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# Recommended improvements for online learning based on Omani students' experiences and perspectives

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**ABSTRACT**

The outbreak of COVID-19 prompted a worldwide transition to online education in academic institutions, which had a profound effect on both instructors and learners. This study aims to investigate the perspectives and experiences of students who have undergone emergency remote learning at the University of Technology and Applied Sciences (UTAS) in the Nizwa branch. The study explored students' experiences in four areas: i) the impact of online learning on academic performance, learning skills, communication, health, and motivation; ii) students' preferences; iii) the challenges they faced; and iv) the suggestions they have for enhancing the online learning environment. An online survey was conducted with 447 students, and the data collected were analyzed both quantitatively and qualitatively. This study shows that online learning has impacted students' academic performance, communication, health, and motivation. The findings revealed that students preferred live online lectures and exams but were dissatisfied with the online learning system overall. Content analysis revealed that the most significant challenges faced by students were technical issues, study-related concerns, and learning difficulties. These findings highlight the necessity of enhancing the infrastructure, fostering communication, and implementing effective teaching methods to create a more engaging and productive online learning environment.



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## 1. INTRODUCTION

Online learning is a new learning pedagogy that has emerged in the last two decades, owing to the high progress in technology. In 2015, Baris [1] reported that online learning will be crucial in higher education. It has been found that online learning offers more flexibility than face-to-face classes and makes learning a more active process [2]. This type of learning can be conducted anywhere and at any time; it provides a chance for teachers to interact with learners either asynchronously or synchronously [3], [4]. Therefore, before the pandemic, many universities started using this learning system and transitioning their education from face-to-face methods to online learning for various reasons, including innovative teaching [5], lower learning costs [5], increased student motivation [6], and to be more competitive with technological change [7]. However, the outbreak of COVID-19 in 2020 forced academic institutions worldwide to abandon traditional face-to-face methods and adopt a virtual environment. The entire shutdown of most academic institutions has forced the education system to change. This transition in the education system continued for approximately three years until most institutions were reopened and released from online learning. During this period, educational institutions focused almost entirely on online learning to adapt to the new system of learning.

This sudden shift left students and educators in panic due to the lack of preparation and inadequate planning caused by the lack of time. Literature shows that the pandemic has had a clear impact on students, which varies from one institution to another [8], depending on students' educational background, such as their familiarity with online learning and their level of digital knowledge and skills [9]. These factors also depend on the level of instructors' digital skills [4], facilities, and policies [2].

Previous studies on online learning have investigated the impacts of such sudden transitions on students' experiences in different dimensions, and it was found that online learning had both positive and negative impacts on them. Online learning has been found to improve students' writing skills [5] and technical skills [10], [11], and they have become more independent [5], [11]. However, several studies reported that online learning negatively affects students' mental health [12]–[14] and academic performance [15]. Others have found that online learning reduces the interaction between students and their lecturers [16], leading to low motivation and feelings of isolation [16], which indirectly leads to reduced academic success [6]. However, Villani *et al.* [17] found that during the mid-stage of the pandemic, students became more nervous and depressed during their learning. Another study showed that online learning induces negative emotions such as fear, anger, and helplessness [14] as well as sight problems and back pain [18].

When looking into students satisfaction in online learning, Elzainy *et al.* [19] found that Saudi students at Qassim University reported high satisfaction with online learning and recommended the adaptation of distance learning in their academic system in future. In contrast, Iqbal *et al.* [20] found that online teaching had a negative impact on student satisfaction levels in Pakistani Higher Education Institutes. Another study found that students were more satisfied with traditional teaching methods than with online learning [21]. This is because students might lose their focus and interest and feel stressed due to a lack of time management, which causes missed deadlines for submitting assignments [5]. Rahman *et al.* [22] investigated the perspectives of students in Bangladesh about online learning, which were mostly negative. Therefore, there is a relative difference in students' opinions regarding the benefits of online learning. Some students were less satisfied with online learning and preferred the face-to-face method, while others found that online learning enhanced their confidence and success [23]. Despite these negative aspects, the online learning system proves to be effective in meeting students' needs if it generates high levels of satisfaction and a positive impact on learning outcomes [24].

Higher education institutions (HEIs) in Oman, which are unfamiliar with delivering courses completely online, have found that the sudden transition to online learning is challenging [12], [25]. Most HEIs use traditional teaching methods and online learning is not widely used. The lack of proper technological infrastructure [12], [25], weak digital knowledge and skills of lecturers and students [26], lack of policies [25], and improper training in digital learning tools [25] were found to be a big issues to restrict the implementation of online education in Oman [25]. During the pandemic, students across Oman, especially those who living in rural areas, faced problems with internet access [12]. In addition, some students found it difficult to find a suitable place in their homes for online learning [27]. Another study showed that Omani students prefer face-to-face rather than online learning, because they claim that lecturers interact with them more than online [28]. In addition, they found that using Moodle, Teams, or Google platforms for assessment was unfair, as instructors were very strict and caused students to lose more marks than expected [12].

Many studies have been conducted to show the impact of online learning on Omani student satisfaction. Behforouz *et al.* [29] found that Omani students of the International College of Engineering and Management were satisfied with the online learning system, and it was a very successful experience. Study by Slimi [25] found that both students and lecturers were satisfied with online learning, and students gained different digital skills, which helped them in their learning [25]. In contrast, Malik and Javed [12] found that online teaching during the pandemic increased stress among students because of their fear of failing in their courses [12]. This leads to careful thinking about the quality of online learning delivered. The virtual environment should be effective; otherwise, students will lose their interest in learning. Therefore, lessons learned from students' experience in online learning after the pandemic are important because they would assist HEIs in becoming more resilient and better equipped to deal with such crises in the future. Students' perspectives, satisfaction, and experiences can be considered as key indicators of the effectiveness of the online learning environment [30].

Looking into the impact of online learning in different dimensions of the learning process, such as academic performance, time management, student engagement, health, and skill development, can provide insight into the extent to which students were successfully engaged in the online learning process. Although the literature on online learning during the COVID-19 pandemic has provided some insights into the challenges and needs of students, there is still a research gap regarding students' perspectives and experiences with the online learning system after having used it for approximately two years. This study aimed to address this gap by investigating students' perspectives on how the pandemic has affected their learning experiences, with the ultimate goal of improving future online teaching practices in HEIs in Oman.

The University of Technology and Applied Sciences (UTAS) returned to traditional teaching methods in February 2022. Over the course of two years of using distance learning, students adapted to the new system of learning and were able to express their opinions about their experience in online learning. It is crucial to assess students' experiences with the online learning environment and determine the extent to which UTAS succeeded in providing an effective learning experience. To achieve this, the current study utilized an online survey to address the following research questions (RQ):

i) RQ1: How did online learning impact students' perspectives and experiences in four dimensions of the learning process: academic performance, learning skills, health, and learning motivation?
ii) RQ2: What were the students' preferences for learning in online classes?
iii) RQ3: What were the challenges students faced during their online learning?
iv) RQ4: What are students' suggestions for improving the online learning process?

## 2. METHOD

### 2.1. Participants

The participants were from University of Technology and Applied Sciences-Nizwa, a HEIs in Oman that uses a face-to-face teaching method combined with a learning management system (Moodle). During the pandemic, all courses were inverted to e-learning, using Moodle and Microsoft Teams to create online classrooms. The survey was distributed across UTAS-Nizwa to all students at different levels (foundation, first diploma year, second diploma year, advanced diploma, and bachelor's degree) and from different departments (engineering, information technology, and business departments). The data were collected at the end of the lockdown on the last day of teaching in the first semester of the academic year 2022/2023. An online survey was constructed using Google Forms and distributed to all the students via email. Participation in the survey was voluntary and there was no punishment or obligation related to answering the survey questions. A total of 447 students participated in this study.

Table 1 summarizes the basic information of participants. Male students represented 55% of the sample, whereas female students represented 45%. The majority of students were at the diploma first and second levels (72%), followed by the advanced diploma (12%), and bachelor's level had the same percentage of foundation students (8%). The academic disciplines of the participants were from the engineering department (51%), business studies (30%), information technology (11%), and foundation years (English, math, and computing skills) (8%) before they moved to specialize in one of the academic disciplines.

Table 1. Basic information of participants

| Variable | | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 244 | 55 |
| | Female | 203 | 45 |
| Study level | Foundation year | 37 | 8 |
| | Diploma first year | 193 | 43 |
| | Diploma second year | 127 | 29 |
| | Advanced diploma | 55 | 12 |
| | Bachelor | 34 | 8 |
| Department | Foundation | 37 | 8 |
| | Engineering | 228 | 51 |
| | Business Studies | 134 | 30 |
| | IT | 48 | 11 |

### 2.2. Measurements and data analysis

To investigate students' perspectives and experiences with online learning systems, an online survey consisting of 30 closed-ended questions and two open questions was used. The closed-ended items explored the following:

- How did online learning impact students in four dimensions of learning process: academic performance (7 items), learning skills (8 items), health (4 items), and learning motivation (3 items)?
- Students' preferences for learning in online classes (5 items) and mode of online learning in the future (3 items).

Students were asked to select one option from a five-point Likert scale (5=strongly agree, 4=agree, 3=not sure, 2=disagree, and 1=strongly disagree). Means and standard deviations were calculated for students' responses, and the means were interpreted as: strongly disagree (1.00-1.80); disagree (1.81-2.60); neutral (2.61-3.40); agree (3.41-4.20); and strongly agree (4.21-5.00) [31]. The data were analyzed using IBM SPSS statistical software for descriptive analysis of the quantitative variables in the survey. Pearson correlation coefficient was calculated. The reliability of the survey items was found to have a Cronbach's

alpha value of 0.82, indicating a good level of consistency. The two open-ended questions were used to identify the challenges students faced while learning online and their suggestions to improve the virtual learning environment at the university. Responses to the open-ended questions were received from students, and qualitative analysis was performed by identifying the trends in their comments and grouping them into themes and sub-themes, which were coded and obtained, as shown in Tables 2 and 3.

Table 2. Descriptive statistics of academic performance

| Statements | Mean | SD |
|---|---|---|
| My understanding of the basic concepts in different subjects increased after applying online learning. | 2.60 | 1.46 |
| I can understand the difficult materials explained by the lecturer in online learning better than if I had to face the lecturer physically. | 2.37 | 1.47 |
| I spend more time in front of the screen in online learning than in face-to-face learning. | 3.84 | 1.27 |
| I have more time to study and understand during online learning. | 3.09 | 1.51 |
| I find online participation and discussion with my lecturer better than face-to-face. | 2.82 | 1.52 |
| My academic performance and grades improved after I started studying online. | 2.62 | 1.51 |
| In general, using online learning helped me a lot in increasing my academic knowledge. | 2.75 | 1.51 |
| Overall | 2.87 | |

Scale: 1=strongly disagree, 2=disagree, 3=not sure, 4=agree, 5=strongly agree

Table 3. Descriptive statistics of academic performance

| Measures | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Understanding of the basic concepts | 1 | 0.80** | 0.22** | 0.74** | 0.69** | 0.86** | 0.80** |
| Understanding from teachers | 0.80** | 1 | 0.19** | 0.69** | 0.70** | 0.80** | 0.74** |
| Time spent in front of the screen | 0.22** | 0.19** | 1 | 0.26** | 0.20** | 0.25** | 0.19** |
| Study time | 0.74** | 0.69** | 0.26** | 1 | 0.71** | 0.81** | 0.73** |
| Online participation and discussion | 0.69** | 0.70** | 0.20** | 0.71** | 1 | 0.75** | 0.70** |
| Academic knowledge | 0.86** | 0.80** | 0.25** | 0.81** | 0.75** | 1 | 0.81** |
| Academic grade | 0.80** | 0.74** | 0.19** | 0.73** | 0.70** | 0.81** | 1 |

**p<0.001

## 3. RESULTS AND DISCUSSION

### 3.1. Impact of online learning on students' academic performance

The academic performance dimension in this study included seven items related to students' time spent learning the course, understanding basic concepts, interacting with lecturers, understanding course materials, improving grades, and increasing knowledge. The descriptive analysis in Table 2 shows that overall respondents scored below neutral (i.e., below 3 points) on a 5-point Likert scale (M=2.87), which means that most students agreed that online learning had a negative impact on their academic performance. All items related to performance had mean scores varying between 2.37 (lowest) and 3.84 (highest). Students faced difficulties in understanding their subjects and did not comprehend the explanations of their lecturers via online learning, although they spent a long time in front of the screen to take notes and attend the lectures.

On the other hand, the correlation between variables ranged from 0.19 to 0.86, and they were statistically significant at $p<0.001$, as shown in Table 3. Students' level of understanding of their subjects during online learning had the highest positive correlation with improved academic knowledge ($r=0.86$, $p<0.001$). There was also a significant positive correlation between understanding lecturers and obtaining a higher grade ($r=0.8$, $p<0.001$).

However, getting a good grade in online learning was weakly related to the amount of time students spent in front of a screen ($r=0.19$). The relationship between getting a good grade in online learning and the amount of time spent in front of the screen was weak ($r=0.19$). The study showed that achieving a good grade and increasing knowledge were associated with the level of understanding of the basic concepts of the course and the ability to understand the lecturer in online classes.

### 3.2. Impact of online learning on students' learning skill

The learning skills dimension focuses on computer skills, group work, independence, and searching for information and learning resources. According to the descriptive analysis in Table 4, on average, the participants scored around 3 points (M=3.04) on a 5-point Likert scale, indicating that 50% of the students agreed that online learning increased their skills and became more independent in their learning, while the remaining 50% were unsure about their skills and still depended on their lecturer more than searching for information from online resources. As shown in Table 4, only three of the eight items scored higher than three points, and students generally expressed disagreement with most of the items. The lowest score was associated with working and learning in the groups, with an average of 2.70 points.

Table 4. Descriptive statistics of online learning skills

| Statements | Mean | SD |
|---|---|---|
| I have the ability to find more information about the subjects when I study online. | 2.97 | 1.47 |
| I feel I am no longer dependent on the lecturer to understand the materials of my courses. | 3.40 | 1.30 |
| I find it easy to participate and discuss with my lecturer virtually rather than face-to-face. | 2.82 | 1.52 |
| My ability to communicate with my classmates has increased more in online learning. | 2.82 | 1.51 |
| I liked working and learning in groups (group work) during online learning. | 2.70 | 1.48 |
| I find it easy to find learning tools and resources in online learning. | 3.04 | 1.22 |
| My computer skills have improved even more after studying online. | 3.65 | 1.31 |
| I find that online learning increases the skills that I need to study online. | 2.93 | 1.42 |
| Overall | 3.04 | |

Scale: 1=strongly disagree, 2=disagree, 3=not sure, 4=agree, 5=strongly agree

It appears that students found online communication with lecturers and peers was difficult and did not improve during the implementation of online learning. Students expressed that engaging in discussions with their lecturers was not easy, and that they did not prefer to cooperate with their peers in groups. According to one study, collaborating in groups during online education has been shown to foster the development of leadership abilities, improve communication between students, and increase student satisfaction through collaboration [32]. There are many reasons for inadequate communication, such as poor internet connections [16], unconfident and uncomfortable feelings when using online communication, and lack of interaction between lecturers and students during online classes [5]. In addition, low motivation for learning may hinder students' ability to engage effectively [3], [33]. Students indicated in open-ended questions on the survey that they experienced difficulties with internet access, and that online teaching was not successful in motivating them to participate and engage in online lectures. It is evident that cooperating with peers online and communicating with instructors online are essential for creating a more productive and appealing online learning environment.

### 3.3. Impact of online learning on students' health

The participants were asked about their health during online learning. Table 5 shows the overall mean score of (M=3.28), indicating that students' health was affected during remote learning. The results illustrate that online learning has a negative impact on university students' health. Numerous students reported experiencing back pain and vision problems as a result of sitting for extended periods in front of the screen. Typically, when students experience discomfort in any part of their bodies, their ability to concentrate during lectures is reduced, leading to a decrease in their motivation to learn. Therefore, it is clear that students' well-being is crucial for the effectiveness of an online learning program.

Table 5. The result of descriptive statistics in health

| Statements | Mean | SD |
|---|---|---|
| I have gained weight when learning online. | 2.96 | 1.406 |
| I suffer from back pain due to sitting for a long time in front of the computer. | 3.69 | 1.431 |
| I had to make eyeglasses or change my glasses because of online learning. | 3.00 | 1.491 |
| I find that online learning affects my health. | 3.47 | 1.473 |
| Overall | 3.28 | |

Scale: 1=strongly disagree, 2=disagree, 3=not sure, 4=agree, 5=strongly agree

### 3.4. Impact of online learning on learning motivation

Table 6 shows that students' learning motivation (M=3.14) was negatively affected by remote learning. The highest mean score (M=3.73) was for feeling bored during online classes, while the other two statements received below 3 points. These findings indicate that most students had low motivation levels for learning in virtual environments. The main reason for this demotivation is the feeling of boredom during online lectures, which decreases students' motivation to attend their next online lecture. When students are less motivated during learning, they lose interest in understanding, communicating, and studying well, leading to low academic performance. These results are consistent with those of other researchers who reported that students with high learning motivation had better academic performance and interacted effectively during lectures [10], [33]. In addition, high interactivity in online teaching leads to increased learning motivation and helps to create an efficient learning environment [6]. Thus, academic staff should consider the motivation of students while delivering online lectures. Thus, more activities, engagement, interaction, and teaching approaches must be considered in online learning.

Table 6. Descriptive statistics of learning motivation

| Statements | Mean | SD |
|---|---|---|
| I am not motivated to attend the teacher's lecture on online classes. | 2.93 | 1.39 |
| I feel more anxious about the electronic exam than the paper exam. | 2.75 | 1.45 |
| I feel bored while attending the virtual lecture. | 3.73 | 1.39 |
| Overall | 3.14 | |

Scale: 1=strongly disagree, 2=disagree, 3=not sure, 4=agree, 5=strongly agree

### 3.5. Students' preferences for learning in online class

Students were also asked about their preferences while learning in the online class. The analysis in Table 7 shows that the least preferred part of online learning is watching a recorded video. Most respondents preferred live online lectures rather than recorded lectures. They also found that reading materials was better than watching recorded videos. This is probably because students found that watching recorded videos makes them bored, tired, and suffered from a lack of focus, while live online classes save time and allows them to interact with instructors and classmates. This result conflicts with Muthuprasad *et al.* [11] who found that the majority of students preferred recorded lectures to live classes and reading materials because it gives them more flexibility in learning. In addition, students did not prefer watching recorded videos of lab experiments, especially those from the engineering department. Watching experiments did not develop their problem-solving skills or, laboratory and research skills. Consequently, institutions need to enhance their online platforms and seek alternative methods for conducting laboratory experiments efficiently. Furthermore, most students preferred online exams to paper exams. Students found a difference between paper and online exams. They expressed feeling more comfortable during online examinations than paper examinations.

Table 7. Descriptive Statistics of students' preferences in the learning process

| Statements | Mean | SD |
|---|---|---|
| I prefer to watch a video about the experiment rather than do the experiment by myself in the lab. | 2.25 | 1.38 |
| I prefer reading the topic of the lesson to understand it rather than watching a recorded video about it. | 3.24 | 1.25 |
| It is better to follow the recorded lecture than to attend the online class. | 2.60 | 1.30 |
| I feel more comfortable attending my lectures from home. | 3.20 | 1.57 |
| I find electronic exams are better than paper exams. | 3.60 | 1.49 |
| Overall | 2.98 | |

Scale: 1=strongly disagree, 2=disagree, 3=not sure, 4=agree, 5=strongly agree

### 3.6. Student's preferences on the mode of online learning

Table 8 shows the students' preferences for different online learning modes. Students were given three options: blended learning, where they could take some courses online and others on campus; learning the theoretical part online and the practical part on campus; and learning completely online. The three options received below-mean scores (M=2.61), indicating that students were slightly satisfied with any mode of online learning. The second option, learning the theoretical part online and the practical part on campus, ranked highest (M=2.97), followed by studying all courses online (M=2.72), and blended learning ranked lowest (M=2.15). The results indicate that the majority of students preferred traditional learning methods, and if they had to take online classes, they preferred to study the theoretical part online and the practical part on campus. Students' feedback revealed that they were dissatisfied with the online learning system and did not want to use it in the future. Most students disagreed with the blended learning system and stated that it was challenging to manage their time by using this mode.

### 3.7. Challenges students faced during online learning

The analysis of open-ended questions (Table 2) revealed that students' responses indicated challenges in various areas such as health, study-related issues, the learning process, the environment, and technical problems. Figure 1 presents the percentage of responses to each challenge. The most significant challenges were technical issues (31%), including problems with laptops and devices, as well as limited internet access in certain regions, which gave students a negative outlook on their online learning experience. Additionally, many students indicated that poor networks in some regions forced them to move from their homes to areas with better connectivity, which, in turn, generated additional expenses for accommodation and transportation.

Table 8. Descriptive statistics of students' preferences on the mode of online learning

| Statements | Mean | SD |
|---|---|---|
| I prefer to continue my learning by combining the two methods (physically and virtually). | 2.15 | 1.34 |
| The best way to study is to learn the theoretical part online and the practical part on- campus. | 2.97 | 1.42 |
| If I have the opportunity to choose, I would like to continue my learning online in all subjects | 2.72 | 1.69 |
| Overall | 2.61 | |

Scale: 1=strongly disagree, 2=disagree, 3=not sure, 4=agree, 5=strongly agree

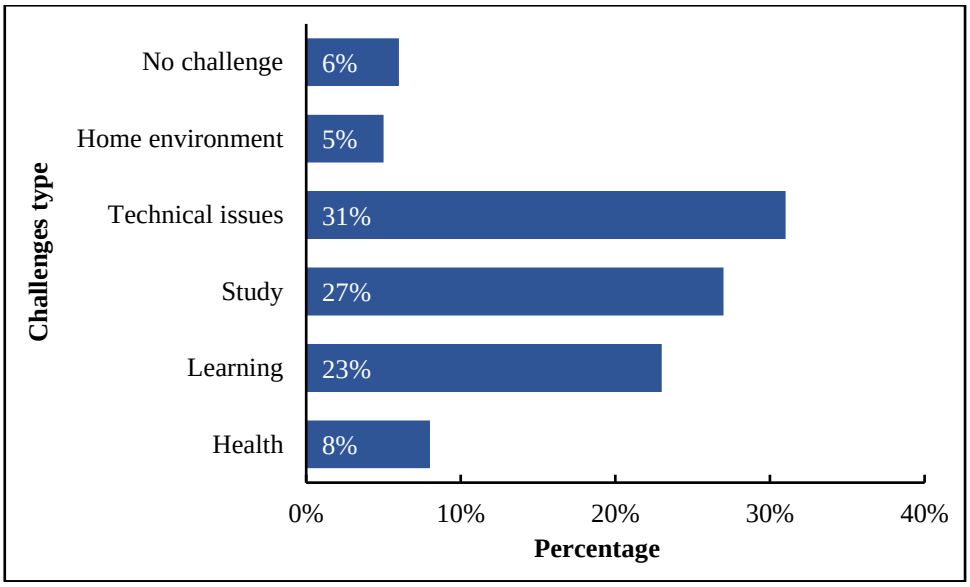


Figure 1. Challenges students faced during online learning

The second challenge in virtual learning is the issue of effective study, as presented in Figure 2. The findings showed that students' emotions and motivations, time management, focus, and understanding during lectures, as shown in Figure 2(a) were important factors that influenced students' success in online learning. The results indicated that online learning hindered students from studying well because of the difficulty in understanding concepts and focusing on lectures. Students reported feeling bored, stressed, and unmotivated, which affected their ability to grasp concepts and understand their subjects well. Moreover, students struggled with time management because of the increased workload, which included materials, time spent on homework, and inflexible timetables. This negatively affects performance and health. Additionally, students reported that it was challenging to balance and manage their studies and personal lives, as they had to take care of their siblings, parents, and study simultaneously.

The learning process is another obstacle that students encounter in online learning. Learning challenges were categorized into four areas: assessment timeline and difficulty, lecture time and load, communication, and teaching methods. Quality of learning is associated with the quality of teaching and assessment. This was evident from the students' responses, which indicated that the assessments and teaching methods were the most challenging, as shown in Figure 2(b). Students commented that online learning makes coursework, exams, and assignments more challenging and denser. Participants found that the number of topics in each course was dense, and that the lecturer's explanations were too fast for students to understand. Furthermore, the students indicated that online learning made them feel passive, bored, depressed, and unmotivated. The duration of the lectures was too long, making it difficult for the students to remain focused and motivated. Some students also reported poor communication with their instructors, making online learning a less enjoyable experience than face-to-face learning. Additionally, they indicated that they did not have sufficient time to complete their exams and submit their answers, especially when technical issues arose, causing them to lose marks and receive low grades.

Physical and mental health are other challenges faced by students. According to the students' experiences, online learning induced mental and physical health problems, such as back pain, problems in the eyes, and headaches due to sitting for a long time in front of the screen. Moreover, online learning causes mental health problems, such as feelings of stress and anxiety, lack of interest, boredom, and low motivation towards learning.

The home environment was the lowest recorded challenge faced by the students during online learning. Students did not find an appropriate room or place to study online in their homes. The social culture in many regions in Oman does not support students in getting a convenient and quiet study environment, especially for some female students who have a responsibility to take care of the house, whether by helping their mothers take care of their siblings or by performing housework tasks. Although the results of this study showed that a significant number of students had negative experiences with online learning, many students found the mode of learning convenient and advantageous. The students who considered online learning beneficial were those who lived in areas with high internet access. Online learning allowed them to save money because they stayed at home, thereby reducing transportation and accommodation expenses. Furthermore, online learning provided these students with the opportunity to eat healthy food and get adequate sleep. Therefore, high-speed internet access, a comfortable environment, and good health are the primary advantages of online learning.

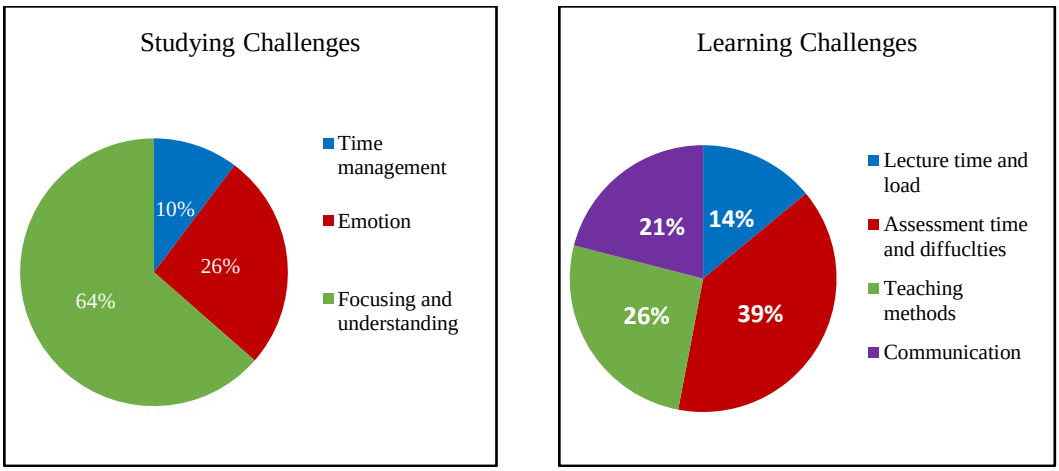


Figure 2. Areas of challenges students face in their (a) studying and (b) learning during online education

### 3.8. Suggestions to make online learning more effective

The second open-ended question asked the students to provide suggestions to enhance the effectiveness of online learning. The analysis of the open-ended questions is illustrated in Table 3 of the supplementary information, and the results of the analysis are presented in Figure 3. Most suggestions focused on improving the areas of teaching techniques, learning process, mode of learning, and technical support.

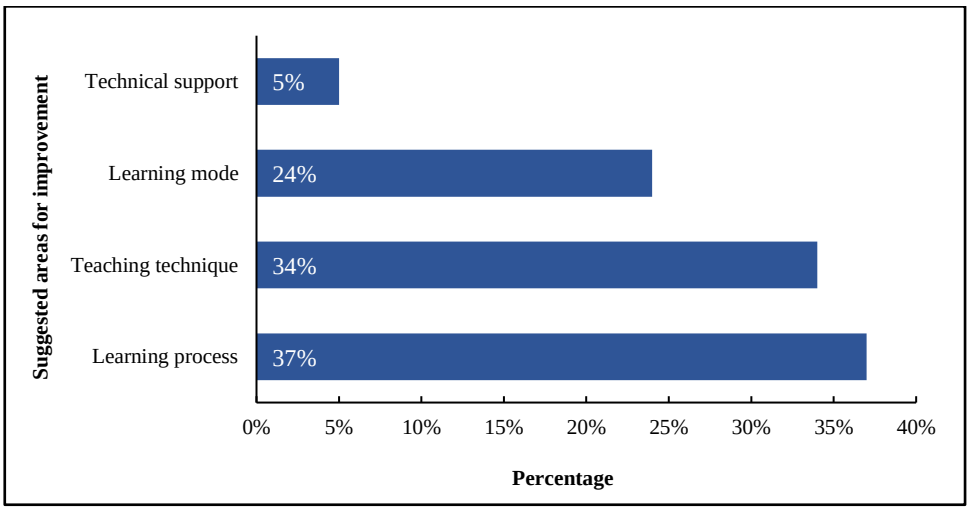


Figure 3. Areas suggested by students to make online learning more effective

The majority of the participants indicated that the process of learning in a virtual environment requires improvement. Students emphasized that assessment strategies, lecture duration, and resources in the learning process need to be considered in Table 3. The assessment area was a major concern, and students suggested various topics for improvement. They emphasized the need for online exams to be compatible with online learning; the importance of formative assessments for skill development; extending the submission deadlines for online assessment; and providing clear instructions, guidance, and policies for online assessment, which is crucial for creating an effective online learning system. Another suggestion for improving the learning process is to enhance learning resources. Learning materials and library resources should be available to students and can be opened by using different devices because students commented that they faced difficulties accessing some resources and diagrams on their mobile phones, which were the most commonly used devices for online learning. Furthermore, students suggested reducing the duration of lectures, and there must be a sufficient amount of time between lectures (around 30 minutes) so that students can prepare well for the next lecture.

The second area of improvement that students frequently suggested was teaching methods. Students commented that online teaching differs from face-to-face teaching in various ways, such as poor communication, inability to comprehend fundamental concepts from the instructor's explanation, and low motivation for learning. Although the university provided online teaching tools like Moodle and Microsoft Teams, students found the overall online learning experience unsatisfactory. It seems that academic staff members lack experience in using digital tools for instruction, making it quite challenging. Students emphasized that lectures should be interactive and engaging to understand, with increased interaction between lecturers and their classmates. To achieve this, lecturers must invest quality time in designing well-structured, interactive, and relevant lectures. Additionally, the students highlighted the need for support and consideration from their lecturers for a positive online learning experience. Students' engagement with tutors is a crucial factor for success in a virtual environment. According to Özhan and Kocadere [6], involving students and keeping them engaged in online learning significantly enhanced their understanding and improved their learning performance.

The fourth area that the students highlighted was more of a request than a suggestion, and it was related to the learning mode, where many students expressed their desire to engage in face-to-face learning, while a few of them proposed blended learning as a suitable alternative to complete online learning. This suggests that the university was not successful in attracting students' attitudes towards online learning, even after they had gained the experience. The lowest area that students mentioned for improvement was technical support, despite it being a significant challenge they encountered during online learning.

### 3.9. Recommendation for future effective online learning

Figure 4 illustrates a successful online learning model that is extracted from analyzing students' perspectives and experiences with online learning. To ensure the success of an online learning environment, it is crucial to consider four key elements: quality of teaching and assessment, active engagement, high motivation, and effective communication skills. Based on the findings of this study, the following recommendations are suggested to enhance teaching and learning effectiveness in virtual environments for future implementation.

i) Offer a diverse range of online courses across different departments, making them optional for students. Every two semesters, new courses can be made available to be taught online. This will enable the majority of academic staff to familiarize themselves with the virtual environment and modify the courses to be prepared for online learning.
ii) There should be continuous training for lecturers as part of staff-development programs. This will enable the academic staff to become more competitive in online teaching.
iii) Select online course instructors who exhibit enthusiasm for online teaching and are eager to incorporate innovative ideas, platforms, and resources to promote student engagement in online lectures, while continuously refining course materials and assessment procedures. This will allow lecturers to gradually and effectively redesign their course materials and assessment structures for online teaching.
iv) Collaboration and collective learning among academic colleagues should be encouraged by facilitating exchanges of knowledge and experience through seminars, workshops, conferences, and interactions.
v) Establish a clear policy and guidance at the university level to define the learning process and assessment techniques to enhance the quality of teaching.
vi) Implementing flexible scheduling, shorter online class durations, a variety of platform alternatives, digital tools, and diversified resources to meet the unique needs of students.
vii) To augment student-teacher interactions and performance, it is imperative to improve online communication methods, encourage group activities, and establish interactive online class activities, forums, conversations, emails, and discussions.

viii) All forms of assessment should be conducted online, using different tools to evaluate student progress. Moreover, to improve student engagement and comprehension, and reduce stress, it is essential to establish congruence between online learning content and examinations. This can be achieved by providing a range of online assessment methods and extending assignment deadlines.
ix) Explore alternative modalities for experiential learning or laboratory assessments such as interactive video recordings, simulations, blended learning methodologies, or interactive virtual laboratories that use artificial intelligence technologies to imitate real laboratories.
x) Collaborate with internet service providers to improve connectivity and speed and provide academics with mobile-friendly online course delivery platforms.

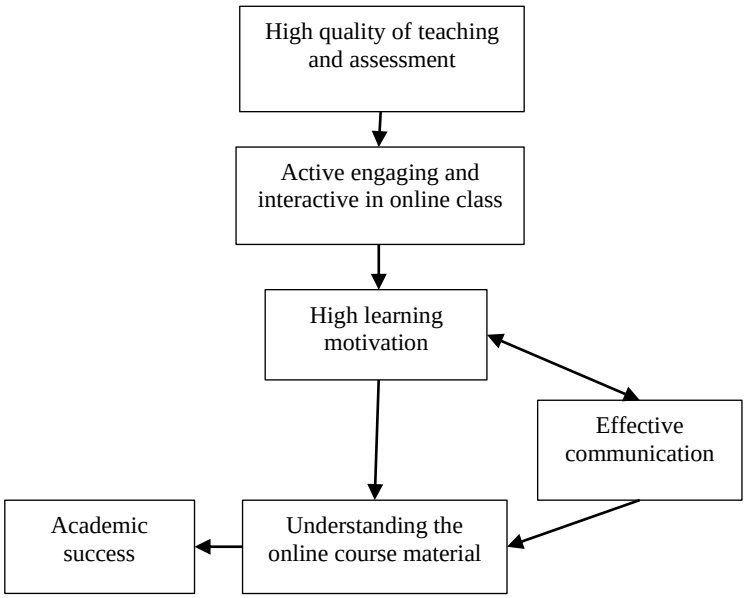


Figure 4. Model leads to success in online learning environment

## 4. CONCLUSION

Drawing on insights gathered from student feedback at UTAS-Nizwa, it is evident that students had negative experiences with online learning during the pandemic. The study revealed that online learning has a detrimental impact on students' academic performance, skills, motivation, and health. Students reported that they struggled with understanding subjects, comprehending lecturers' explanations, and experiencing health issues such as back pain, vision problems, and headaches. Furthermore, students reported low motivation levels, primarily due to feelings of boredom during the online lectures. While some students demonstrated improved learning skills and became more independent in their studies, others struggled with online communication and collaboration with their peers and instructors. The study also revealed that students preferred live online lectures to recorded videos and exams. However, most students were dissatisfied with the online learning system and preferred the traditional learning methods.

The open-ended questions revealed that the most significant challenges faced by students were technical issues and study-related concerns, including emotions, motivation, time management, concentration, and understanding. Additionally, the dimensions of the learning process pose several challenges. The most challenging aspects of this area are online communication, teaching methods, and assessment. Many suggestions have been offered by students to enhance online learning, including refining teaching and assessment strategies to foster interactive and engaged learning experiences in virtual classes. Additionally, students have emphasized the necessity of engaging in lectures, thoughtful communication, and effective assessments to optimize their learning outcomes.

The results of this study imply that although universities acquired experience during the lockdown period, extensive preparation is still required to enhance the effectiveness of online learning. The findings of this study reveal four crucial elements of an effective online environment: quality of teaching and assessment, active engagement, high motivation, and effective communication skills. Improving the efficiency of online learning in universities requires major work to meet the needs of online education, including upgrading the teaching philosophy and practice. It is crucial to provide continuous training,

workshops, and seminars to academic staff to equip them with digital skills required for technological adaptation and innovation. Therefore, it is critical to develop and maintain updated online learning policies, processes, and standards. Implementing these principles will help ensure the sustainability and acceptance of online teaching and learning in university settings.

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