



Assessing the impacts of online learning on architectural criticism courses during the COVID-19 pandemic: Case Study Faculty of engineering - Kafrelsheikh University

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KEYWORDS:

Digital portals; online learning; SPSS statistical analysis; Likert scale questionnaire; correlation matrix.

Abstract— The paper investigated the architectural criticism course in the faculty of engineering at Kafrelsheikh University in Egypt during the online learning period following COVID-19. It applied qualitative and quantitative analytical methods. The former explored the pedagogical nature of the course. The latter adopted an anonymous structured questionnaire submitted to students. It evaluated the course's delivery, visualization, quality, and feedback policy. The conducted results are analyzed through IBM SPSS statistical software, testing the variables' reliability and validity.

The study was concluded by a statistical correlation matrix between groups of pair-variables and illustrated by an entity relational chart. It defined the key parameters influencing the digital course format. The paper offers a study measuring, assessing, and testing the performance of digital formats through statistical data analysis. The study encourages conducting dashboards displaying the key performance indicators of online courses in different academic institutions (local and global), highlighting its overall progress and imperfections. Accordingly, this research work would accelerate the improvement of the digital formats to act immediately in possible emergencies.

Research Domain: The research domain focuses on e-learning in higher education, notably in the engineering field, using information and communication technology (ICT).

Research questions: How to manage courses based on collaborative work within the novel online teaching pedagogies? How far are they sufficient to replace on-site learning during global or local emergencies? How to assess their educational impact?

Research problem: One of the most difficult problems that mankind is currently experiencing is the uncertainty of the future. The globe is presently dealing with issues including global warming, a cycle of pandemics, wars, poverty,

terrorism and other issues impending growth. After COVID-19 propagation in 2019, the topic of how to handle these uncertainties responsibly arose on a worldwide scale. The pandemic represents a particular set of uncertainties that could recur in various ways in our modern civilization. The method of overseeing the educational process was one of the urgent topics that required fast decisions after the lock-down decision. Educators were challenged to develop digital formats interpreting the on-site practiced pedagogies with virtual tools. The research paper highlights the method of assessing online courses focusing on architectural criticism, where currently there is no clear digital format for online pedagogies.

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I. INTRODUCTION

THE COVID-19 pandemic has proved that the conventional methods of education have become obsolete after practicing lockdown policies. In this context, the transition to distance learning was a necessity. But this educational paradigm shift caused major challenges, especially for academic courses based on students' collaboration in working spaces. Architectural criticism is one of the most affected courses. It is appraised by progressive class discussions and inter-student communication. The current pandemic accelerated the educators' recognition of these challenges and urged them to develop a digital format matching the online communication tools (2).

In 2020, the Egyptian ministry of higher education offered online training courses for academic staff, technicians, and administrators for Microsoft Teams interface. The ministry announced it as the official platform for online learning in governmental universities. The research paper assesses the efficiency of the pedagogies offered by the architectural criticism course in the architectural department-faculty of engineering at Kafresheikh University. It evaluates the students' interaction with the digital platform.

II. REVIEW OF LITERATURE

In architectural education, criticism plays a key role in developing the students' understanding of the discipline. In this setting, students are responsible for interpreting the architectural competent practices, reflecting their reasoning capacities (18) (16). The education of architectural criticism is appraised by progressive class discussions and inter-student communication (8). It promotes self-learning, cross-referencing, and reflective learning approaches to replace traditional regimes. (2) (9).

This pedagogical approach was severely influenced by COVID-19. The pandemic was one of the challenging conditions, inevitably urging online education after lock-down (7). In response to these conditions, architectural education has witnessed a paradigm shift, interpreting traditional pedagogies to virtual ones. Varma and Jafri in 2020 highlighted that the online mode offered an alternative to traditional face-to-face education. It offered synchronous or asynchronous content delivery. But they affirmed that the whole educational process had to respond to different feedback mechanisms and assessment methods (22). Accordingly, digital platforms offered real-time communication applications to ensure the immediate delivery and receipt of materials (21).

In this context, assessing the distance-learning mode is crucial to developing the learning strategies and facilitating the students' adaptation and engagement. Different researches had designed assessment frameworks for evaluating architectural online courses. Their structure was basically divided into four dimensions, addressing learning management, autonomy, quality, and learning behavior. The first discussed the technological aspect, academic support, feedback policy, and peer learning. The second involved the student's responsibilities and capacities to manage their time according

to the assigned workload. The third discussed the design process and course outcomes, while the latter measured the frequency of using online resources and sustainable practices (17). Accordingly, the researchers performed a quantitative analysis of the results based on a structured questionnaire for students. They concluded by stating the factors influencing the online learning process through qualitative and quantitative analysis (4).

III. RESEARCH METHOD

The research method adopted an anonymous, structured, multi-dimensional questionnaire submitted online. The conducted results are analyzed and investigated through IBM SPSS statistical software, examining the reliability and validity of the variables. Finally, the study performed a correlation between groups of pair-variables.

3.1 The Pedagogical Nature of the Course

The Theories of Architecture and Criticism course is a four-hour weekly course. It holds the code number ARC4127. It is assigned to the bachelor's degree students in the architectural department. It is mainly composed of two didactic activities. The former is composed of a sequence of synchronous lectures discussing the conceptual and methodological architectural approaches. This phase is oriented towards instructor-student communication.

The latter didactic activity concerns a two-hour tutorial. Students are divided into smaller sub-groups; each is composed of 7-10 students. They are required to display the different standpoints of critics. The assessment criterion is based on two phases. The former concerns weekly self-administered quizzes adopting an electronic evaluation, where students have the opportunity for self-monitoring and progress tracking. The latter concerns the final project, submitted through a 15-minute recorded video.

3.2 The Digital Platform and The E-Learning Policy

The digital platform enabled the instructor to create virtual channels for communication. These channels enabled both the instructor and students to launch synchronous meetings or upload asynchronous video recordings. It's also designed for exchanging class materials and files. Besides uploading and downloading assignments and quizzes. During synchronous lectures, the digital platform offered applications and user-interfaces enabling the instructor to monitor, control, and follow students in real-time activities. Furthermore, the platform offered a wide communication tool-kit during tutorials based on students' peer debates and feedback. Using the platform, sub-groups of students are assigned to semi-private virtual channels called "Room (n)" holding a specific number. It is considered a virtual simulation for physical classes. Students were capable of sharing their standpoints with their colleagues and instructor.

3.3 Structuring A Likert Scale Questionnaire

The research method is aimed at measuring the efficiency of the digital course's format during the COVID-19. It employed a quantitative assessment approach based on an anonymous structured questionnaire. It was conducted by the end of the semester and extended for almost a week from January 18th to January 24th, 2021. The questionnaire form was delivered online to 39 students (all registered students). Questions are displayed through nominal and ordinal typologies. Ordinal ones are presented using a five-point ordered Likert scale ranging from "strongly agree" (1) to "strongly disagree" (5).

The designed questionnaire is based on previous researches proposing certain dimensions and categories. The related references are: (4), (7), (22), (21), (12), (1), (5). The questionnaire involved 7 dimensions inspired by Alnusairat.S in 2020, as shown in table (1). The former included demographic information related to accommodation, gender,

and age, displayed in 3 nominal questions. The second concerned the learning tools, discussing the infrastructural suitability and internet accessibility besides the availability of training sessions to users. Moreover, it assessed the technological appropriateness of the platform in displaying lectures and other didactic activities. The third dimension tackled the learning quality, which mainly evaluated the instructor's support and the course's quality. The fourth dimension introduced the possibilities of learning cooperation. It evaluated the efficiency of collaboration and peer learning. The fifth dimension presented the learning autonomy, discussing how far students were productive and efficiently managed their time. The sixth dimension evaluated the feedback and assessment policies during the distant-learning period. Finally, the latter dimension explored how far E-learning could develop a resilient learning culture acting against contemporary uncertainties.

TABLE (1)
SHOWS THE STRUCTURED QUESTIONNAIRE USED IN THE RESEARCH. SOURCE AUTHOR BASED ON LITERATURE REVIEW INCLUDING (4), (7), (22), (21), (12), (1), (5).

Dimension	Sub-category	Questionnaire items
Demographics	Accommodation (regional belonging)	1) Where are you living (indicate the province/village)? (Outside the city/ inside the city)
	Gender	2) What is your gender (Gender)
	Age	3) What is your age? (Age)
Learning Tools	Infrastructure	4) You have a suitable device for pursuing e-learning process; specify it (Laptop/ desktop/ mobile/ Tablet...) (Device suitability) 5) You have a good accessibility to internet. (Internet accessibility) 6) I needed technical help in managing my e-learning account. (Technical aid)
	Training (instructor/ student/ technician support)	7) I knew how to use the e-learning platform through a self-learning process. (Self-learning) 8) My instructor offered me guidance in using Microsoft teams (Instructor's help) 9) My instructor was trained enough to use Microsoft teams. (Instructor training) 10) The IT engineers were trained enough to solve technical problems related to the platform. (IT training)
	Technology	11) Microsoft teams platform was suitable for the online criticism course. (Microsoft Ts suitability) 12) The instructor used multimedia objects (visualization ex: images/ videos...). (Multi media) 13) The instructor used synchronous/asynchronous learning. (synchronous learning) 14) I used other communicative online platforms during the course (ex: Zoom, Skype...). (other online PL use) 15) E- learning enabled me to access different websites during tutorials and to acquire more knowledge about the criticism article. (Websites use) 16) It is easier on e-learning platforms to upload class work and download assignments than traditional way. (Upload and download)
Learning quality	Instructor's support	17) The instructor motivated me during the E-learning process. (Motivation Inst.) 18) The course improved my architectural criticism skills. (Arch. Crit. Skills) 19) The assignments/tutorials enhanced my knowledge about criticism. (Assig. Tut. Crit. Knowledge) 20) The course work challenged my innovation and creativity. (Innovation) 21) The course had a well chronological reading for architectural phases and influential historical events. (Chrono. Reading events) 22) The class materials were consistent with the course. (Consistency Class Mat.) 23) The class materials were uploaded online on-time. (Upload Time)
	Workload	24) The workload was consistent with the course. (workload consistency) 25) The workload was consistent with online learning formats (workload online lear.)
	Integration	26) The course introduced different reflections on the architectural and urban scopes. (Reflections) 27) The course encouraged cross-referencing in educational process. (Cross-ref.)

(continued on the next page)

(TABLE 1: continued)

Dimension	Sub-category	Questionnaire items
Learning cooperation	Pear learning	28) The work of the sub-channels (Rooms) enabled sharing knowledge between colleagues. (Rooms shar.Know) 29) The sub-channels (Rooms) was a context for interaction and decision making between colleagues and instructor. (Room dec-mak.)
	Collaboration	30) Microsoft-teams with its integrated apps (forms/ chat/ Polly/white board/share point, real-time questions...) enabled me to better cooperate with my colleagues and instructor during the lecture. (Micro-Tms cooperation) 31) I was able to discuss my ideas and thoughts in the sub-channels discussions and during the lecture. (Share ideas)
Learning autonomy	Individual skills	32) The course enabled me to criticize my architectural work and improve it. (Crit. My work) 33) The course enabled me to enhance my reflective learning potentials. (Reflective learning) 34) The course enhanced my leadership potentials. (Leadership) 35) The course enhanced my technical communication skills. (Tech. Comm.) 36) The course enabled me to better integrate in self-learning process. (Self-learning Int.)
	Time management	37) E-learning saved commuting time between university and home. (Commuting time) 38) The online course had arranged announcements and reminders, which helped in better managing my time. (Announcements) 39) Uploading and downloading assignments saved time consumed in printing papers. (Save time)
Learning assessment	Feedback and assessment policy	40) It was possible to ask questions and have a direct feedback from instructor during the lecture. (Direct feedback) 41) The instructor replies immediately to our questions during the semester. (Ins.immediate response) 42) I know immediately my grade of the weekly quizzes. (Evaluation time) 43) I prefer using online evaluation applications rather than traditional evaluation process. (Online evaluation) 44) I usually had feedback from the instructor during the integrated learning on closed Room-channel discussions. (Room FB Ins) 45) I usually had feedbacks from my colleagues in our closed rooms (peer-to-peer feedback) (Room-PFback)
	Assignments	46) The weekly assessment policy is clear and sufficient to evaluate my level of understanding regarding each class. (Assig. Clarity) 47) The final project (theatrical performance) enhanced my knowledge about architectural criticism. (Final work success) 48) The assignments covered all the topics of the course. (Assig. Cover Topics) 49) The due-date for submitting assignments was suitable. (Assig Due date)
Learning culture	Adaptation and pleasure	50) I got easily adapted to online learning. (Adaptation) 51) I used online platforms as a communication tool with friends and family during pandemics, besides educational activities. (Platform use in life) 52) I enjoy E- learning. (e-learning joy)
	Resilience	53) Online courses offered an alternative way of education during pandemics. (Alternative to traditional lear.) 54) I was more productive during e-learning process. (Productivity) 55) The online platform with its integrated apps (SharePoint/PowerPoint/teams/outlook...) enabled me to perform different tasks in less time during pandemics. (Apps and mult. Tasks) 56) Online learning enhanced my practical, communicational, and technical skills in facing futuristic challenges in my architectural career. (Skills/ future challenge) 57) E-learning experience could develop the architectural criticism education in the future. (Develop fut. Educ.)

3.4 Statistical Validation and Data Entry Using IBM SPSS

The survey received 20 responses out of 39 submitted formats. Responses were analysed using IBM SPSS statistical analysis software. The process of data entry categorised the variables (questions 1- 57) following their assigned codes, into categorical/nominal or ordinal data. The ordinal data is presented into 5 levels, including strongly agree, agree, Neutral, disagree and strongly disagree, showing a decreasing precision of data. The statistical analysis investigated the reliability and validity of data through a sequence of tests affirming the

consistency of the results and exploring the correlation between variables.

3.4.1 Reliability Test

The research performed a reliability test to validate the results and examine the accuracy of the questionnaire variable items (13). Cronbach's alpha is the main coefficient measuring the degree of reliability. A high degree of reliability concerns Cronbach's coefficients greater than 0.85, while a low degree of reliability concerns values below 0.5. A low output reflects the unreliability of the responses. It reduces the precision of the

statistical analysis, and negatively influences the quality of the research. (Bonett and Wright, 2014). Using IBM SPSS statistical software, the study generated a reliability test through choosing *Analyze < Scale < reliability analysis* from the top menu, where a *reliability analysis* dialogue was presented. Transfer the required variables into the *item box*. Set *model alpha* to run a Cronbach procedure. Afterword's, activate *scale if item deleted* from the *descriptive for* area in the *statistics dialogue box*. Then click *ok* to run the software and generate the results.

3.4.2 Normality Tests

After executing the reliability test, the study examined the sample's distribution, whether it's normal or Gaussian. This investigation is responsible for choosing the typology of applied statistical tests. Accordingly, parametric or non-parametric tests are selected. In statistical analysis, the Shapiro-Wilk test was executed to check normality for samples of less than 50 units. The null hypothesis of the test states that the data is normally distributed when the p value (sig.) is > 0.05 (19) (11). It is generated by selecting '*Analyze < Descriptive Statistics < Explore*' from the top menu. An '*Explore dialogue*' appears, where the required variables are dragged into the '*Dependent item list*'. From '*Plots*' check '*Normality plots with tests*' box and from '*explore statistics*' select '*Outliers.*'

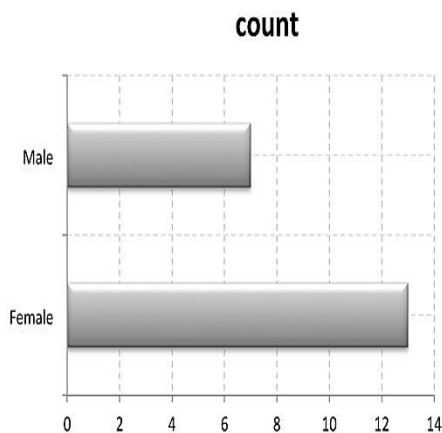
3.4.3 Correlation tests

Finally, the research method investigated the correlation between groups of paired variables. Correlated data records the associated change between two variables, whether in the same direction (+ve correlation) or the opposite direction (-ve

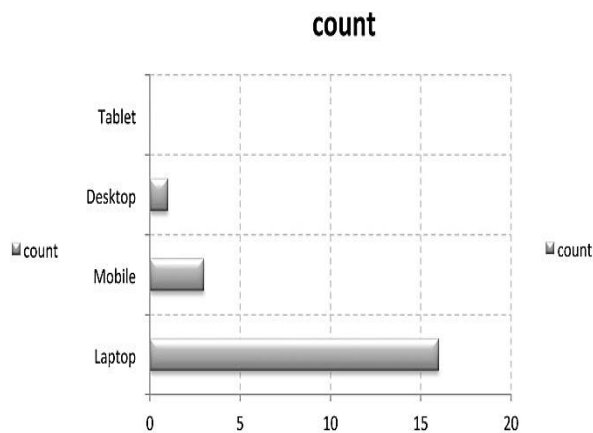
correlation) (20). Accordingly, the study measured the strength and dimension of association between the different variables. Eventually, it assessed the influence of these variables on one another.

IV. RESULTS AND DISCUSSION

The study displayed the questionnaire results through a stacked bar chart for Likert scale data as shown in fig. (1). The data sample was dominated by a female majority with a percentage of 65%. The participants' ages ranged between 22 and 25. Almost 50% of the participants lived outside the city of Kafrelsheikh. Regarding the learning tools, most of the students had suitable devices, mainly laptops. But the survey recorded 11 neutral responses regarding Internet accessibility. It reflects partial network disturbances influencing the students' engagement in e-learning. Moreover, the survey revealed that 90% of students knew how to use the digital platform through self-learning and following the instructor's guidance. They mostly agreed that the instructor and IT engineers were trained enough to pursue e-learning education, with percentages equal to 80% and 70%, respectively. Concerning the technological perspective, students confirmed that the platform was suitable for the course's pedagogical nature. While 95% of the students agreed that it facilitated access to class materials and websites. They agreed that the instructor used suitable visualisation for the online course, employing multimedia objects during the synchronous lectures. Moreover, the survey revealed that 65% of students preferred communication via platform rather than the course's Facebook group or official e-mail as shown in fig. (1).



Gender	Count
Female	13
Male	7



Device	Count
Mobile	3
Laptop	16
Desktop	1

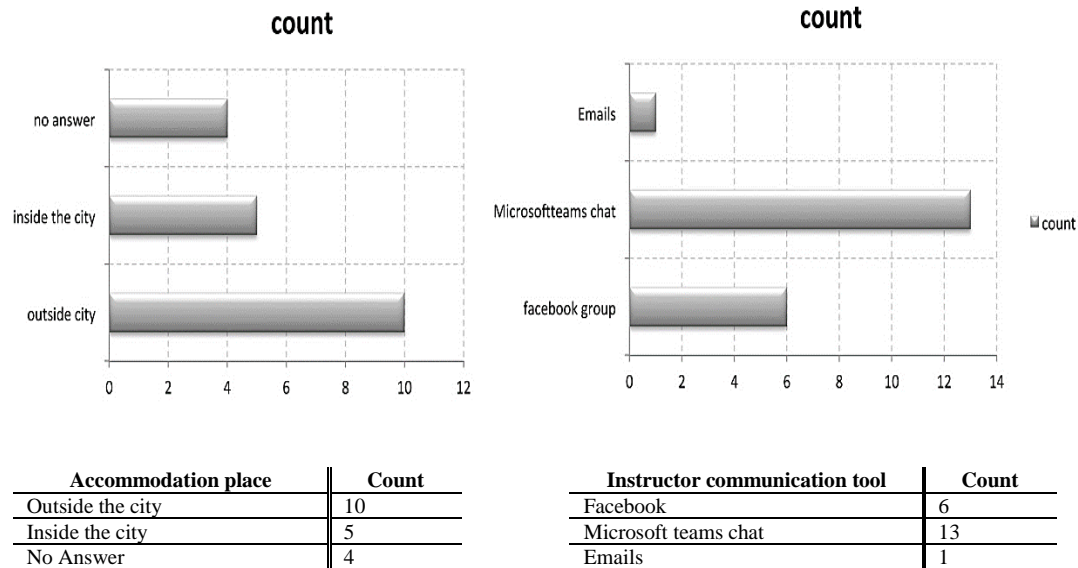


Fig. (1) shows bar-chart presentations for gender, used devices, accommodation place and the preferred communicational application. Source: Author

Regarding the learning quality, 90% of the students agreed that the instructor motivated them and improved their architectural criticism skills. Only a limited numbers recorded neutral responses, with percentages equal to 10% and 5%, respectively. The survey showed that all students confirmed that the course was well structured. 90% of the students agreed that the class materials were consistent with the course and the course challenged the students' creativity and innovation. The students agreed that the course introduced different reflections on the urban and architectural disciplines, while 75% stated that the course encouraged cross-referencing during the educational process. Moreover, most of the students approved that the workload was consistent with the course content and online format; only 1 student recorded a neutral response.

Most of the students agreed that the digital course's format enhanced peer learning and collaboration during the lectures and tutorials. The survey affirmed that the sub-channels (Rooms) enabled more inter-student and instructor-student interaction. It also facilitated the decision-making process regarding architectural criticism topics, but 10% of the students recorded neutral responses. Furthermore, the course witnessed sufficient scores regarding the enhancement of learning autonomy. Students mostly agreed that the course enabled them to better criticise their own architectural design work and integrate it with the self-learning process, with percentages equals to 85% and 75%, respectively. Although the majority of students agreed that the course enhanced their leadership skills (80%), 2 disagreed and 3 students recorded neutral responses. The digital platform achieved sufficient results regarding time

management, where 85% of the students agreed that online learning saved commuting time. Only 1 student disagreed and 2 recorded neutral responses. The survey also revealed that the course announcements and reminders were well managed according to 80% of the students. The students mostly agreed on the feedback and assessment policies, but only 1 student disagreed. Moreover, all students preferred the online evaluation rather than the traditional way. The survey also confirmed that 80% of the students confirmed having peer feedback from their colleagues during tutorials, but 20% disagreed or recorded neutral responses. Most of the students agreed on the assignments' clarity and consistency, but only a limited portion recorded neutral responses, with percentages equal to 15% and 5%, respectively. The survey revealed the success of the final project in enhancing the students' knowledge regarding architectural criticism. Only 1 student disagreed, and 2 recorded neutral responses.

Eventually, the survey investigated how the online learning of architectural criticism enhanced the learning culture in terms of adaptation and resiliency. It was recorded that 85% of students were easily adapted to online learning during the course. Moreover, 95% of them found it a successful alternative for physical education during pandemics. It is reported that 85% of students were more productive, and 80% stated that online learning enhanced their practical and communication skills in facing futuristic challenges. They also agreed with a percentage of 80% that the e-learning experience could develop architectural criticism education in the future.

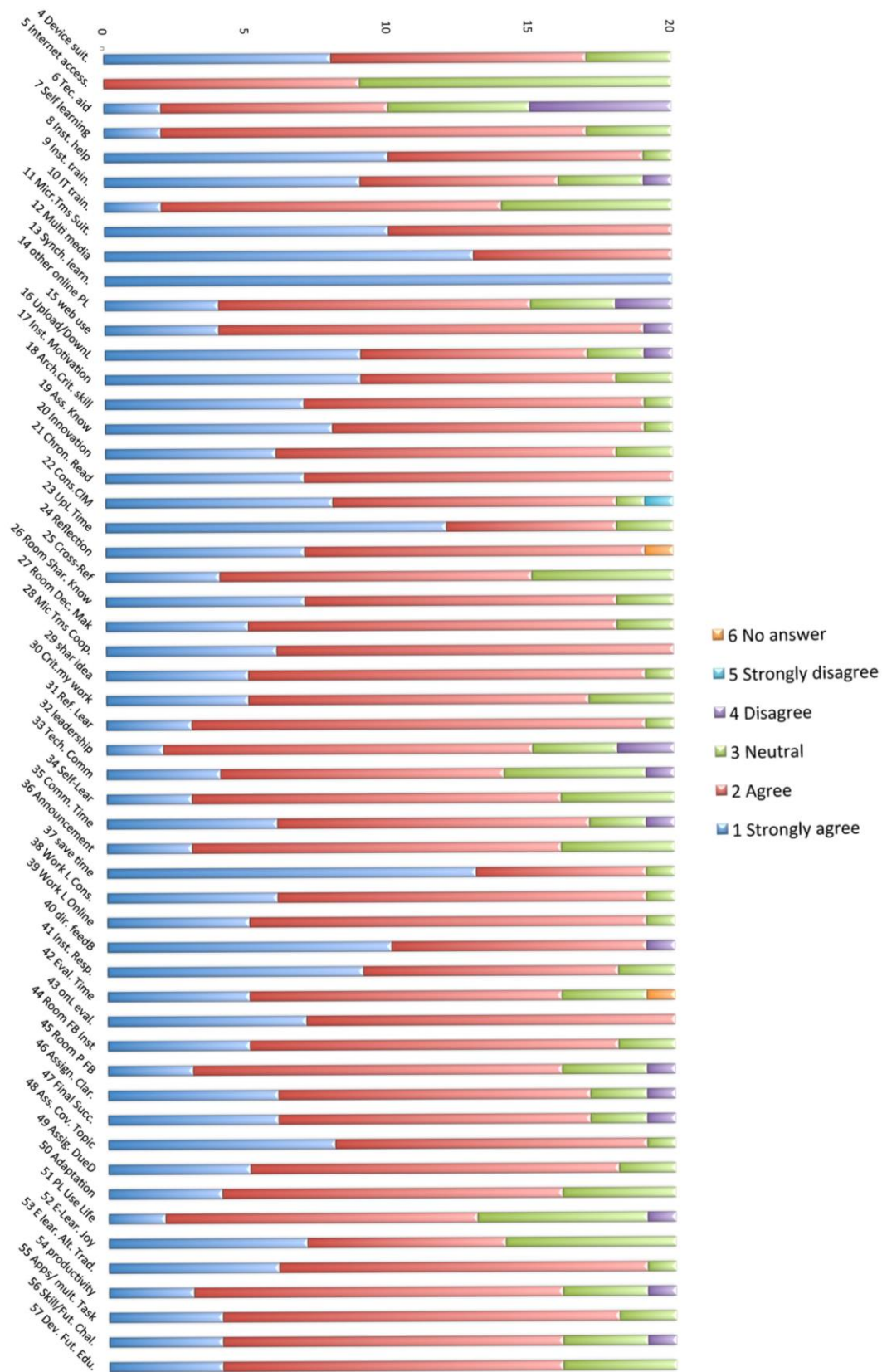


Fig. (2) shows a stacked bar chart for the questionnaire’s Likert scale data, Source: Author

4.1 Statistical Analysis for Reliability and Normality Tests

The study performed statistical analysis for the questionnaire responses through IBM SPSS software. It

performed reliability and normality tests for the sample units. The results are illustrated in table (2). The sample revealed moderate non-normality with an acceptable asymmetrical distribution of skewness < 2 and Kurtosis < 7.

TABLE (2)
ILLUSTRATES THE VALUES OF RELIABILITY TEST (CRONBACH ALPHA COEFFICIENT) AND NORMALITY TEST INCLUDING SKEWNESS AND KURTOSIS AND SHAPIRO-WILK TEST. SOURCE: AUTHOR

ID	Cronbach's Alpha if item is deleted (α)	Mean	Std. Deviation	Skewness	Kurtosis	Shapiro-Wilk p (Sig.)
Place	0.880	1.67	0.488	-0.788	-1.615	0.000
Gender	0.879	1.35	0.489	0.681	-1.719	0.000
Age	0.888	22.50	0.827	1.860	3.443	0.000
Device-Suit	0.880	1.75	0.716	0.418	-0.826	0.008
Specify-Device	0.881	1.35	0.745	1.847	1.769	0.000
Internet-Access	0.878	2.55	0.510	-0.218	-2.183	0.000
Tech-Aid	0.896	2.65	0.988	0.081	-1.043	0.021
Self-Learning	0.883	2.00	0.459	0.000	2.980	0.000
Instr-Help	0.879	1.55	0.605	0.583	-0.459	0.000
Instr-Training	0.883	1.80	0.894	0.922	0.224	0.005
IT-Training	0.884	2.25	0.550	0.132	-0.076	0.000
Mic-Tms-Suit.	0.880	1.50	0.513	0.000	-2.235	0.000
Multi-Media	0.879	1.35	0.489	0.681	-1.719	0.000
Synch-Learning	0.879	1.00	0.000	-	-	0.011
Other-PL-Use	0.875	2.20	0.834	0.800	0.721	0.000
Web-Use	0.877	1.90	0.641	1.414	5.923	0.000
Ins-Com-Tool	0.883	1.40	0.598	1.245	0.783	0.002
Upload-Down	0.877	1.75	0.851	1.104	1.067	0.002
Instr.Motivation	0.873	1.65	0.671	0.549	-0.548	0.001
Arch-Crit-Skill	0.873	1.70	0.571	0.038	-0.395	0.002
Ass-Knowledge	0.875	1.65	0.587	0.212	-0.552	0.005
Innovation	0.871	1.80	0.616	0.120	-0.207	0.000
Chrono-Read	0.876	1.65	0.489	-0.681	-1.719	0.000
Cons-CI-Mat	0.872	1.80	0.951	2.069	6.177	0.000
Upload-Time	0.875	1.50	0.688	1.076	0.083	0.000
Reflections	0.879	1.63	0.496	-0.593	-1.856	0.000
Cross-reference	0.877	2.05	0.686	-0.62	-0.630	0.001
Roomsharknow	0.879	1.85	0.671	0.177	-0.548	0.003
RoomDecMak	0.877	1.85	0.587	0.004	0.178	0.001
Mic-Tms-Coop	0.877	1.70	0.470	-0.945	-1.242	0.000
Share-Ideas	0.879	1.80	0.523	-0.294	0.457	0.001
Crit-My-Work	0.883	1.90	0.641	0.080	-0.250	0.003
Reflect-Learn	0.875	1.90	0.447	-0.549	2.663	0.000
Leadership	0.875	2.25	0.786	0.947	1.115	0.002
Tech-comm	0.871	2.15	0.813	0.358	-0.008	0.055
SelfLearning	0.870	2.10	0.641	-0.080	-0.250	0.005
Commute-Time	0.876	1.90	0.788	0.903	1.389	0.001
Announcement	0.874	2.05	0.605	-0.012	0.189	0.003
Savetime	0.874	1.40	0.598	1.245	0.783	0.001
Work-LoadCon	0.874	1.75	0.550	-0.132	-0.076	0.001
Work-LoadOnp	0.874	1.80	0.523	-0.294	0.457	0.001
Direct FeedB	0.872	1.60	0.754	1.670	4.220	0.000
Inst-Response	0.871	1.65	0.671	0.549	-0.548	0.005
Ealuat-Time	0.875	1.35	0.489	0.681	-1.719	0.000
Online-Eval	0.879	1.65	0.489	-0.681	-1.719	0.000
Room-FB-inst	0.882	1.85	0.587	0.004	0.178	0.005
Room-Peer-FB	0.885	2.10	0.718	0.796	1.727	0.022
Assig-Clarity	0.871	1.90	0.788	0.903	1.389	0.020
Final-Work	0.875	1.90	0.788	0.903	1.389	0.020
Assig-Cov-Top.	0.872	1.65	0.587	0.212	-0.552	0.002
Assig-DueDate	0.873	1.85	0.587	0.004	0.178	0.001
Adaptation	0.875	1.95	0.605	0.012	0.189	0.001
PL-use-Life	0.877	2.20	0.768	0.403	0.366	0.045
E-Learn-Joy	0.881	1.95	0.826	0.098	-1.518	0.010
E-Learn-Alt-TR	0.873	1.75	0.550	-0.132	-0.076	0.001
Productivity	0.877	2.05	0.686	1.023	2.886	0.002
App-Mult-Task	0.874	1.90	0.553	-0.83	0.766	0.001
SkilFChallenge	0.871	2.05	0.759	0.716	1.195	0.007
Dev-Fut-Edu	0.874	2.00	0.649	0.000	-0.279	0.003

4.2 Statistical Correlation Analysis for Spearman's Test

The study aimed to detect the main parametric variables influencing the empirical digital format of the architectural criticism course. Since the sample was not normally distributed, the study performed a Spearman's correlation test. It rejected the null hypothesis, stating that there is no correlation between variables. But the study illustrated that all the tested variables show positive correlations varying in levels. The results are demonstrated in an entity relational chart visualized in fig. (3).

Table (3)
illustrates the Cronbach alpha reliability coefficient.
Source: Author

ID	Correlated pair variables	Correlation degree	Correlation Coefficient
A1	Arch-Crit-Skills x Device suitability	Moderate	0.482*
A2	Arch-Crit-Skills x Innovation	Strong	0.707**
A3	Arch-Crit-Skills x Self learning	Moderate	0.514*
A4	Arch-Crit-Skills x Leadership	Moderate	0.477*
A5	Arch-Crit-Skills x Direct FBack	Strong	0.598**
A6	Arch-Crit-Skills x Final work succ	Moderate	0.534*
A7	Arch-Crit-Skills x Skill-Fut-challenges	Moderate	0.452*
A8	Arch-Crit-Skills x Cross Ref.	Strong	0.610**
M1	Mic-Tms-Coop x Multi Media	Moderate	0.480*
M2	Mic-Tms-Coop x Room-Dec-Mak	Strong	0.602**
M3	Mic-Tms-Coop x Final work succ	Moderate	0.526*
M4	Mic-Tms-Coop x Room PFBBack	Strong	0.602**
L1	Leadership x Innovation	Moderate	0.510*
L2	Leadership x Cross Ref.	Moderate	0.497*
L3	Leadership x Self Learning	Moderate	0.551*
L4	Leadership x Skill-Fut-challenges	Moderate	0.520*
I1	Innovation x Self Learning	Moderate	0.463*
I2	Innovation x Direct FBack	Moderate	0.551*
I3	Innovation x Online evaluation	Moderate	0.459*
I4	Innovation x Skill-Fut-challenges	Strong	0.668**
S1	Self-Learning x Cross Ref	Moderate	0.477*
S2	Self-Learning x Final work succ	Moderate	0.520*
S3	Self-Learning x Skill-Fut-challenges	Moderate	0.483*
P1	Productivity x Internet Access	Moderate	0.550*
P2	Productivity x Skill Fut Challenges	Strong	0.575**
P3	Productivity x Room FBInstr	Moderate	0.460*

01	Device suitability x Adaptation	Moderate	0.464*
02	Commute Time x Direct FBack	Moderate	0.516*
03	Multimedia x Room PFBBack	Moderate	0.482*
04	Room-Dec-Mak x Final work succ	Moderate	0.485*

*Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

The item concerning the course's enhancement of architectural criticism skills depended on multiple variables, as shown in table (3) and fig. (3). It reported a high degree of positive correlation with the stimulation of students' innovation and creativity. It achieved a correlation coefficient equals to 0.707**. Moreover, it scored a high degree of positive correlation with the use of cross-referencing and the enhancement of self-learning, with a correlation coefficient equals to 0.610** and 0.514*, respectively. The adopted synchronous online learning policy enabled students to obtain direct feedback from the instructor, which was correlated with their reflection about the course's quality, with a coefficient of 0.598.

The capacity of the digital platform to adopt cooperative learning had a remarkable influence on variable items. Spearman's statistical test illustrated its correlation with items concerning the facilitation of decision-making and peer-to-peer feedback. Both variables illustrated high levels of positive correlation, with coefficients equal to 0.602**. The results have also clarified a high degree of a positive correlation between students' productivity and how online learning would enhance their skills for future challenges. It scored a correlation coefficient equals to 0.575**. Furthermore, productivity was associated with the availability of good Internet accessibility and sufficient feedback from the instructor during the sub-channel discussions. The reported correlation coefficients were equal to 0.550* and 0.460*, respectively.

The statistical analysis highlighted as well, a moderate degree of a positive correlation between the enhancement of leadership capacities and the course encouragement for innovation and creativity. This correlation scored a significance value of 0.510*. Moreover, the leadership item was also positively correlated with self-learning and cross-referencing with a coefficient equal to 0.497* and 0.551*, respectively. The acquired knowledge from the final project was positively correlated with cooperative and self-learning policies. It recorded correlation coefficients equal to 0.485* and 0.520*, respectively.

The pandemic limitations challenged students' intellectual skills and enhanced their abilities for self-learning and cross-referencing. The course 's pedagogy reinforced communication and socialisation between students through real-time tutorials and peer feedback. It participated in decreasing the psychological effects of the lockdown through multiple student interactions and collective tutorial activities. The study illustrated the positive effect of the adopted pedagogies in enhancing students' architectural criticism skills and problem-solving techniques. These pedagogies improved their self-

assessment, productivity, and technical communication skills. Furthermore, the e-learning process facilitated the feedback and assessment policies through synchronous interactions and online evaluation technologies.

Although the majority of students were satisfied by the digital platform, the author as the instructor of the course faced a number of challenges. The first concerned the difficulty of observing the students' interaction during sharing screen mode. Accordingly, the instructor employed additional applications like *Polly* for asking questions, which in some way distracted the instructor himself. The second concerns the difficulty of following weak students during synchronous lectures, which

requires face-to-face interaction. Thus, the study recommends performing training courses for educators to develop their teaching patterns towards innovative methods for students' engagement. Aiming at enhancing the instructor's capacity to design visualization and representation techniques compatible with the digital format of the course and matching the online communication applications. Although the study was applied on the architectural criticism course but the author recommends assessing further courses with different theoretical and practical bases. Aiming to explore the reliability of the e-learning system to assimilate different pedagogies with high levels of learning quality.

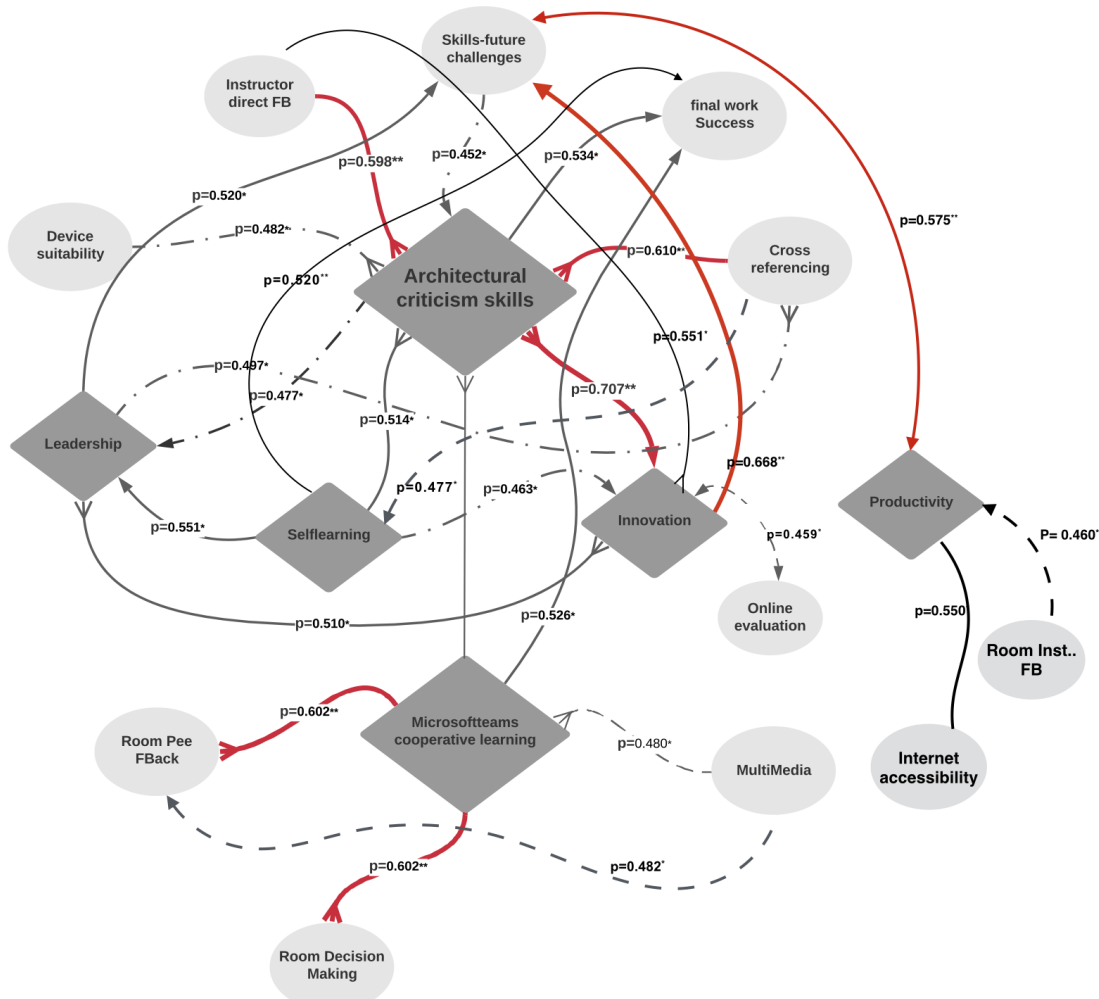


Fig (3) shows an entity relational chart between the different variables. Red colour is assigned for strong relations; continuous lines for moderate relations and dashed lines are for lower correlations. Source: Author.

V. CONCLUSION

The pandemic of COVID-19 had a major influence on the educational process worldwide, particularly in courses based on collective work. In this context, the education of architectural criticism has witnessed a paradigm shift, interpreting the physical communication pedagogies towards virtual technologies. The study investigated this transformation by assessing the impact of distance learning on the course

pedagogies in the faculty of engineering at Kafrelsheikh University during the academic year of 2020-21. The research achieved this assessment through exploring 6 dimensions based on the literature review. These dimensions concerned the availability of learning tools, the efficiency of learning quality, and the possibility of learning cooperation, besides the achievement of learning autonomy. Moreover, it tackled the efficiency of feedback and assessment policies and the adaptation to distance learning as a new culture. The research adopted a quantitative method for assessing the performance of

an architectural criticism course. It performed an anonymous structured questionnaire composed of 57 questions measuring the previous dimensions. The number of students presented was 39, while the participants in the questionnaire were a sample of 20 students.

The results are validated through IBM SPSS analytical software testing the reliability and distribution of the study sample. The tests confirmed the reliability of the variable items. The research results appraised the architectural criticism course's pedagogies based on peer debates and cooperative learning. Moreover, the outcomes elucidated the efficiency of the course's digital format in developing cross-referencing and self-learning potential. But the study recommends the enhancement of the learning autonomy dimension, particularly the items concerning leadership skills. Moreover, it recommends training educators to better engage digital representational tools through real-time lectures and tutorials. The research illustrated that the enhancement of architectural criticism skills is strongly affected by the student's capacity for self-learning and innovation, as well as the instructor's use of cross-referencing and synchronous feedback. Moreover, it depended as well on cooperative learning technologies. The efficiency of the digital platform, had caused the success of peer-to-peer feedback and decision making process between students. However, their productivity fluctuated based on the Internet stability and the instructor's synchronous feedback.

The research results were analysed through Spearman's correlation test, highlighting strong and moderate correlations between groups of pair variables. It defined the key parameters influencing the digital course format and was visualised through an entity relational chart. The research participates in the current frequent measurement of the e-learning process. Assessment and evaluation of academic courses are essential in this time of uncertainty, when the educational process is facing a remarkable transformation in its pedagogy and technologies. The study is considered a dashboard displaying the general key performance indicators of online courses, highlighting their overall progress and imperfections. Eventually, the pandemic of COVID-19 accelerated the speed of recognising digital-learning approaches. It worked as a catalyst, developing educational institutions worldwide and enhancing their resilience against future challenges.

VI. Recommendations

The study aims to expand this research work in the future, aiming to involve other educational institutions to share their experiences, discussing how they deliver different courses' content to fit online education. The study recommends integrating this research to contribute to other frameworks applying effective remote facilitation to imitate on-site interaction in laboratories. It endorses achieving an overview of how academic institutions are responding to emergencies and uncertainties. Finally, the study targets the continuous updating for distant-learning supporting the educational facilities and providing a safe learning environment. It addresses the fourth

sustainable development goal 2030 (SDGs) concerning quality education.

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DECLARATION OF CONFLICTING INTERESTS STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Arabic Title:

تقييم اثار التعلم الالكتروني لمقرر النقد المعماري خلال جائحة كوفيد ١٩ : دراسة حالة كلية الهندسة-جامعة كفر الشيخ.

Arabic Abstract:

مجال البحث: يتعلق مجال البحث بتكنولوجيا المعلومات والاتصالات التعليمية مرتكزا على التعلم الإلكتروني بالجامعات خاصة القطاع الهندسي.

مشكلة البحث: تعتبر حالات عدم اليقين المستقبلية واحدة من أكثر القضايا التي تواجه البشرية صعوبة. حيث ان العالم حاليا يواجه عدة تحديات جسيمة منها الاحتباس الحراري، دائرة الاوبئة، الارهاب، الحروب و الفقر و غيرها من المشكلات التي تعيق مسارات التنمية. كيف يمكننا التعامل مع هذه الشكوك بشكل مناسب، كان سؤالا عالميا تم طرحه بعد انتشار جائحة كورونا و التي بدأت عام ٢٠١٩. يشكل الوباء نموذجا لاحدي تحديات العصر و الذي يمكن تكراره باوجه مختلفة، لذا يجب دراسة كيفية التصدي لمثله من التحديات. خلال كوفيد-١٩ شغلت كيفية ادارة العملية التعليمية اكبر الاهتمامات العاجلة المطلوبة سرعة في القرار، خاصة بعد الاغلاق. حيث واجه القانمون علي العملية التعليمية تحديا لتطوير تنسيقات رقمية لتلبية المتطلبات التدريسية و التربوية المختلفة و التي سيتم تدريسها من خلال منصات افتراضية لتحل محل التدريس بالكليات. تسلط الورقة البحثية الضوء علي طريقة تقييم المحتوى الرقمي للمقررات من خلال دراسة لمقرر النقد المعماري. حيث لا يوجد حاليا تنسيق رقمي واضح لوسائل التدريس الالكتروني.

السؤال البحثي: كيف يمكن ادارة المقررات التعليمية المقامة علي اسس العمل التعاوني من خلال التعلم الالكتروني؟ الي اي مدى يمكن للتعلم الالكتروني ان يحل محل التعلم بالكليات اثناء حالات الطوارئ العالمية او المحلية؟ كيف يمكن تقييم المقررات الالكترونية؟

منهج البحث: تناول البحث دراسة لمقرر النقد المعماري بكلية الهندسة بجامعة كفر الشيخ. طبقت منهجية البحث التحليلات النوعية و الكمية. تستكشف الاولي الطبيعة التدريسية للمقرر. اما الاخرة فاقامت استبياناتا منظما مجهول الهوية مقدما الي الطلاب. قام بتقييم الرؤية و سياسة تقديم المقرر، الجودة و ردود فعل الطلاب. تم تحليل النتائج من خلال برنامج SPSS IBM الاحصائي لاختبار موثوقية المتغيرات و صلاحيتها.

نتائج البحث: خلصت الدراسة الي مصفوفة معامل الارتباط الاحصائي بين مجموعات المتغيرات الزوجية. و التي حددت المعاملات الرئيسية المؤثرة علي تنسيق المقرر الرقمي. اهداف البحث: تقدم الورقة البحثية دراسة لقياس و تقييم و اختبار اداء المقررات الرقمية من خلال تحليل البيانات الاحصائية. تشجع الدراسة علي اجراء عرض لمؤشرات الاداء الرئيسية للمقررات الرقمية في المؤسسات الاكاديمية المختلفة محليا و عالميا. لتحديد نقاط التقدم و القصور. و بناء علي ذلك، فان هذا العمل البحثي من شأنه ان يسرع في تطوير المقررات الرقمية لتفعل فور حدوث اي نوع من الاضطرابات او حالات الطوارئ.