

The Impact of Crises on Design Education Efficiency in Gulf Universities

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Abstract This study explores the impact of the crises on architectural and design education in the Arab region. It focuses on the dramatic effect of crises on students' learning outcomes in core courses in two Gulf universities. The study comprises two sections. The first is a theoretical background based on a comprehensive literature review to ensure the global relevance of this research, and the second is a statistical analysis of data collection. The statistical analysis compared the means of the student's grades for the learning outcome variables of the courses before and after COVID-19. It examined whether the students achieved the course's learning outcomes during the crises. The researchers selected the academic years 2018–2019 for collecting the data before the crisis, and the academic year 2020–2021, during the crisis. The first course results show a significant difference between the two means of skill module variables during and after COVID-19. The results confirm the negative impact of the crises on the efficiency of students taking practical courses requiring higher skill levels. In contrast, the results of the second course show a major difference among the two means of values module variables during and after COVID-19. The results confirm the negative impact of the crises on the efficiency of students in developing their communication methods for improving their work. The results confirm that despite the successful measures taken to reduce the risks of crises by the two universities, to remedy the adverse effects resulting from it, higher education requires the development of a short-term risk management plan within the next two years and the development of a long-term plan for any future

surprises. That affects the efficiency of architectural education and design in the labor market to eliminate any future adverse effects on the graduation attributes of fresh graduates of Architecture and Design. The plan should focus on practical activities, training students on risk management, and practicing professionalism.

Keywords Efficiency of Education, Learning Outcomes, Gulf Universities

1. Introduction

The world has gone through several crises recently, and the latest of which was the exposure to the risks of the sweeping spread of the COVID-19 virus worldwide. D. Boothe [1] explains that the global pandemic's challenges and impact have threatened the world's educational systems to reassess their goals; engagements in the academic fields, such as students and educators, are asked to teach and learn in different ways using different methods in separated places conditioned distancing themselves from others.

The closure policy taken by Gulf countries during COVID-19 reduced the spread of the epidemic in the region and reduced human losses. Despite this, there have been other effects on the educational sector. The obstacles and challenging influence of global COVID-19 have pushed educational methods worldwide to reassess their objectives.

In architecture and interior design, many fresh graduates

in 2023 and 2024 have not acquired the skills and values needed in a practical and professional career due to their inability to move during the pandemic. The open-source platforms have substantially impacted brain-based learning, problem-solving, broadening horizons, and creativity in architecture and interior design education in Arab countries. The success of the university education system is linked to the success of teaching strategies and learning styles used in achieving learning outcomes and benefiting students, which is linked to the development of students' intellectual and professional skills together to become responsible, sophisticated, and appropriate degrees of professional objectivity.

1.1. Online Education

Online learning is not a new concept in higher education organizations, as advanced information technologies were used to manage learning and support educational content well before the COVID-19 outbreak [2]-[3]. However, after the crisis, the traditional way of educating such as face-to-face study method has been entirely switched with online learning to control the possibility of virus transmission.

Morueta et al. [4] explained that the remarkably fast progression of online learning is challenging academics at the higher education institutions to guarantee that their online programs and courses meet the program objectives and have similarity high quality as their traditional classes. B. De Wever et al. [5] had shown that asynchronous online discussions are ideal for building and supporting knowledge as students can collaborate and intercommunicate with their peers via platforms and discussion panels to solve problems, all of which benefit to accelerate thinking skills at the high level.

Online education offers locational flexibility for students and cost reduction for educational establishments. Materials such as E-libraries, online assessments, assignments, and exams can be available anytime and accessible anywhere [6]. It is possible to find different approaches to assessing efficiency in the engineering sector [7]. De La Hoz, Zuluaga, and Mendoza [8] presented a data-based template to examine the fundamental quality of and connections in engineering education programs and the outcomes of a standardized assessment to achieve academic proficiency. Their study was aligned with understanding analytics and facilitated using data as input to sustain decision-making in academic environments.

Various e-learning significantly advocates supporters who have found that online learning can significantly and positively impact the quality of education, student performance, and engagement levels of achievements [9]. In the early stages of emergency crisis e-learning, most academic institutes in general and universities in particular focused more on course continuousness and less on online learning best practices. This crisis or "emergency mode" did not come without negative impacts and consequences.

On the one hand, forced e-learning was chance to "convince the unconvinced" of its advantages [10]. On the other hand, those changes were implemented rapidly without appropriate deep planning and design. Thus, it only partially benefited from the affordances and possibilities of the online format. Therefore, there is a notable risk of sealing critics' perception that e-learning is a weak option to traditional education [11]. Vivek and Ramkumar [12] demonstrated that online learning with digital aid influences course outcomes positively. The result was that the students preferred online learning to complete the shortage of flexibility from the learner's perspective, lack of self-studying motivation, etc. However, with feature management, continuous enhancement is probable.

Walker et al. [13] explained that online methodologies helped engineering students imagine construction site visits and gave them opportunities for experiential learning. Site visits helped provide a context for the theory they had learned, letting them practice formation activities in risky areas. They found that the reputation of contemporary-day engineering education establishments was repeatedly built on the productivity of academic research in its place of technical expertise. Gasper and Lipinski [14] and T. Y. Chen [15] recognized that most faculties need to employ with the industry actively and that many have no association with their specialization exceeding academic overseeing. Modern engineering education has attempted to remedy this by introducing field work and site visits, which can provide students with on-site experience. However, it faced funding and logistical issues, mainly when large groups of students had to be acclimated. It also ran the risk of excluding physically disadvantaged students, which gave rise to complex safety issues.

Alkabaa [16] focused on a university in Saudi Arabia and distributed a survey among male (74%) and female (26%) undergraduate students (n = 235) in an engineering college. More than 10 phases, comprising 38 items on the advantages and disadvantages, were considered in the survey to understand the advantages, restrictions, and complications involved in using Blackboard. Two non-parametric statistical mechanisms, the Mann-Whitney and Kruskal-Wallis tests, were employed to examine the survey results. The study reported significant impacts on the different perceptions of Blackboard by gender and engineering discipline. It found that men and women in engineering had different perceptions of online learning.

Berényi et al. [17] aimed to understand the procedure of Hungarian engineering students (n = 94) to e-learning using Moodle software. They used an online questionnaire to investigate the motivation and restrictive aspects of using e-learning. They encountered that e-learning primarily completes classic or traditional learning. As many as 87.2% of the students downloaded the learning materials and utilized them offline often or regularly. Further, 58% found the materials appropriate. Over half the respondents believed the structure or aesthetics was weak or moderate. As many as 38% of the students with previous experience

taking online quizzes, tests, and exams recommended the classic and traditional examination methods, whereas 25% preferred the online method. As access to technological tools and benefits is possible for effective e-learning, successive training of instructors and tutors is necessary to develop their conversational skills

1.2. Learning Outcomes

Universities are interested in clarifying learning outcomes for students due to their importance in determining the knowledge and skills of university graduates in the labor market. University of Wisconsin–Madison [18] presents that learning outcomes help faculty and students understand the purpose of a course or academic program. Faculty should provide clear learning outcomes and a transparent path for student success. Learning outcomes are the foundations of course design and assessment. The learning results help students focus on what is necessary, and they can also be considered a comprehensive learning practice as they help clarify student experiences.

Brown, Collins, and Duguid [19] demonstrated that several authors have declared that knowledge and understanding should be situated in the activities, contexts, and cultures in which they are designed and implemented. Then, they suggested a cognitive internship learning model concentrating on efficiently observable real-world assignments where skills originated hands-on via the assignment. Herrington and Oliver [20] built it on this by generating an instructional design framework for genuine learning environments. Research from T. C. Reeves et al. [21] and J. S. Brown et al. [22] explained that the genuine learning framework recommends that knowledge and understanding be assembled collaboratively, using learning contexts and activities that reflect how knowledge and skills will be operated in real life. This idea of genuineness is similar to contextual and psychological dedication discussions in other parts of the education literature, notably in simulation-based training.

Several studies have investigated the connection between evaluation scores and various measures of student learning [23]. However, S.-C. Chen, S. J. H. Yang, C.-C. Hsiao [24] mentioned that little attention was paid to estimating online courses. Online learning procedures share several common features with face-to-face courses; the point that they are offered online means that there are new variables to assess, particularly when evaluating the entire process. This study used a flexible classroom learning environment and a teaching methodology during the crisis period. Consequently, the research assesses the impact of the crisis on the efficiency of architectural education in Gulf Universities. The study aims to devise ways to overcome these adverse effects and improve the efficiency of architectural education and design in the future crisis period.

2. Materials and Methods

2.1. Methodology

This study was conducted to examine the impact of the COVID-19 pandemic crisis on the proficiency of architectural and design education in the Gulf region. Since the labor market for all citizens of the Gulf countries brings them together and includes them in a unified system, the research was done on two core courses from two Gulf universities. The researchers chose the courses in the architectural and design programs because they are similar in teaching methodology and evaluation and assessment methods.

The data were collected over two years: the pre-pandemic period from 2018 to 2019, during which the method of teaching in the course was in attendance, and the period 2020 to 2021, during which the method of teaching in the course was remote / online. The collected data were after the complete closure of educational institutions in the Gulf region.

The courses from the two universities aim to strengthen creative competencies through influential community and industry partnerships. The objectives of the courses were to provide a proper understanding of the concepts and methods of construction and the details of working in Gulf countries. The analysis examined whether the teaching strategy and methodologies implemented with students during the COVID-19 crisis were successful in helping students achieve their learning outcomes to achieve high proficiency in architectural and design education at the two universities. The method sought to determine the difference in students' achievement of learning outcomes' modules, knowledge skills, and values modules in each course before and after the crisis pandemic.

The first learning outcome domain was “Knowledge”, which was assessed through quizzes, a midterm exam, and a final exam before the outbreak of COVID-19. However, the final exams were replaced by individual projects after a lockdown.

The second domain was “Skills.” This item included three learning outcomes. Students' skills in these activities were evaluated through assignments, implementation of construction models, working details, and field trip assessments during the course before the outbreak. The field trip was canceled in the two courses after the onset of the crisis.

The third domain was “Values.” Throughout the course, students had to demonstrate effective time management and teamwork skills and act responsibly and ethically in assigned tasks.

Two factors (independent variables) influenced the discrepancy in the student's learning outcomes in the courses:

- The period or duration of the course before and during COVID-19: The researchers drew data from 2018–

2019 (before) and 2020–2021 after/(during the pandemic).

- The factors used to assess the dependent variables are grades assigned for each learning outcome.

Tables 1 and 2 review the independent variables and descriptive statistics for dependent learning outcome variables in the BCM course at IAU and the WD2 course at UOB.

Table 1. Independent variables and descriptive statistics for dependent learning outcome variables in the BCM course at IAU

Items of learning outcomes	Type of variables			Descriptive statistics of dependent variable value	
	Dependent learning outcome variables according to the items	Independent variables (factors)			
		Period Time	Total grade assigned to assess the dependent variables	Mean (%)	(Std. dev.)
Knowledge	K1	Before	85	79.69	0.1
		After	85	79.65	0.1
	K2	Before	50	82.7	0.13
		After	45	86.5	0.1
Skills	S1	Before	100	81.8	0.1
		After	55	77.2	0.12
	S2	Before	10	88.3	0.1
		After	50	71.7	0.13
	S3	Before	40	86.6	0.1
		After	50	74	0.13
Values	V	Before	15	93.6	0.1
		After	5	89.3	0.1

Where: The total number of students in the course is 43 and 42 for the BCM course before and after COVID-19 in 2018/2019 and 2020/2021, respectively.

Table 2. Independent variables and descriptive statistics for dependent learning outcome variables in the WD2 course at UOB

Items of learning outcomes	Type of variables			Descriptive statistics of dependent variable value	
	Dependent learning outcome variables according to the items	Independent variables (factors)			
		Period Time	Total grade assigned to assess the dependent variables	Mean (%)	(Std. dev.)
Knowledge	K1	Before	50	81.39	0.12
		After	60	82.08	0.12
	K2	Before	40	78.88	0.17
		After	30	85.96	0.06
Skills	S1	Before	60	79.68	0.13
		After	50	79.80	0.17
	S2	Before	40	82.68	0.14
		After	60	76.93	0.19
	S3	Before	40	81.93	0.12
		After	90	81.83	0.14
Values	V	Before	20	87.36	0.11
		After	10	92.73	0.12

Where: The total number of students in the course is 30 and 22 for the BCM course before and after COVID-19 in 2018/2019 and 2020/2021, respectively.

2.2. The Building Construction Methods Course at IAU

The grades assigned in the BCM course are used to assess the dependent variables for each learning outcome, as explained in Table 2. In the first item of learning outcomes, Knowledge, the percentage differences in students' assessment scores before and after (during COVID-19) were insignificant. The grade value of the K1 variable is the same before and after. At the same stage, the grade value of the K2 variable is 10% lower in the period during COVID-19 than before it.

In the second item of learning outcomes, skills, there are high differences between the grade distribution for the dependent variables S1, S2, and S3 before and after (during COVID-19). The total grade assigned to assess the dependent variables S1 before was 100 grades, and during the crisis period, it was 55 grades. While assessing skills, S2 before is 10 and after 50 grades. Moreover, Assessing Skills S3 was 40 before and 50 grades after the lockdown.

In the third item of learning outcomes, values, the differences in students' assessment scores before and after were very high; 15% were before the lockdown, and 5% were after that of the total score intended for the rapporteurs.

2.3. The Working Details 2 Course at UOB

In the WD2 course, the grades assigned are used to assess the dependent variables for each learning outcome, as explained in Table 2. In the first item of learning outcomes, Knowledge, the difference in grade value of the dependent variable K1 is 10 grades higher than before it during COVID-19. At the same time, the value of the dependent variable K2 is 10 grades lower during COVID-19 than before it.

In the second item of learning outcomes, skills, the value of the dependent variable S1 is 10 grades lower in the period during COVID-19 than before it. While assessing skills, S2 before is 20 grades higher after. Moreover, Assessing Skills S3 was 40 before and after the lockdown 90 grade.

In the third item of learning outcomes, values, the differences in students' assessment scores before and during COVID-19 were high. 20 grades were before the lockdown, and 10 grades were after the lockdown that of the total score intended for the rapporteurs.

From the results of the two courses, Tables 1 and 2, the factors used to evaluate the dependent variables are the scores assigned to each learning outcome. These are used to analyze the efficiency of architectural and design education before and during COVID-19. It is also clear to researchers that the disparity in the grades of course evaluation before and during COVID-19 is due to the change in some evaluation methods to suit the change in the teaching method from attendance to online. The new procedures were flexible in dealing with developing

assessment methods to adapt to the latest changes.

To examine whether there was a significant difference between the two means of dependent learning outcomes variables by the assessment degrees and by the study system during two periods after and during COVID-19, a statistical test was applied to compare the means, answer the following question, and verify the research hypotheses.

Did the two means of learning outcome variables for architecture and design students differ significantly before and during the COVID-19 pandemic? Or, in other words, what is the difference between the two means of learning outcome variables owing to the change in assessment degrees and the study system from attending class to online learning? And verify the following hypotheses:

$$H_0: \mu_1 = \mu_2.$$

There is no clear significant difference between the two means of learning outcomes variables.

$$H_1: \mu_1 \neq \mu_2.$$

There is an apparently significant difference between the two means of learning outcomes variables.

For the study, assumptions required to apply the parametric tests of the One-Way ANOVA test or T-test and the state of fulfillment:

- Dependent variable that is continuous (interval or ratio level). It is fulfilled for all dependent variables; the variables K1, K2, S1, S2, S3, and V are in the research.
- Independent variable that is categorical (two or more groups). It is fulfilled for all independent variables, whereas the study included two student groups: before (2018-2019) and during COVID-19 (2020-2021).
- Independent samples/groups (independence of observations). It is fulfilled, whereas the observations of the first group are independent of the second.
- Random sample of data from the population. This is fulfilled because there is no sample, whereas all data were collected from all students representing the study population. The total number of students in the BCM course was 43 and 42 before and during the crisis in 2018-2019 and 2020-2021, respectively. Furthermore, the total number of students in the WD course was 30 and 22 in the two periods before and during COVID-19 in 2018-2019 and 2020-2021, respectively.
- Normal distribution of the dependent variable for each group. It is unfulfilled for most dependent variables in each group, as shown in Table 3 for the BCM course at IAU and Table 4 for the WD2 course at UOB.
- Homogeneous variances (variances of the dependent variable approximately equal across groups). It is fulfilled for most dependent variables, as shown in Table 3 for the BCM course at IAU and Table 4 for the WD2 course at UOB.

Table 3. Homogeneity of variances in the BCM course at IAU

Items of learning outcomes	Dependent learning outcome variables	Result of Levene's test for the homogeneity of variances	Result of Shapiro's test for normal distribution	
			Before (group 1)	After (group 2)
		Sig. (p value)	Sig. (p value)	Sig. (p value)
Knowledge and understanding	K1	0.66	0.07	0.01
	K2	0.000	0.004	0.008
Skills	S1	0.2	0.005	0.005
	S2	0.1	0.000	0.005
	S3	0.37	0.02	0.01
Values	V	0.33	0.000	0.000

Note: *Levene's test: The variance in each group is equal if Sig. (p value) > 0.05, and vice versa; Shapiro's test: The dependent variable is normally distributed if Sig. (p value) > 0.05, and vice versa. Source: Output sheets of the analysis of variance and the normality tests by SPSS.

Table 4. Homogeneity of variances in the WD2 course at UOB

Items of learning outcomes	Dependent learning outcome variables	Result of Levene's test for the homogeneity of variances	Result of Shapiro's test for normal distribution	
			Before (group 1)	After (group 2)
		Sig. (p value)	Sig. (p value)	Sig. (p value)
Knowledge and understanding	K1	0.437	0.000	0.000
	K2	0.004	0.000	0.006
Skills	S1	0.920	0.000	0.000
	S2	0.808	0.000	0.000
	S3	0.845	0.000	0.000
Values	V	0.834	0.000	0.000

Note: *Levene's test: The variance in each group is equal if Sig. (p value) > 0.05, and vice versa; Shapiro's test: The dependent variable is normally distributed if Sig. (p value) > 0.05, and vice versa. Source: Output sheets of the analysis of variance and the normality tests by SPSS.

3. Results

3.1. Results for BCM Course before and during the Crisis

Based on the above, the Kruskal-Wallis non-parametric test will be applied to compare the means in the BCM course at IAU. The researchers found that the analyses shown in Table 5 showed a minor change in the average means of the learning outcome variables of K1 before and during COVID-19 (0.04%), demonstrating proximity in the two periods. The grade distribution for K1 remained the same before and during the crisis. There was a slight difference in the means for the learning outcome variables of K2 before and during (+3.8%). This was a positive result, indicating a slight increase in the grade percentage of the students during COVID-19. The grade distribution for K2 was less during the crisis than before. There was a clear difference in the means of the learning outcome variables of S1 before and during (-4.6%). This was a negative result. The students' grade percentage decreased during the crisis when compared to what it had been before. The grade

distribution to assess S1 was reduced after, in contrast to prior COVID-19. The means of the learning outcome variables of S2, S3, and V before and during COVID-19 showed differences of -16.6%, -12.6%, and -4.3%, respectively, all of which were negative results. The above discussion shows that students' average grades dropped during the crisis. The grade distribution to assess S2, S3, and V decreased during COVID-19 in contrast to what it had been before.

Results of comparing the means of learning outcome variables before and during the crisis are presented below.

It is clear from the Table 5 that:

- There is no significant difference among the two means of K1, K2, and V variables before and during COVID-19 for each variable. Therefore, the researchers will accept the null hypothesis ($H_0: \mu_1 = \mu_2$) that there is no major difference between the two means of K1, K2, and V variables and reject the alternative hypothesis ($H_1: \mu_1 \neq \mu_2$).
- There is a clear significant difference between the two means of the S1, S2, and S3 variables before and during COVID-19 for each variable. Therefore, the

researchers will accept the alternative hypothesis ($H_1: \mu_1 \neq \mu_2$) that there is a clear significant difference between the two means of the S1, S2, and S3 variables and reject the null hypothesis ($H_0: \mu_1 = \mu_2$).

3.2. Results for WD2 Course before and during the Crisis

Based on the above, the Kruskal-Wallis non-parametric test will also be applied to compare the means in the WD2 course at UOB. The researchers found the analyses shown in Table 6. The results showed a positive change in the average means of the learning outcome variables of K1 (+0.7%), and K2 (+7.08%) before and during COVID-19. The change of the grade distribution for Knowledge was successful. There was a slight difference in the means for the learning outcome variables of S1 before and after (+0.11%). However, there was a difference in the means of the learning outcome variables of S2 before and during COVID-19 (-5.76%). This was a negative result. Also, there are means of the learning outcome variables of S3 before and during (-0.1%). The students' grade percentage

decreased during COVID-19 when compared to what it had been before. The grades distribution to assess S2 and S3 was increased during the crisis. The means of the learning outcome variables of V before and after was (-5.37%).

Results of comparing the means of learning outcome variables before and during COVID-19 are presented below.

It is clear from the table 6 that:

- a. There is no major difference between the two means of the K1, K2, S1, S2, and S3 variables before and during COVID-19 for each variable. Therefore, the researchers will accept the null hypothesis ($H_0: \mu_1 = \mu_2$) that there is no clear significant difference between the two means of the K1, K2, and V variables and reject the alternative hypothesis ($H_1: \mu_1 \neq \mu_2$).
- b. There is an apparent significant difference between the two means of V variables before and during COVID-19. Therefore, the researchers will accept the alternative hypothesis ($H_1: \mu_1 \neq \mu_2$) that said there is a significant difference between the two means of S1, S2, and S3 variables and reject the null hypothesis ($H_0: \mu_1 = \mu_2$).

Table 5. Results of comparison of means of learning outcome variables in the BCM course at IAU before and during the crisis

Domain	Dependent learning outcome variables	Mean (%)		Result of the Kruskal-Wallis test		Statistical decision
		Before	After (During COVID-19)	Value	Sig. (p value)	
Knowledge	K1	79.69	79.65	0.05	0.83	There is no difference.
	K2	82.7	86.5	0.35	0.56	There is no difference.
Skills	S1	81.8	77.2	4.47	0.034	There is a difference.
	S2	88.3	71.7	30.9	0.000	There is a difference.
	S3	86.6	74	26.1	0.000	There is a difference
Values	V	93.6	89.3	3.4	0.064	There is no difference.

There is no clear significant difference between the means if Sig (p-value) of Kruskal-Wallis test > 0.05, and vice versa.

Source: Output sheet of the Kruskal-Wallis nonparametric test by SPSS.

Table 6. Comparison of means of learning outcome variables in the course WD2 at UOB before and after COVID-19

Domain	Dependent learning outcome variables	Mean (%)		Result of the Kruskal-Wallis test		Statistical decision
		Before	After (During COVID-19)	Value	Sig. (p value)	
Knowledge and Understanding	K1	81.38	82.08	.058	0.810	There is no difference
	K2	78.87	85.95	1.115	0.291	There is no difference
Skills	S1	79.68	79.79	.099	0.753	There is no difference
	S2	82.68	76.92	3.032	0.082	There is no difference
	S3	81.92	81.82	0.17	0.897	There is no difference
Values	V	87.35	92.72	9.55	0.002	There is difference

There is no clear significant difference between the means if Sig (p-value) of Kruskal-Wallis test > 0.05, and vice versa.

Source: outputs sheet of the Kruskal-Wallis nonparametric test by SPSS.

4. Discussion

This study showed a statistical analysis using the effectiveness of the course to the its grades, and test scores as indicators to compare the arithmetic means of the learning outcome (LOs) variables in the architectural and design courses in the universities.

In the BCM course at IAU, it is clear before and during COVID-19 to ascertain whether students successfully achieved their “knowledge and understanding” of learning outcomes during the crisis. The statistical analyses proved that the students’ knowledge increased during COVID-19. For each variable, there was no significant difference between the two means of knowledge, K1 and K2, before and during COVID-19. Therefore, the null hypothesis was accepted. Students achieved their learning outcomes by saving time and effort and concentrating on the knowledge they had to acquire through the course. The outcome was positive. Thus, the grade distribution for the learning outcome during COVID-19 should remain the same.

By contrast, the learning outcomes that covered “skills” needed different actions. There was a significant difference between the two means of the S1, S2, and S3 variables before and after crisis for each variable. Therefore, the alternative hypothesis (H1) that there is an apparent significant difference between the two means of the S1, S2, and S3 variables is accepted, and the null hypothesis is rejected. The acquisition of skills in the course depends on the activities that students undertake to fulfill the course requirements, such as individual and group work, a joint performance with other students, and field trips to construction sites to observe construction work, all of which help them observe, understand, and connect the information to reality. As a result of completing the field trip, the study commenced in the second phase of the agenda due to COVID-19 enriching the students and establishing them in an actual position to develop their skills. Based on the information provided, the grade distribution for the skills learning outcome should be retained as before the crisis.

The third learning outcome, covering “values”, requires students to demonstrate effective time management and teamwork skills and act responsibly and ethically in conducting assigned tasks. Students should also retain the grade distribution that existed before the crisis. The results show no significant difference between the two means of the value before and during COVID-19. Therefore, the null hypothesis of no significant difference between both means of values is accepted.

The WD2 course at UOB is evident before and after COVID-19 to ascertain whether students successfully achieved their learning outcomes during the crisis. The statistical analyses proved that the students had increased their “knowledge” and covered “skills” needed for different learning outcomes before and after the crisis.

For each variable, there was no significant difference between the two means of knowledge and understanding,

K1 and K2, before and during COVID-19. Also, the two means of skills, S1, S2, and S3, before and during COVID-19, were the same. Therefore, the null hypothesis was accepted for both knowledge and skills learning outcomes. Students achieved the learning outcomes they had to acquire through the course. Thus, the grade distribution for the learning outcome during COVID-19 should remain the same.

By contrast, the third learning outcome covers “values”, where students should demonstrate how to apply various communication techniques and technologies to produce working drawings for details. Based on the information provided, there was a significant difference between the two means of “Values”. Consequently, the grade distribution for the skills learning outcome should be retained before COVID-19.

5. Conclusions

This study explored the influence of the COVID-19 crisis on architectural and design education in Saudi Arabia and Bahrain. It studied the effectiveness of the course methodologies and teaching methods in two core courses in architectural and design programs by using the assessment scores as indicators to test the student’s learning outcomes.

The researchers chose these two courses because they are core courses in two of the essential architectural education and design programs in two of the most prestigious universities in the Gulf region; graduates of both colleges have an influential role in the labor market in both countries. The courses aim to develop an awareness of building construction types and how to implement their drawings.

Regarding the importance of the course’s learning outcomes, the research examined whether the course outline and methodologies implemented during the COVID-19 successfully helped students achieve the learning outcomes to understand the efficiency of architectural and design education before and during the crisis for Architecture and Design students in both countries, Saudi Arabia, and Bahrain. The researchers collected data on students’ scores for achievement of the course’s knowledge, skills, and values. Additional data were gathered through a survey and analyzed to measure students’ satisfaction with the two courses’ items and teaching methodologies during the periods in question. The researchers chose the 2018–2019 dataset for the period before the pandemic and the 2020–2021 dataset for the period during the pandemic period.

The statistical analysis proved that students in both universities achieved the learning outcomes of knowledge well due to forcing students to stay using the Internet for long periods, where they became more acquainted with the latest architectural and design methods that they learned from various construction sites locally and globally, which

helped to encourage their entry into the global content of scientific material, which increased their “knowledge”, study, and understanding. While the results that measured the learning outcomes of the “skills” decreased in the BCM course at IAU while it increased in the WD2 course at UOB, the opposite occurred in the results of the learning outcomes of the values, as the results of the students of the WD2 course at UOB decreased. In contrast, the results of the students of the BCM course at IAU increased. The researchers explained the lack of students’ skills in the BCM course due to the student’s loss of the site visit trip to the construction sites, which gives them practical experience in fieldwork and links it to information and theoretical knowledge that they obtained in the course. They relied on theoretical videos only to learn some of the skills required in the course without training to implement them practically. In contrast, the students in the WD2 course focused on the individual skills that they succeeded in acquiring. On the contrary, students in the BCM course focused on communication and group values; the group work exercises, focus groups, and interactive assignments increased their understanding of teamwork and the possibility of its application in architectural and design work in the course, in addition to their need for communication and their awareness of the importance of maintaining moral ties in academic dealings, while the students in the WD2 course focused on their values only.

The results indicate that the two universities successfully ran the educational process efficiently, with severe procedures in closing, to avoid the negative impact of architects' lack of education on the labor market and economic development.

6. Recommendations

Learning from the lessons of national and international experiences has become imperative, as the security situation in the world that allows for thinking and planning to make plans for many years is gone. Planning based on multiple and continuous risk management alternatives has become essential to prepare our students and equip them with the required skills and values. Figure 1 illustrates the Expected Roles of the administrator, instructor, and student for the suggested future risk management plan. The following can be considered:

- a. Teaching the students the principles and methods of risk management and emergency planning, how to deal with them in all areas of life, and implementing alternatives for self-development in work and aspects of life during a flexible program.
- b. Training students from the start point of the program to determine the required skills and values to practice professionalism. Moreover, assisting them in making suitable plans that enhance their future goals according to their desire and capabilities. The goals

must be based on the needs of the labor market and their personal needs in general.

- c. Taking various precautions to innovatively equip students with skills and values to compensate for any students’ lack of acquired in the absence of physical gathering and presented in discussion groups to enrich their essential communication skills in the likelihood of any global adversities.
- d. Integrating the students during the early stages of their study plan in training programs in architectural and design companies and consulting offices to provide them with early skills in dealing with the site field and technical skills. This helps them increase their community service values and sense of well-connected design work on construction sites.
- e. Focusing on practical activities as a central teaching method to help students improve and develop their skills and create more activities and visits to existing job sites. Future studies can study and suggest different activities in the architectural and design track to support them in their careers after graduation.

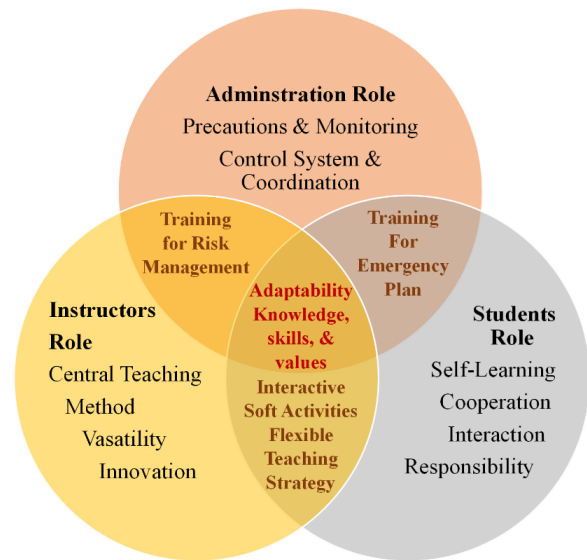


Figure 1. The Expected Roles of the administrator, instructor, and student for future risk management plan

The significance of the research stands in the choice of studying students of two universities close in geography and population composition, affecting the same labor market, as the eastern region of the Kingdom of Saudi Arabia converges with the Kingdom of Bahrain. Subsequently, many Saudi students are in Bahrain and vice versa because of this region’s overlapping families. On the other hand, the two courses are cores in their programs and have a similar nature and importance in the study plan, whether in the architecture or design program. They were taught similarly with correspondence in their evaluation methods.

Finally, despite some challenges confronted by the researchers, such as the small study population in the two courses and the selection of the years in which the statistical analysis was carried out to reach the best credibility to reflect the actual reality of the results. This research can be a nucleus for future studies in several disciplines that look at the details of the flexible, interactive activities that support architecture and design, as well as in the specialty of risk management in higher education in the Gulf countries.

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