

# Challenges Faced in Online Education during COVID-19: A Case Study of Taibah University, Saudi Arabia

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## Abstract

This study aimed to find out if distance learning has been smoothly adopted by instructors in Saudi Arabia using e-learning. The study adopts a quantitative approach and uses a descriptive survey design and was carried at computer science and engineering department of Taibah University, Saudi Arabia. Moreover, the study incorporates 200 participants comprising of students and faculty members. Out of 200, 150 were students and 50 were the faculty members. A questionnaire was administered via email and WhatsApp to the study participants. The data collected was analyzed using Statistical Package of Social Sciences version 23.0. Descriptive statistical analysis using frequencies and bar graph was used to represent the data moreover independent sample t-Test was administered to compare group B and C. The study findings showed that 80% of the faculty members were able to cover the course using distance learning, moreover about teaching online complexity balancing act 50% agreed that the students were the main challenge however 65% reported that it was the lab. This paper illustrates some possible keys for more interactive and effective distance learning in the current crisis.

## Keywords

Distance Learning, COVID-19, Saudi Arabia, Higher Education, Applied Course

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## 1. Introduction

In late 2019, several official organizations have informed the seriousness of a newly discovered coronavirus (COVID-19) that presents a significant threat to

public health, and the need for taking immediate action (Spinelli & Pellino, 2020). As an attempt to reduce human contact and physical communications, which in turn assists in reducing the spread of the virus, the affected countries have imposed different levels of restrictions on all sectors including education (Bozkurt et al., 2020). The sudden conversion from traditional classroom-based education into distance learning throughout the pandemic of COVID-19 was the decision that has been made by almost all countries around the world (Bozkurt et al., 2020; Chick et al., 2020). This conversion has brought various thoughts about the challenges and future expectations of education in general and higher education in specific. For example, universities in Saudi usually receive a great number of students from rural areas around the cities. Most of these areas are still not fully structured for an acceptable quality of Internet connection (Akhter, 2020). Also, there were other issues related to online learning, such as lack of teamwork, dependence on a digital library, and methodological, behavioral, and technical challenges (Khalil et al., 2020; Tanveer et al., 2020). Conversely, some students accounted that it saved their traveling time and provided comfortability of studying from home that reduced their anxiety, and improved their results (Khalil et al., 2020). The debate between the advocates of traditional education and online education is conventional. This global mandatory experience of transformation to completely online learning has renewed this debate with more compel (Manion, 2019). The bold argument is whether there will be a return to the traditional education, or this will be a forever conversion. Although many scholars have shown the effectiveness of online learning throughout the previous decade, the current situation can be even stronger motivation to adopt blended learning as minimum expectations (Castro, 2019). Blended learning is the education style wherewith tradition on-campus learning, technologies, and online learning is integrated for teaching purposes (Evans et al., 2020). Though they are often used reciprocally, “eLearning” is distinguished with “Distance Learning” as eLearning provides training and educational programs utilizing electronic technologies such as Intranet or other platforms, CDs or DVDs, emails, and discussion forums in synchronous (real-time learning) or asynchronous (self-learning) manner (Moore et al., 2011). Whereas, distance learning is direct communication between the teaching staff and students through the internet via an online communication platform and the student attends their courses online throughout the term (Traxler, 2018). Despite having their benefits, remote learning and distance learning require scheduled class time with a high level of accountability and responsibility, while online learning and e-learning are more flexible. For efficient delivery of information to the students, the instructor is required to incorporate emergent ways of blended teaching for various types of practical-based and theory-based curriculums (Bruggeman et al., 2021). The Kingdom of Saudi Arabia 2030 vision and the National Transformation 2020 program focuses on national plans to support a sort of learning approach in the higher education sector, including e-learning (Vision 2030, 2016). From the beginning of this

pandemic, there was a sudden switch to distance learning, which followed a full distance study semester and then 50% in lab classes for practical courses such as programming II. Based on National Transformation Program 2020, this study aimed to find out if distance learning has been smoothly adopted by instructors in Saudi Arabia using e-learning. Also, if it is helpful for students in cultivating their skills e.g. programming, the anticipation of various ideas, assimilation of discussions, etc. Moreover, associations between course contexts, the relationship between the students among themselves and with their faculty members were studied. The online practical-based courses have been a challenge in various disciplines, e.g., nursing, medicine, computer programming, etc. for which solutions have been suggested by many scholars and researchers (Farooq et al., 2020; Kabiri & Wannous, 2017; O'Doherty et al., 2018). However, this study is different as it conducts a cognitive survey at university level to analyze the effect on both students and instructors. This study adds to the body of knowledge in the area of scientific education that other researchers may refer to in light of the current epidemic. As it gives pertinent information on how to equip science instructors to counteract the effects of COVID-19 on their teaching abilities, it may also be attention-grabbing for the ministry of education. Based on the aim of the study, following research questions were formulated:

Q1. Were the students able to acquire the skills of programming 2 course via distance learning during the pandemic?

Q2. What challenges were faced by students and the faculty members during distance learning in terms of resources and content of online classes at Taibah University, Saudi Arabia?

## 2. Background

Distance education or distance learning is defined as a field of education based on pedagogy and technology and the design of educational systems that are effectively incorporated to deliver education to students who are not physically "on-site" to receive their education (Traxler, 2018). Saudi Arabia has developed the education sector and applied distance learning by replacing the entire curriculum with e-learning materials in the current curricula in universities. Among the vision of 2030, is the expansion of distance education programs in an unprecedented way. This has led to the spread of distance education centers linked to government universities throughout the Kingdom of Saudi Arabia, which has made it easier for many individuals and residents to enroll in educational programs (Vision 2030, 2016). In line with this mission, several universities launched distance learning before this pandemic, such as the University of Dammam has had distance learning since 2010, Electronic Saudi University has it since 2011, and King Abdulaziz University started distance learning in 2016 in some colleges such as Faculty of Arts and Humanities. Also, Imam Mohammad Ibn Saud Islamic university considered that making education accessible to all who wish from all over the Kingdom is a major goal for it, so it approved a new

strategic vision that is to integrate technology with education, which allows students to learn effectively and easily from anywhere through the Internet and various technologies. After COVID-19 caused the closure of universities in the Kingdom of Saudi Arabia, distance learning strategies were adopted by the Ministry of Education for students to pursue studies based on curricula and other regular educational activities when universities and other educational institutions were closed. The education moved to distance learning using many platforms such as Google classroom, blackboard, Zoom, etc.

### 3. Material and Methods

#### 3.1. Study Design and Setting

This study is quantitative in nature and uses descriptive survey design. Moreover, study was carried out at Taibah University, Saudi Arabia. All the participants before participation were informed regarding the study and had given consent to participate.

#### 3.2. Study Sample and Sampling Technique

For this study, the estimated sample size is derived from the online Raosoft calculator. The recommended sample size was 132 with a 95% confidence level, a 5% margin of error, based on a response rate of 50%. A total of 200 study participants were approached out of which 150 were students and 50 were the faculty members from the college of computer science and engineering at Taibah University. The 200 respondents of the survey include 120 (60%) females and 80 (40%) males. The age of the students was ranging from 21 to 39 years old and the age of faculty members was ranging from 40 to 55 years old. The online survey was employed through a simple random sampling technique to reach the respondents since the outbreak did not permit physical contact with individuals. At this time the study was categorized into three groups. In this study, 20% were group A (Programming 2 skill levels), 35% were group B (Distance Learning) and 45% were in group C (Blended Learning). The demographic characteristics of the respondent are shown in **Table 1**.

#### 3.3. Study Instrument and Data Collection

Two different structured questionnaires were created and used as research tools to collect the data from students. The first questionnaire was for the faculty members and the second was for the students. For faculty members, the questionnaire aimed at finding out their opinion about distance learning, especially how they feel about their recent experience. The first part of the questionnaire was related to the skills that need to be incorporated in every student via programming 2 course. Secondly how successfully these skills were incorporated in the students. The last part of the questionnaire asked for their suggestions for improvement in programming 2 course. Then reasons selection or other presented for the students to give reasons for skills success or failure. Finally, we

**Table 1.** Demographic of respondents.

	Variable	N (%)
<b>Sex</b>	Female	120 (60%)
	Male	80 (40%)
<b>Age</b>	<30	68 (34%)
	30 - 39	60 (30%)
	40 - 49	40 (20%)
	≥50	32 (16%)
<b>Group A</b>	Programming 2 skill levels	40 (20%)
<b>Group B</b>	Distance Learning	70 (35%)
<b>Group C</b>	Blended Learning	90 (45%)

asked them if there are any suggestions for improvement from programming 2. The other questionnaire, results were collected from 150 students who studied programming 2 during COVID-19. These students were further divided into three groups Group A (25), Group B (50) and Group C (75). Group A students already studied programming 2 course before COVID-19, group B studied full distance during the second semester although group C attended 50% distance and 50% in class and also attended labs during the third semester. The questionnaire given to the students consisted of close ended questions and were compiled on a 5-point-Likert scale with 1 strongly agree, 2 agree, 3 strongly disagree, 4 disagree, 5 neutral. The questionnaire was designed on Google forms and were distributed and collected via email and whatsapp (**Appendix**).

### 3.4. Data Analysis

The data collected was analyzed using Statistical Package of Social Sciences version 23.0. Descriptive Statistical Analysis using percentages represented by bar graphs were used to reveal the findings of the study. Also, independent sample t-Test was administered to compare group B and C.

### 3.5. Validity and Reliability of the Instrument

The internal consistency of the questionnaire was checked through Cronbach's Alpha and the value of all the items were above 0.7 which deems it fit for the current study. Moreover, validity of the questionnaire was checked by field experts from the same university. After receiving their feedback, few changes in terms of language were done and then the questionnaire was emailed to the participants of the study.

### 3.6. Ethical Consideration

The study's aim and objectives were explained to all the participants before the commencement of the study. Moreover, written consent was taken from all the participants of the study before the study took place.

## 4. Results

### 4.1. Faculty Members

Based on the survey questions in **Table A1 (Appendix)**, among the faculty members, 65% had some concerns about teaching online. A total of 80% of the faculty was able to cover the rest of the course using distance learning as at the start of the pandemic about a third of the curriculum was remaining. However, about 20% had to cancel part/s of the course's syllabus, due to some difficulties in teaching them online. For teaching online complexity balancing act, 50% agreed that the main challenge was students and 65% reported it was teaching lab. Regarding the technology challenge as expected, that most faculties had enough experience to use the technology due to their specialization in computers. Moreover, there were training lectures at the university and college level for on the blackboard and solving any problem that a member of the faculty may face. Due to computer experience, 55% agreed on the ease of online assessment/evaluation activities. Almost 80% of them agreed to use different kinds of online assessments to evaluate students. About 57% had issues with students' attendance. Therefore, 85% believed that using various learning strategies makes distance learning more attractive to students.

However, about 48% agreed that it was difficult/challenging to use these learning strategies, as teaching online is a different way than teaching face to face principally in the lab. After the events related to the COVID-19 epidemic and the replacement of traditional education with distance education, 65% believed that applying distance learning should be included in future policies soon. While 72% believed that applying blended education at their university is a good idea, and better than distance learning as it can improve content according to students' activity especially with practical courses, and see where they are excelling and where they are struggling. About 63% think that distance-learning activities have increased their teaching workload. While 21% teaching workload was not affected. It may be because they already had used blackboard or another platform before with their students for extra lectures or activities. In relationship with the students with distance learning, 76% disagreed that it has changed for the worse as they continued to contact with electronic platforms or emails or any other social media that helped students to feel more attached to their college by facilitating for more connections. Around 76% had developed their competencies in educational technologies that support learning goals and needs. The largest percentage is neutral (50%) in the plan to deliver the course remotely (on-line) from now on, because they follow their college system, according to the study of the situation. A small percentage (17%) of faculty agreed that teaching online is a bad idea because they faced some obstacles when teaching online.

In the second part, questions on the satisfied to dissatisfied scale were asked.

**Table 2** presents the answers that collected data regarding some distance learning criteria as following: 1) Previous experience in distance learning (before the epidemic); 2) University was ready to react and smoothly shift all educational/

**Table 2.** Responses of faculty members.

Items	Percentage
Concerns about teaching online	65%
Course during distance learning	80%
Cancellation of syllabus	20%
Online complexities and challenges (students or teaching lab)	50% (students) 65% (teaching lab)
Online assessments/evaluation activities	55%
Use different online assessments for evaluation	80%
Issues related to students attendance	57%
Use of different learning strategies to make it more attractive	85%
Challenges involved in using these strategies	48%
Applying distance learning in future policies	65%
Include blended learning rather than distance learning	72%
Increase in workload because of distance learning	63%
No increase in workload because of distance learning	21%
Change in relationship with students	76%
Development of competencies	76%
Plan to deliver the courses online	50%
Teaching online is a bad idea	17%

working activities to online; and 3) Distance learning platforms that have been made available by the university were suitable for the needs of on-line educational processes. As seen in **Table 1** the highest percentage around 49% satisfied with their previous experience in distance learning. This may be related to computer sciences course nature that needs practices online or design websites or other. Taibah University's level of readiness and infrastructure for distance study was high and it smoothly shifts all educational/working activities to online.

Accordingly, in Computer Science College, 78% of their faculty were very satisfied. About 90% of the faculty members are very satisfied and satisfied with distance learning platforms (blackboard) that have been made available by the university. Blackboard and virtual lab were suitable for the needs of online educational processes especially for an applied course such as programming 2. It is noticed that most of the faculty members have used Zoom for synchronous meetings and more platforms for information.

**Table 3** shows the evaluation methods that the faculty members adopted while using distance learning during COVID-19 era. Majority (95%) have used online tests and 85% have used individual assignments to be done at home. While 68% have applied group homework to be presented online. Moreover, 40% adopted online interviews and 42% adopted individual homework to be presented online.

**Table 3.** Evaluation methods adopted by the faculty members.

Items	Number of responses	Percentage
Online interview	19	40.4%
Online test/quiz	45	95.7%
Individual assignment to be done at home	40	85.1%
Adopted individual homework to be presented online	20	42.6%
Group homework to be presented online	32	68.1%
Project	1	2.1%
Project presentation with viva voce	1	2.1%

A temporary amendment of the educational and examination regulations was made following the pandemic conditions in Taibah University. For example, the Computer Science College issued certain recommendations to change the distribution of degrees approved at the beginning of the semester and replace the final exam with only 20 marks and the rest of the marks were distributed between individual/group homework and tests online. The faculty members used more than one evaluation method.

#### 4.2. Students

This part presents the results that were collected from students' questionnaires that evaluate the actual impact on students learning experience from several aspects. Among 150 students, about 25 studied programming 2 courses before the COVID-19 pandemic (Group A), 75 students during the COVID-19 pandemic in the second semester (Group B), and 50 students during the third semester (Group C). The number of girl students was three times greater than that of boys. As shown in **Table A2 (Appendix)**, a question about measuring the skill level required to successfully pass the programming course was asked, and it was followed by clarifying the reason for its mastery or failure. In the first questionnaire results were collected from Group A. Most of the students (90%) were able to create files/projects and using tools and 85% could plan programs (using models/flowcharts) easily. Thus, critically important for a student to understand what it means when start to implement any code moreover, these basic skills were practiced in programming among group A, 73% of students understood applying strings and enumerated types to solve problems as it was an easy topic for them. However, inheritance and polymorphism are quite difficult topics as they are the main topics in the programming 2 courses, so 63% could solve problems using them.

About 95% have abilities for understanding and applying abstract classes and interfaces to solve problems as it is likely the simplest topic to use and understand. Exception Handling is an essential part of programming 2 topics thus 57% of the students found that using exception handling is a complex code due to



many lines that are designed to handle all normal and exceptional cases. About 52% have good experience with managing file systems, this may be due to the lacking of application and other used tools. The majority (88%) of the students has good skill in writing Object-Oriented Programs. For the graphical user interface, about 47% of the students in Group A had an intermediate level for applying various types of events in the programming and 63% can learn concepts and apply them to other problems. More than half (58%) had the ability to updating and expanding some existing programs and tracing and/or debugging code. The same percentage has excellent mathematical skills as there were just three different courses of mathematical that related to college requirements. Also, 58% had an inquisitiveness side for example: trying to discover as much as he/she can how something is done. This might be because most of the students think about grades and their certificates that may be affected on their opportunities in jobs.

For problem-solving capability, there were 63% who had great skill. Around 21% had a lower level of communication skills such as discussing ideas/solutions with other team members when working on the project. It could be because there were many stumbling students and there were several sections of different students who do not have enough knowledge of each other. In the last part of the questions, a large percentage of students (74%) agreed that the reason for mastering all the previous skills is the abundance of practice and implantation. Followed by the skill of the course professor at 47%. Moreover, we found that almost half of the students mentioned that the reason for the failure in the previous skills was the weakness of their foundation in Programming 1, and from our point of view the reason for Programming 1 is equivalent to those transferred from the community college.

In the second questionnaire results were collected from Group B and C (**Table 4**). About 63% of students from Group B could learn and understand from home by the internet. Thus, there was an internet service at home to be able to learn on his/her phone or laptop. On the other hand, the percentage increased in group C reaching 85%. The reason may be to adapt to the induced technology for them. A total of 46% of students from Group B and around the same percentage in group C said that learning is better alone without other students as it may be helpful to minimize distraction and can enhance their focus, due to the social nature of humanity. Regarding distance learning effectiveness, it was noted in Group B that there is 30% that was neutral when answering this question **Table A3 (Appendix)**.

This may be due to their short experience of distance education however, the percentage doubled in group C because of their mastery and familiarity with the distance learning process. While 54% of Group B and 65% of Group C found that the distance learning system is very effective and will help many students, about 56 % of Group B agreed with ease of communication with teachers which would have helped them to understand more. It must be drawn to the attention that there are many means of communication such as e-mail and others. While during the third semester and the attendance of lab for Group C the percentage

**Table 4.** Students response to programming 2 skill levels (Group A).

Items	Percentages
Create file/project using tools	90%
Using models/flowcharts	85%
Applying strings to solve problems	73%
Inheritance and polymorphism	63%
Abstract classes and interfaces	95%
Exceptional handling	57%
Managing file systems	52%
Writing OOP	88%
Developing graphical user interfaces and types of events	47%
Learning concepts	63%
Updating/expanding programs/tracing and debugging	58%
Mathematical skills	58%
Problem solving capabilities	63%
Inquisitiveness	58%
Communication skills	21%
Reasons for mastering previous skills	74%
Skills of the course professor	47%

of communication with teachers was increased to reach 76% as the communication process had become more organized in the department, and there were more channels of communication, such as the Microsoft teams and others applications. It was a positive sign that 46% of Group B hadn't changed their relationships with other colleagues (students) for the worse. Although in Group C this percentage was increased to reach 65%, this is because students had discovered and used new applications to communicate with each other.

In terms of providing useful resources, the university had included a link for technical support to use Blackboard and other educational platforms. Therefore, 92% had information on the blackboard system that the university approved. It showed that the students' express gratitude to university resources and supports. However, 78% to 80% from Group B and C respectively, had information and communication technology skills to be able to access any distance learning platforms other than blackboard. This might be because students grew up with technology especially in Computer Science College. Students in Group B and the faculty members were asked about the teaching methods because of their impact on the success and prominence of students, and this is what colleges and universities compete for. Especially, in the lab, it might be difficult and boring for students who stayed in front of a screen. Regarding this 55% of the students agreed

that several methods of distance education were applied in the programming lab, whereas, 26% disagreed.

The reason might be the surprise factor in the transfer from a face-to-face lab to a distance study lab for disaster preparedness. Unsurprisingly, 63% faced problems in taking the lab online. In addition, just 44% said that distance lab of programming was a good experience and 52% encountered some technical problems during the practicing of Programming Course 2 lab. Because of the reasons mentioned earlier, the department decided on the laboratories, which was to be in class instead of studying remotely. Due to the nature of the programming course relying on training more than theoretical, the virtual lab was used by 65% of the students. The college took care of its students and their success and modified them to motivate them to finish the course. Therefore, 84% agreed with the procedures and rules that were used to redistribute the grades. It was done by replacing some assessment tests with individual or group assignments for Group B. However, in Group C 44% of the students agreed with the procedures and rules that were used to redistribute the grades. Thus, the distribution of grades had almost returned to what it was before, as long as the laboratory remained present, and students were accustomed to the method of studying remotely. Some of the students needed to miss class due to the technology and internet issues, therefore around 26% - 30% from each group said that attendance at lectures was worst with distance education. However, 60% in Group B and 85% in group C agreed that their attendance at lectures was better and their absenteeism rate was less. As for the rest of the students, they were neutral, and distance education did not affect them in the issue of attendance. One way to stimulate good communication in distance learning is an asynchronous lecture, as 42% in Group B and 75% in Group C preferred to attend lectures that are presented directly/concurrently so that inquiries can be raised and discussed first-hand and there is no need to activate the recording. As it can be seen, there is a difference in the ratio between the two groups, and the reason is a matter of practice and familiarity with the process.

Moreover, around 84% of each group needs to activate the recording to go back to that lecture in case there is a problem with the internet. In Group B, 29% did not like online tests as they may appear anxious and stress especially if he/she has not previously tested online. While 63% found that the online test was a good experience for them. The percentage of that factor is slightly increased with Group C. Group B and C agreed that there is a difference in the effectiveness of distance education, according to the nature of the given course. A considerable example here is the programming 2 course.

From the experience of forced distance education during the Corona crisis, we found that a small percentage (36%) of Group B did not prefer this type of education. However, this matter differed with group C 80%, as the study plan was clear to them from the beginning, distance education was adopted from the beginning of the term, and the laboratory work was on campus (Table 5). If the pandemic continues unevenly (comes and goes in waves) over a long period, we

**Table 5.** Response from the students in Group B and C.

Items	Percentages (Group B)	Percentages (Group C)
Ability to learn and understand at home through internet	63%	85%
Learning is better alone	46%	46%
Effectiveness of distance learning	54%	65%
Communication with teachers	56%	76%
Relationship with other students and colleagues	46%	65%
ICT skills	80%	80%
Procedure and rules to redistribute grades	84%	44%
Online attendance of students	60%	85%
Attend lecture directly or concurrently	42%	75%
Experience of distance learning during COVID-19	36%	80%
Blended learning	70%	70%
Psychological impact	41%	57%

might get used to the alternating face-to-face (For example, blended) teaching and entirely online education. Therefore, one of the most important questions was the student's opinion about the use of blended learning in the future. The majority (70%) from each group preferred to adopt blended education at the university. Many had worries and anxieties as a result of the COVID-19 pandemic, as 41% from Group B stated that the psychological impact of corona had an impact on achieving the required skills in programming 2 and group C 57% stated that it affected their understanding of programming material, especially in the final parts of the curriculum. These simple percentages indicate the quality of distance learning in the college so that the COVID-19 pandemic had not affected as much as it has in schools or educational institutions other than university. Note that there are social and psychological services for students at the university that deal with their problems, especially during a pandemic. In the last part, the question about skills was asked. We found that there was little difference between the two groups (A & B) in mastering the skills. Moreover, we found the largest percentage who chose the intermediate level to master most of the skills. The strongest difference was in mastering the skills related to the last lessons of the curriculum, such as Graphical user interfaces, and the reason was clear that 41% stated that the reason was distance education and the psychological impact of the pandemic. However, it was different for Group C, as it positively affected them in acquiring and mastering the skills required to be achieved in programming as distance education advances in Programming 2's concept and practice.

**Table 6** shows an independent t-Test between group B and group C to find out if totally distance learning is more appropriate or blended learning will yield more fruitful results in context with skills acquisitions. The *p*-value of blended

**Table 6.** Independent t-test.

Items	N	Mean	Std Deviation	t-Test	<i>p</i> -value
Distance Learning Group B	50	6.3	18.6	1.9	0.04*
Blended Learning Group C	75	7.5	20.2	2.5	0.00**

\**p* value > 0.05 is significant; \*\*shows that students in group C were able to more successfully acquire the skills required for programming 2 course compared to group B.

learning  $p = 0.000$  shows that students in group C were able to more successfully acquire the skills required for programming 2 course compared to group B who only attended distance learning ( $p = 0.04$ ).

## 5. Discussion

The aim of the study was to find out if distance learning had been smoothly adopted by the university instructors in Saudi Arabia using e-learning. The study findings showed that majority of the faculty members were able to complete the course as only one-third was left at the start of the pandemic. Also, a number of faculty members stated that teaching online complexity balancing act challenge was due to the teaching lab. This finding is in-line with the findings of [Adnan & Anwar \(2020\)](#) as they state that it may be due to the nature of some courses, lack of laboratories, no direct connection with students, or network problems. This high percentage could be due to several possible reasons, such as the importance of the course to the student, problems at the time of lectures, or internet issues. During the crisis the shift to distance learning should be in the most simplest and effective methods so that students can achieve the purpose they desire ([Adnan and Anwar, 2020](#)). Another finding of the study states about the workload that might change or compensate some of the lectures time due to problems that initially were experienced from using blackboard and other similar platforms which were fit for use ([Albrahim, 2020; Khafaga, 2021](#)). This workload might be regarding changing or compensating some of the lectures' times due to the initial problems that arose from using the blackboard and other platforms and trying to adopting the most appropriate ones ([Albrahim, 2020; Khafaga, 2021](#)). The study results also showed that distance learning is not just content delivery, finding a good relationship with students is critical ([Sadeghi, 2019](#)). This finding is aligned with the results of [Sadeghi \(2019\)](#) as it states that distance learning also helps to bridge the communication gap. Evaluations help determine what works well and what could be improved in distance learning. Therefore, in the last part evaluation methods questions were presented to understand how successful it has been in achieving the desired goals. This is in contrast to the study by [Sadeghi \(2019\)](#) who suggested that with no peers and teachers around, there is a high chance of getting distracted and losing track of important deadlines. The picture has become clear now that the strong common reasons in the two groups (A & B) for the lack of mastery of the required skills in programming 2

are related to the weak establishment in programming 1 and the lack of applications and exercises, so we suggest increasing the practical part and the exercises that it already started with Group C during the third semester. In addition, it is better to do a re-description of a programming 2 course and its components to be taught remotely now and in the future add virtual lab to improve the learning outcomes now and in the future. The lack of options for students to decide whether or not to take online courses, the lack of access to free technology hardware, software, and internet services on campus due to social distancing, a lack of motivation to learn, the new course workload, and adjusting to unfamiliar technology for first-time online students are all issues with distance learning in the COVID-19 environment (Bambaeroo & Shokrpour, 2017; Friedman, 2020).

In response to the question of what the department can do to improve the distance learning experience, students offered several suggestions. The following ideas appeared after analyzing the responses given by the students regarding recommendations: Increasing applications and lab hours, starting the draft project of the course from the beginning to avoid pressure at the end of the semester, modifying the syllabus and add more examples, and finally, adopting a variety of teaching methods in line with distance education. For online strategies, it should be one of the main instructions in courses and it should accelerate the learning process and consider the outcome in students learning performances. In addition, the assessment should be changed to fit the new way of the learning process. The results conclude that the pandemic had positively influenced the changes in the education system in Saudi Arabia. For the students, the study found that they are interested in exploring different online learning platforms during this pandemic and the education system had positively adapted with the usage of technologies for the teaching and learning process. Also, they can identify the advantages and disadvantages of course concepts and procedures. For faculty members, the results show they tend to be more creative in diversifying teaching strategies to cope with distance learning. In addition, the big challenge was motivating their students to learn online rather than face to face class and to complete their assessments and assignments on time such as emphasizes active communication during an online class.

## 6. Conclusion

The study found that blended learning seems to fit more compared to online distance learning that is a blend of online and physical classes seems to provide more progressive performance in context to acquiring the required skills for programming 2 course. The study also found some challenges encountered by students and the faculty members such as the teachers online complexities and challenges in terms of teaching lab course, issues related to students attendance and other various concerns related to teaching online whereas the students for not being able to master previous skills in programming course 1 which group C

student were able to do so because of blended learning program. Therefore, this paper recommends adopting blended learning as a basis at colleges and universities to facilitate the transition to distance education in any emergency. In some cases, programming courses require additional optional laboratories to ensure students' understanding after suffering from the Corona crisis. The study some limitation for example firstly the study used self-reported questionnaire about student skill acquisition of programming which have a potential risk of students over reporting. However, future researchers can conduct research without using self-reported questionnaires to avoid bias.

### Conflicts of Interest

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

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## Appendix

**Table A1.** Survey first questions (Faculty members).

	Questions
1	Have some concerns about teaching online?
2	During the distance learning period, it was possible to cover the rest of the course.
3	Had to cancel part/s of the course's syllabus, due to some difficulties in teaching them online.
4	Teaching online is a complex balancing act, and the main challenge is students.
5	Or using technology.
6	Or teaching lab.
7	Online assessment/evaluation activities are easy.
8	I used different kinds of online assessments to evaluate my students.
9	Many students have attendance issues.
10	It was difficult/challenging to use various learning strategies.
11	I believe that using various learning strategies makes distance learning more attractive to students.
12	In my university, I believe that applying distance learning should be included in future policies soon.
13	I believe that applying blended education at my university is a good idea, and better than distance learning.
14	I think that distance learning activities have increased my teaching workload.
15	My relationship with students has changed for the worse.
16	My competencies in educational technologies have developed.
17	I plan to deliver the course remotely (online) from now on.
18	Teaching online is a bad idea, I face some obstacles when teaching.

**Table A2.** Programming 2 skill level's questions.

	Questions
1	creating file/project and using tools
2	Planning programs (using models/flowcharts)
3	Understanding and applying strings and enumerated types to solve problems
4	Understanding and applying Inheritance and Polymorphism to solve problems
5	Understanding and applying Abstract Classes and Interfaces to solve problems
6	Understanding and applying Exception Handling to solve problems
7	Managing file systems
8	Writing Object-Oriented Programs (e.g., using Java)

**Continued**

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- 9 Developing Graphical user interfaces
  - 10 Applying various types of events
  - 11 Learning concepts and applying them to other problems
  - 12 Updating and expanding some existing programs
  - 13 Tracing and/or debugging code
  - 14 Mathematical skills
  - 15 Problem-solving capability
  - 16 Inquisitiveness (trying to discover as much as you can how something is done)
  - 17 Communication skills (discussing ideas/solutions with other team members, when working on a project)
- 

**Table A3.** Distance learning students' questions (Part 1 for Group B & Group C).

Questions	
1	I have the ability to learn and understand from home through the internet
2	Learning is better alone without other students
3	There is an internet service at home to be able to learn on my phone or laptop
4	The distance learning system is very effective and will help many students
5	Communication with teachers is easy and helps me to understand more
6	I had trouble communicating and sharing with other students
7	My relationship with my colleagues (students) has changed for the worse
8	I have the information and communication technology skills to be able to access any distance learning platforms
9	I have information of the blackboard system that my university approved
10	The procedures and rules that were used to redistribute the grades were in my interest
11	My attendance at lectures is better with distance education and my absenteeism rate is less
12	I prefer to attend lectures that are presented directly/concurrently (with the need to activate the lecture recording)
13	I prefer to attend lectures that are presented directly/concurrently so that inquiries can be raised and discussed first-hand (and there is no need to activate the recording)
14	Online tests were a good experience
15	There is a difference in the effectiveness of distance education, according to the nature of the course given
16	I faced problems in taking the lab online
17	Distance lab of programming was a good experience

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**Continued**

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- 18 I encountered some technical problems during the practicing of Programming Course 2 lab (but I was able to understand the main idea of the solution)
  - 19 I tried the virtual lab in programming 2
  - 20 Several methods of distance education were applied in the programming lab
  - 21 The COVID-19 pandemic affected my understanding of programming material, especially in the final parts of the curriculum
  - 22 I prefer to adopt distance learning at our university
  - 23 I prefer to adopt blended education at our university
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