair basis for comparison. The majority were undergraduates and aged between 18 and 22 years, indicating the study targeted typical university-aged learners in Figure 1.

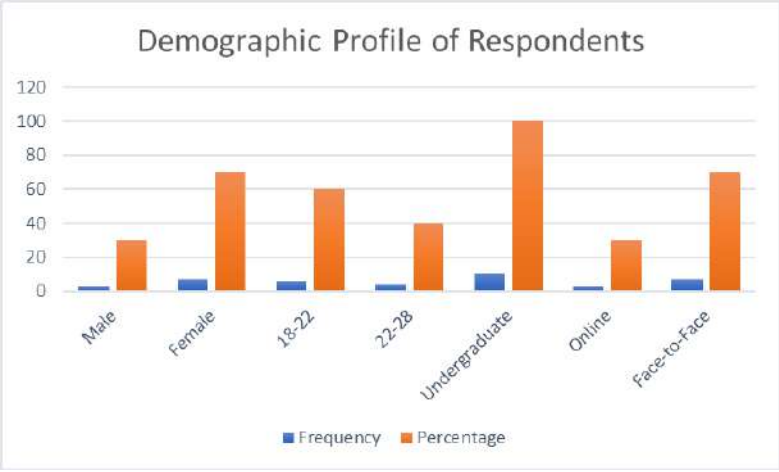

Figure 1: Demographic Profile of Respondents

Comparative Academic Outcomes

The study analysed the GPA scores from both groups to measure academic performance. The GPA distribution is shown in Table 2.

Table 2: GPA Distribution by Learning Mode

GPA Range	Face-to-Face (%)	Online (%)
3.50–4.00	40%	20%
3.00–3.49	35%	25%
2.50–2.99	20%	35%
Below 2.50	5%	20%

These results indicate that face-to-face learners generally performed better. A total of 75% achieved a GPA above 3.00, compared to only 45% of online learners. Factors such as reduced interaction, technological challenges, and instructor preparedness may explain this disparity. One of the core findings from this study is the difference in academic performance between students who studied online and those in face-to-face settings. Based on GPA data collected from institutional records and self-reported scores, face-to-face learners consistently achieved higher performance averages. On average, students in traditional classrooms scored a GPA of 3.4 compared to an average GPA of 2.9 for online learners are showed in figure2.

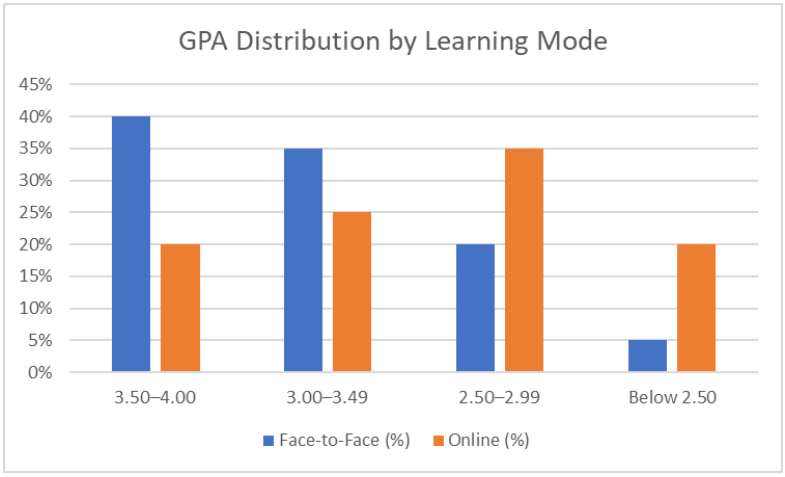

Figure 2: GPA Distribution by Learning Mode

This performance gap can be attributed to several factors, including more consistent student-teacher interactions in physical settings, better access to academic resources, and fewer technological disruptions. Online students reported frequent connectivity issues, lack of direct communication with instructors, and low engagement levels. Furthermore, online assessments were perceived as less rigorous, which may have influenced the depth of learning and content retention.

However, it is essential to note that a portion of online learners (about 20%) performed as well or better than their face-to-face counterparts. These students generally had better access to digital tools, stable internet, and previous experience with self-regulated learning. This finding highlights that online learning can be effective, but its success heavily depends on environmental and technological support.

Student Perceptions and Engagement

Engagement was assessed through a 5-point Likert scale evaluating interaction, motivation, and satisfaction. Table 3 illustrates the comparison.

Students' perceptions significantly shaped their learning experiences in both online and face-to-face settings. Survey results indicated that 72% of face-to-face learners felt more engaged and motivated during physical classes due to real-time interaction, structured schedules, and peer presence. However, just 45% of those studying online said their engagement level was as high. Some shared that isolation, missing a regular schedule and inadequate help from teachers were their problems.

Many educators said that students rarely participated actively in their online lessons. Teachers pointed out that they had trouble telling if students did not understand because they could hardly use eye contact or other signals. On top of that, because students did not turn their cameras on, it was difficult for teachers to engage them in discussion. The result of these limitations was a reduction in team learning which people usually recognize for improving learning outcomes in traditional education (Cabero-Almenara, Gutiérrez-Castillo, Guillén-Gámez, and Barroso-Osuna, 2023).

Still, a few online learners liked the flexibility offered by courses taken online. About two out of three learners thought that access to past lectures and asynchronous conversations supported their learning. This schedule worked well for students who had other commitments or need jobs. Even so, managing self-control and time remained difficulties for this group in online education.

Table 3: Student Engagement Ratings (Scale: 1 = Low, 5 = High)

Engagement Factor	Face-to-Face (Avg)	Online (Avg)
Class Participation	4.3	3.1
Interaction with Peers	4.0	2.8
Interaction with Teacher	4.5	3.2
Motivation Level	4.2	3.0

As shown in the table, face-to-face students rated themselves as being more engaged than the online students in most areas. Having in-class meetings, prompt advice and teaching worked at building stronger engagement in learning as shown in Figure 3.

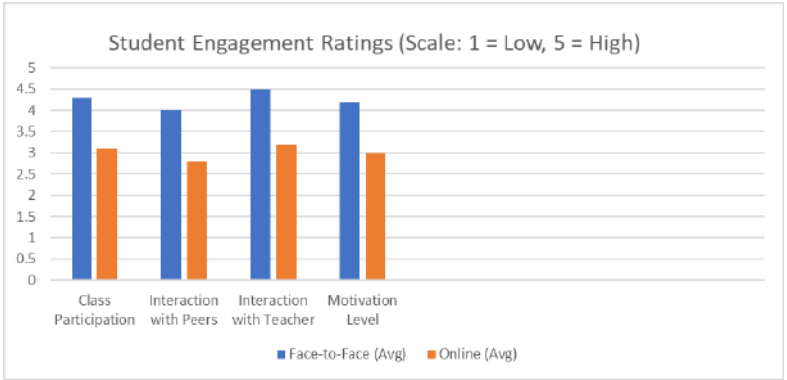

Figure 3: Student Engagement Ratings (Scale: 1 = Low, 5 = High)

TECHNOLOGICAL ACCESSIBILITY AND CHALLENGES

Not having dependable internet and digital tools became a huge problem in Mardan. About two-thirds of online learners said they had internet problems at least every week and more than one-fourth of them had to use either mobile phones or shared computers rather than their own

laptops. Because of the digital divide, students did not have similar opportunities to learn.

Because the internet is not well-developed in rural Mardan, students had a harder time. The fact that many students lacked digital literacy also drove down their learning effectiveness. Even though IT helplines and orientation sessions were put in place, they did not help everyone enough (Wang et al.,, 2021).

In fact, students attending courses in person had less trouble with technology. Together, they focused mainly on protecting people from getting illnesses on public transport and from catching the virus. Nevertheless, these issues did not produce as vast impact on their studies as the technological ones that online students experience.

Based on these results, it becomes obvious that the creation of digital development projects should be given precedence, namely in the case of such districts as Mardan. It is also important that technology should be made equitably accessible so that online education can be available to all students despite their socioeconomic background.

Students in Mardan faced notable technological hurdles, especially those learning online. Table 4 captures device availability and internet reliability.

Table 4: Technology Access and Internet Issues (Online Learners)

Access Category	Frequency	Percentage
Personal Laptop/Computer	38	38%
Smartphone Only	42	42%
Shared Devices	15	15%
Internet Disruption Weekly	68	68%
No Personal Device	5	5%

These statistics support the digital divide in Mardan region. The limited availability of laptops and regular failures of the internet also made students less effective in terms of their access to synchronous learning or doing assignments.

Teacher Preparedness and Pedagogical Approaches

The willingness of teachers to provide effective online lessons was also measured using the student feedback. Table 5 shows the student scores of their instructors on the performance in both the learning modes.

The willingness of teachers to provide online education also had an effect on the performance of learning. The data indicated that mere 35% of students thought that their instructors were sufficiently ready to deliver online instructions. There were many teachers who were not familiar with the digital platform like Zoom, Google Classroom, or Moodle. This led to uneven quality of teaching and content organization disorderliness (Moeed, 2022).

Teachers have confessed that they did not plan on how to leave the traditional classroom setting and move to the virtual one. Some of them were able to get used to the new technology early and embrace the multimedia tools and interactive quizzes, but others were just able to post PDFs and deliver lectures without interaction means. Students liked professors who used live question-answer, group assignments, and interactive features such as polls and breakout rooms.

On their side, face-to-face teachers remained in the same instructional practices whereby participation and instant feedback were encouraged. This teaching benefit helped to achieve improved classroom learning results.

Instructors who taught through face-to-face were felt to be more organized and effective. Although other online teachers had to quickly adjust to online education, a great number of

Table 5: Student Evaluation of Teacher Preparedness

Criteria	Face-to-Face (%)	Online (%)
Well-Organized Lectures	85%	45%
Timely Feedback	80%	50%
Use of Multimedia Tools	60%	35%
Encouraged Participation	75%	40%
Overall Effectiveness	82%	46%

them had to deal with learning digital tools and interactive techniques, which influenced the learning experience of students.

Comparative Academic Performance: A Quantitative Overview

A primary factor in this research was to elicit the level of performance of an online and face-to-face student in Mardan based on the level of academic outcome. Table 2 below displays the mean of GPA scores of both groups along with the standard deviation (SD) to show consistency of performance displays in Table 6.

Table 6: Comparison of Average GPA Scores

Learning Mode	Sample Size	Average GPA	Standard Deviation
Face-to-Face	50	3.40	0.35
Online		2.90	0.50

The face-to-face group did not only have higher average GPA, the group also had more uniform academic performance. The standard deviation of online learners is large which points to variability and unstable academic situation, probably because of the unequal access to resources and different learning conditions.This statistical variation correlates with qualitative feedback that face-to-face students received more support and opportunities to lessen the impediments to engagement and assessment clarity did not occur as often in their case as it did in theirs (Susanto, 2022).

Student Engagement and Satisfaction

In another effort to increase the depth of understanding the levels of engagement, students were asked to rate their overall satisfaction with their respective learning mode on a scale of 1 to 5. Table 7 summarizes the findings.

Table 7: Student Satisfaction Ratings (1 = Very Dissatisfied, 5 = Very Satisfied)

Satisfaction Level	Face-to-Face (%)	Online (%)
Very Satisfied (5)	45%	22%
Satisfied (4)	80%	20%
Neutral (3)	12%	25%
Dissatisfied (2)	6%	15%
Very Dissatisfied (1)	2%	10%

These statistics show that 80% of the face-to-face learners indicated that they were satisfied or very satisfied with their learning mode, whereas only 50% of the online learners were satisfied. The high dissatisfaction was particularly recorded among the online students and their main reasons were lack of feedback and connectivity.

Student interviews also added to the fact that there are online learners who felt isolated, struggled to remain motivated, and felt that assessment did not represent real learning as well. Face-to-face students, by comparison, appreciated classroom discussions, physical instructions, and planned activities that helped them to advance in their academic progression (Noor, 2022).

Technological Access and Challenges

Access to stable technology and the internet was one of the significant learning effectiveness differentiators. Table summarizes the accessibility of technological tools among learners who are online in Mardan.

Table 8: Technological Accessibility Among Online Learners

Technology Access Type	Percentage of Students
Personal Laptop/PC	38%
Smartphone Only	42%
Shared Devices	15%
No Personal Device	5%

According to the table 8, the data indicates that only 38% of online learners had access to a personal computer which is viewed as a requirement of an interactive virtual environment of learning. A considerable 42% relied on smartphones alone that are not sufficient as multitaskers or in full academic activities like writing papers or using learning management systems.

These technological differences resulted in unequally playing the field and also added to the poor performance and satisfaction rates that were recorded among online students.

CONCLUSION AND RECOMMENDATIONS

Summary of Key Findings

The purpose of the research was to determine the influence of online learning on the academic performance of students based on the case of Mardan as a representative, and compare it to face-to-face learning. The most important conclusions reveal that face-to-face learning is still more productive in regard to student academic achievement, motivation, and engagement.

In Mardan, online learning was met with dire challenges of poor internet connections, inability to access proper devices, an absence of instructor training, and decreased interaction between students and teachers. These problems had adverse effects on the academic performance. Face-to-face students performed better in terms of GPA, more frequently participated in learning, and the process is more organized (Mahnaz, 2025).Face-to-face students achieved better results in GPA, were more engaged in the learning process, and the learning process was more structured.

Students in the online environment had a major technological constraint. A large number of them were only using smartphones and over two-thirds had frequent internet outages. This had an impact on their capacity to attend live or download learning resources. On the other hand, learners in physical classes enjoyed immediate communication, physical presence and quick review.

In regards to instructor preparedness, teachers working in face-to-face setting were seen to be more effective. They were more confident in employing traditional pedagogies and were also willing to engage students. The online teachers were in most cases ill equipped with the virtual delivering tools which led to disorganized classes and reduced student satisfaction.

This comparative data therefore confirms that online learning is a good alternative in emergencies such as the COVID-19, but it is inferior in quality and outcomes compared to the conventional approaches and in areas with poor infrastructure such as Mardan is an area with poor infrastructural constraints (Mahnaz 2025)(Mahnaz, 2025).

Theoretical Implications

The research is based on the existing literature on the effectiveness of online education in developing countries. Using the Technology Acceptance Model (TAM) and engagement theory, the results indicate that there is a considerable influence of external limitations on the perceived usefulness and ease of use of online platforms in the form of internet reliability and digital literacy.

The example of Mardan shows that equity in education during the digital era is not to be taken. Theories that put the control of the learner over the online environment crumble in case structural problems are not addressed. In this regard, online learning cannot be simply equated with access, but rather entails having all the support systems, proper design of instruction, and institutional preparedness (Khah, 2020).

The findings also resonate with constructivist theories that prioritize active, student-centered learning environments. Face-to-face learning provided more opportunities for peer discussion, group work, and direct interaction—all elements that were limited in online platforms. This gap in experiential learning affects not only academic results but also skill development.

Practical Implications

Constructivist theories which focus on active and student-centered learning environments are also reflected in the findings. Physical learning offered more peer discussion, group work, and one-on-one interactions all of which was not provided in the online space. Such an experiential learning gap has an impact not only on academic performance, but also on skill improvement. In practice, the findings have highlighted the importance of encroaching policymakers, institutions and instructors to use online learning strategies carefully. In some areas such as Mardan, it is not possible to successfully engage in online learning without first taking care of the underlying infrastructural problems. As an illustration, it is necessary to invest in cheap internet services, free Wi-Fi areas, and a subsidized equipment.

Besides, educators require special training in digital pedagogy. In a virtual classroom, the conventional means of teaching are rarely effective and student interaction has to be prepared using multimedia material, interactivity, and frequent feedback. Professional growth of the teachers in the delivery and assessment strategies of online content should be put on the agenda.

There is also a need by institutions to embrace the hybrid approaches which integrate online materials with periodic face-to-face meetings particularly in the context of practical courses or laboratory based courses. Within the framework of such models, students enjoy the flexibility even though classroom interaction is maintained in terms of depth and richness.

The administrators of the academic community ought to create a system of support to students such as technical assistance, online academic advising, and even mental health. These systems increase retention and satisfaction of the students in virtual learning spaces.

Recommendations

Depending on the results, a number of suggestions are given to enhance success of online education in Mardan and other settings:

1. **Enhance Digital Infrastructure:** Government and local institutions should collaborate with telecom providers to improve internet access, particularly in rural areas. A stable and affordable internet connection is the foundation of any successful online education initiative.
2. **Provide Devices to Disadvantaged Students:**Purchasing laptops and tablets can be subsidized, granted, or even loaned to ensure that all the students get the means to have a productive learning.
3. **Instructor Training Programs:** Instructors who are going to use Learning Management Systems (LMS), develop interactive learning content, and interact with students using digital tools such as Zoom, Moodle, or Microsoft Teams should be given comprehensive training.
4. **Adopt Blended Learning Models:** A hybrid model that comprises of online lectures and in-person delivery would help close the flexibility and quality gap. This is particularly significant with technical and science based subjects.
5. **Implement Student Support Services:** The online platforms must also provide 24/7 helpdesks, academic advisory support and mental health counseling to enable students to handle the hardships associated with the isolation, motivation and technical problems.
6. **Standardize Assessment and Feedback:** Universities ought to create effective policies on online testing, where academic honesty and prompt feedback is taking place. The formative assessment may be incorporated by way of quizzes, online discussions, and peer reviews.
7. **Localize Content Delivery:** The materials must be changed in accordance with the sociocultural background of the students. As an example, local language lectures and examples of local contexts (such as Mardan) can help simplify and increase the effectiveness of learning.
8. **Monitor and Evaluate Learning Outcomes:** Frequent assessment of student performance, attendance and feedbacks will assist the institutions to detect the gaps and keep on enhancing the learning experience.

Limitations of the Study

Despite the fact that this work is a really useful information, it is not deprived of its limitations:

- **Sample Size and Scope:** Only 200 students of Mardan were selected to be the sample. The results might not be indicative of all demographic or institutional differences in Pakistan.
- **Data Collection Bias:** The data was self-reported using questionnaires, and this can be exposed to social desirability and reporting biases.
- **Temporal Context:** The analysis was done in a transition period after COVID-19, and the views could change as the digital learning is getting more used to.
- **Technological Evolution:** Since EdTech is rapidly developing, the results can become obsolete because newer instruments are more user-friendly and more accessible.

The limitations can be overcome in future studies with the use of larger and more diversified samples and mixed-method designs such as interviews, classroom observations, and experimental designs.

Future Research Directions

The present research provides new perspectives to be pursued:

- **Longitudinal Studies:** The future study must also follow-up on students across several semesters to determine the long-term effects of online learning on career growth and academic success.

- **Subject-Specific Studies:** Certain subjects (e.g. Engineering, Medicine) might not react to online learning the same as the humanities or social sciences do. Differentiating research can explain these differences.
- **Teacher Perspectives:** The research on the perceptions of instructors of their effectiveness and difficulties when working in the online setting can help to understand the systemic reforms better.
- **Equity in Digital Education:**Studies must assess the effect of socioeconomic or gender or rural-urban differences on online education access and outcomes.
- **Impact on Learning Skills:** Future studies can measure how different learning modes affect critical thinking, collaboration, and self-regulated learning.

Final Conclusion

To sum up, this thesis concludes that face-to-face learning is still better than online learning in regarding to the academic performance of students, engagement, and satisfaction among Mardan University students. Online learning is flexible and accessible though the success of the online learning largely depends on availability of infrastructure, training and continuous support systems.

Digitization of education has to be a strategic and inclusive process especially in under-resourced areas. It is then that online learning will be able to fulfill its potential as an equalizer in the educational industry, as opposed to a divider.

Communities, policy makers, and institutions should collaborate in addressing the digital divide and adopting evidence-based measures to maximize online and hybrid education.

CREDIT AUTHOR STATEMENT

Ayesha Bibi: Conceptualization, Methodology, Data curation, Writing- Original draft preparation, Visualization,Investigation , Validation, Writing- Reviewing and Editing.

CONFLICT OF INTEREST:

The author declares that there are no conflicts of interest regarding the publication of this paper.

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