Proposed Method To Be Adopted For Online Exam Without Proctored Environment During Covid 19

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Abstract—During this year and due to COVID19, we have faced the problem of going to university to give lectures and consequently take the exams. The university administration has decided to hold the lectures online but not the online exams, which must be taken on the university campus. In this work, I try to explain the possibility of taking online exams such as the one in the office or the one written at the university. The main question is how to take the exam online and, at the same time, the exam must be as safe, reliable and acceptable as the one on site and normally held on the campus of the faculty. This paper presents a method for taking online exams without a proctored environment; it will be based on an open book test idea, open lecture notes, open internet resources. The proposed method is based on some constraints, in order to minimize or cancel cheating, and therefore consider the online exam as valid as the onsite one. The results show that both online exam grades and onsite exam grades have relatively strong correlations coefficient, both have similar distribution, fairly symmetrical skewness, platykurtic distribution, and both have similar central tendency and dispersion.

I. INTRODUCTION

The pandemic and epidemic of COVID 19 has caused an educational disturbance in most universities, particularly how online higher education courses will be taught and even how online exams will be taken. Our university this year, and due to COVID 19 and the general closure in our country, has decided to continue the academic year through the Internet by taking online classes. While exams have to be taken on the university campus due to many problems and requirements, starting from avoiding cheating to complying with exam laws. We faced a big question, how to take the online exam that passes all the problems presented.

Online exams have been an important point to be discussed in many universities and many researchers around the world are working to improve the way exams are taken online and have suggested many methods. The main problem is how to overcome the problems that make the online exam as acceptable as the onsite exam at the university campus and what tools are needed to take it.

For that, this paper presents a proposed way or method based on how the teacher can ask his or her questions, how students have access to all related materials, how questions need to be related to details during online lectures, and how the teacher can take the advantages of today's technologies. The presented method shows the main features of preparing exam questions and proposes to use the Google form (or any similar program) to use its ability to control many features. The main challenge is that online exams must be as safe, reliable and acceptable as the onsite exams that are usually taken at university.

1.1 Objectives of the Study

The goal of this research is to understand how student results from an online exam can be safe and acceptable and ultimately can be adopted. The results of the online exams have to be compared with the onsite exams using the proposed method and the SPSS software and basic statistical analysis capabilities have been used to prove their worth [1] [2].

1.2 Significance of the Study

Online learning is a good teaching when done under standard conditions; where there is no pressure, but such learning in the time of COVID-19 is a challenge as the classroom suddenly has to be moved online. With this in our attention, how teachers evaluate students by giving them exams online, and how they justify student grades; while minimizing the impact of cheating, is the core of this paper. This research takes into account some considerations and attempts to draw conclusions to suggest the use of online exams. The significance of this study is its call to start using online exams during COVID-19 without fear of cheating and wrong grades.

1.3 Hypothesis Proposed

My goal is to demonstrate that student results from an online exam take similar distribution in the onsite exam at

the university campus and also to demonstrate that student participation grades during online classes are essential and have a relationship to the online exam grades. For this, the following hypotheses will be proposed to verify the objective of this research, and to understand how the results of the online exams can be safe and acceptable, and finally to say that the online exam from home with special constraints can be accepted as the exam done at the university. The hypotheses are:

✓ Hypothesis 1:
   a. Null Hypothesis Ho: "Onsite" onsite exam grades & "Online" online exam grades are independent.
   b. Alternative Hypothesis Ha: "Onsite" onsite exam grades & "Online" online exam grades are dependent.
✓ Hypothesis 2:
   a. Null Hypothesis Ho: "Participation" Number of Presences & Continuous Assessments grades & "Online" online exam grades are independent.
   b. Alternative Hypothesis Ha: "Participation" Number of Presences & Continuous Assessments grades & "Online" online exam grades are dependent.
✓ Hypothesis 3:
   a. Null Hypothesis Ho: "Participation" Number of Presences & Continuous Assessments grades & "Onsite" Onsite exam grades are independent.
   b. Alternative Hypothesis Ha: "Participation" Number of Presences & Continuous Assessments grades & "Onsite" Onsite exam grades are dependent.
✓ Hypothesis 4:
   a. Null Hypothesis Ho: The three grades of the students "Participation, Onsite, and Online" have the same mean.
   b. Alternative Hypothesis Ha: The three grades of the students "Participation, Onsite, and Online" have different mean.

Finally, this work is organized as follows: Related work and the state of the art of online exams will be presented in section 2; The method proposed for taking the online exam is presented in section 3; The methodology used is explained in detail in section 4; Analysis and results are presented in section 5; The conclusions are drawn in section 6. References are listed at the end of the paper.

II. RELATED WORK

There are many research papers in the literature that deal with online exam problems and how to improve results and avoid cheating. In this section, I will try to cite some relevant research papers to see the importance of taking online exams, and to see how some universities are trying to do their best by investing in technology, programming, training of teachers and students, and more.

❖ Paper in [3] titled "Online exams for blended assessment. Study of different application methodologies" explains that online exam can be carried without proctored environment.
❖ Paper in [4] titled "Cheating in online courses: Evidence from online proctoring" compares between proctoring online exam and non-proctoring. The paper's results imply that online proctoring is an effective tool to mitigate academic dishonesty in online courses.
❖ Paper in [5] titled "Students Online Exam Proctoring: A Case Study Using 360 Degree Security Cameras" introduces a new approach for exam proctoring using 360-degree security camera to be sure of the overall test honesty; and it proposes a more advance proctoring model and provides more scheduling flexibility and reduction of human error and resources cost.
❖ Paper in [6] titled "Individualized Excel-Based Exams to Prevent Students from Cheating" presents an approach in delivering online through Excel-based exams which enable the lecturers to develop individualized exam questions.
❖ Paper in [7] titled "Online Exam Vigilantes at Australian Universities: Student Academic Fraudulence and the Role of Universities to Counteract" presents a look at academic exam cheating. It works on how technological advances have enabled students to cheat in many different ways, and how technology can also be used to combat the problem of cheating, by employing biometrics to identify students, based on physiological and behavioral characteristics and applying the use of IP addresses as a tool to identify collusion.
❖ Paper in [8] titled "Mitigation of Cheating in Online Exams: Strengths and Limitations of Biometric Authentication" delivers a categorization of different types of high-risks assessments, diverse ways of cheating, and what kinds of cheating are most relevant for what types of assessments, also it presents an investigation of which threats biometric authentication can be real against and what types of threats biometric authentication is less effective against.
❖ Paper in [9] titled "Investigation of Pre-Service Teachers' Opinions on Advantages and Disadvantages of Online Formative Assessment: An Example of Online Multiple-Choice Exam" shows the importance of online formative assessment that can be employed to shift teaching and learning approaches from teacher-centered learning to student-centered learning by giving chance to students to identify their learning needs and focus on learning processes and their own progress.
❖ Paper in [10] titled "Online Assessment for Pathology Residents during the COVID-19 Pandemic: Report of an Experience" presents cross-sectional study that was carried out in Tehran University of Medical Sciences. The online exam, which consisted of 30 multiple-choice questions, was designed and held in April 2020 to evaluate pathology residents.
❖ Paper in [11] titled "Implementation and Security Development Online Exam, Performances and

problems for Online University Exam" presents a web-based online exam system application at Sur University College with some additional security features using network protocol, biometric devices, and object-oriented paradigms to enhance online exam systems.

❖ Paper in [12] titled "Advanced Online Examination using Raspberry Pi" features an improved raspberry pi 3 model, which uses the webcam to capture the image that captures the image when it detects any movement using the passive infrared sensor and the captured image is sent to the raspberry pi for face detection with the help of open CV.

❖ Paper in [13] titled "Online Exams in the Time of COVID-19: Quality Parameters" intends to investigate some quality parameters to verify the quality of online exams, to find the right and best way to evaluate students during Covid19 scenario and explore ways to justify the level of student performance in remote online exams.

❖ Paper in [14] titled "Experience with Online and Open-Web Exams" reports on a research study of online exams, based on the observations of hundreds of students and faculty who completed out two online surveys; and the results will guide teachers in selecting the arrangement that is correct for their session.

❖ Paper in [15] titled "Effect of remote online exam delivery on student experience and performance in applied knowledge tests" presents an approach of remote delivery of summative online applied knowledge tests. The paper's results show that this approach is an effective and generally acceptable option for students with no evidence of detriment to candidate performance, and it can be used again in future if necessary.

❖ Paper in [16] titled "Online Cheating Amid COVID-19" presents clear cheating that took place in online examinations during COVID-19 lockdowns and propose two solutions with and without a camera for the cheating problem, based on the experience accumulated by online chess communities over the past two decades. It proposes the best implementable online exam where a camera capturing each student's computer screen and room.

❖ Paper [17] in titled "Are Online Exams an Invitation to Cheat?" presents two online exams for two courses to estimate a model that predicts exam scores from independent variables of student characteristics. In one course the final exam was proctored, in the other course the final exam was not proctored. The paper's findings tell that cheating was taking place when the exams were not proctored.

❖ Paper in [18] titled "Blended VS On-Campus Learning: A Study of Exam Results in the Bachelor Degree in Nursing" presents a blended learning method as an educational method that combines classroom learning and online learning. The aim of the study was to compare learning outcomes between students receiving blended learning and the traditional on-campus approach. The paper's results indicate that

students in blended learning are able to do as well in a nursing program as or better than students in an on-campus program

❖ Paper in [19] titled "Students Perspective Assessment on Adopting Open and Distance Learning in Nigeria: The Case Study of Ladoke Akintola University of Technology, Ogbomoso, Nigeria" presents a study that was conducted to uncover students' views on verifying their future assessment on the adoption of open learning and distance education. The study concludes with a description of student satisfaction with online learning by avoiding Covid-19 in going to university; also, the university was able to take exams by its open learning platform and distance learning.

In this literature, most papers worked on how avoid students from cheating, how the camera must be adjusted, and so on for other relative issues. This paper, will take into account that the camera can stop for any reason, the electrical power can go away, and the internet can be interrupted, and also the students can help together during the exam. This paper will present a method of presenting a group of questions on the students, taking into account all above mentioned problems, by proposing open book exam with time limited and computed carefully.

III. THE PROPOSED METHOD FOR CARRYING OUT THE ONLINE EXAM

This proposed online exam must include questions based on the idea of the open book exam (to reduce cheating), in which objective and subjective questions can be provided and the student can open all materials related to the exam. Some of the questions proposed in the online exam were based on a method presented in [20], where the exam was carried out onsite in a computer lab classroom with an intranet and with a computer for each student.

3.1 Steps for preparing questions
In order to avoid or limit cheating, the following characteristics must be considered when preparing the questions of the exam:

1- The teacher must present the questions in the open book method.
2- The teacher should have the necessity to add questions based on concepts to evaluate the understanding of the course and its fundamentals.
3- The teacher must create a bank of questions in the course.
4- The teacher has to create different types of questions from difficult questions to easy questions.
5- Questions should be based directly on the contents of the online lectures.
6- Questions can have definite answer like multiple choice questions, True False questions, fill in the blanks, matching questions, etc.
7- Time must be carefully calculated to avoid students' cooperation during the exam. So that if one student decides to ask help, he/she will waste time on the exam.

3.2 Steps to implement online exams

While during the execution and implementation of the online exam, and technically speaking, the following steps will be used:

1- Choose "at random" a certain number of questions from the question bank.
2- Choose an available system such as "MS Teams with MS Form" or Google from to import the chosen questions.
3- Mix the questions using "shuffle questions order", so each student will receive questions arranged differently.
4- Mix the order of the options in each question.
5- Limit to 1 response.
6- Determine the start time of the exam, so that all students receive the questions at the same time.
7- Establish the end time of the exam, so that students' answers must reach the teacher at the end of the specified time and after this time no answers will be accepted.
8- Correcting the exam automatically through the program used and giving students the marks immediately after the exam ends.

IV. METHODOLOGY

4.1 Background

The teaching experience in traditional classrooms and the transition from traditional to digital classrooms raises the question of how to take exams online. Before we talk about the possibility of cheating, we need to think about how to ask questions to get a true grade that evaluates students' understanding of the course. The grade usually reflects what the student knows and understands. For this the methodology used in this document is based first on the preparation of the exam in a special way (see previous section), then on the execution of an onsite exam and an online exam and on the statistical comparison between them, and finally leads to say that the online exam is reliable and acceptable, and its results are similar to any onsite exam taken on the university campus. Our main aim is to say that the onsite exam at the university campus and the online exam via the Internet have the same grade distribution and the same normality characteristics. Normally, we attend that the students with higher grades in the onsite exams lead to also have higher grades in online exams and vice versa.

4.2 Participants

In this study, the researcher selected all 87 students enrolled in Computer III course of semester_5 in the three departments of the faculty of tourism and hospitality management – Lebanese University, in the academic year 2020-2021 (This study has been done in my class). Table 1 shows the students' participation in both exams.

Table 1: Participation Percentage during Online Exam and Onsite Exam.

Number of Students did exams	HM	TM	TG	SUM
Online Exam	30	29	7	66
Onsite Exam	44	35	8	87
Percentage Online Exam / Onsite Exam	68%	83%	88%	76%

Where HM stands for Hotel Management department, TM for Tourism Management department, and TG for Tourism Guidance department. Because 66 students did the online exam, then the study will be concentrated on these 66 students.

4.3 Methods and Variables

Executing Onsite exam and Online exam with the same difficulty, the same course and the same students, have been used to test relationship between the two exams. Also, the continuous assessments "participation" for students during online lectures have been taken to test with online and onsite exams. The following data variables are collected in order to attain our goal: 1) Department name; 2) Student name; 3) The onsite exam at the university campus at the first middle of the semester; 4) The online exam at the university campus at the second middle of the semester; 5) The participation grade during lectures that depends on participation of students during online lectures and their number of presences and their activations; 6) The total grade of each student including the participation grade, the onsite exam and the online exam. The explanation of each variable and the abbreviated variable name, which will be used in this paper, is shown in Table 2.

Table 2: Explanation of each variable.

Variable	Explanation
Department	HM, TM, or TG
Name	Name of each student
Onsite	Onsite Exam Grade (Maximum 50)
Online	Online Exam Grade (Maximum 50)
Participation	Participation Grade (Maximum 50)
Total	Total Grade (Maximum 50), and it is computed by the following formula: Total= 0.35*Onsite+ 0.3*Participation+ 0.35*Online

4.4 Procedures

The timing of the data collection of onsite-online-participation grades of students enrolled in the course, is the fall semester of the 2020-2021 academic year which started on 1 October 2020 and ended on 12 February 2021. The onsite exam has been done in the university campus in the middle of the fall semester and its grades is saved (The onsite exam started at 13:30 PM on December 16, 2020 and ended at 14:30 PM.); and the online exam has been done at the end of the semester and its grades is saved (The online exam started at 8:30 AM on February 8, 2021 and ended at 9:30 AM.).

While the participation grade, which is also very important, is collected in each lecture. It is very useful during the online lectures to know your students very well, who of them do exercises in time, who do the quizzes and

how much grades obtain, what about their performance by asking them during the lectures and through interactive online questions, and finally by observing their level through continuous assessment.

4.5 Putting all data in SPSS
At the end of the online exam, the data is imported from google form to excel file, then first step was to filter the data by deleting some data not true, then the data are exported to SPSS software as shown in Figure 1. Onsite grades and participation have been added to SPSS data in order to test the hypothesis proposed. Total grades or final grade have been computed inside SPSS in function of onsite-online-participation grades. The results and the analysis are reported in the next section.

Figure 1: Data presented in SPSS.

V. RESULTS AND DISCUSSION

As said in previous section, SPSS software is used to analyze the data. The analysis approach is based on analyzing each variable by doing the necessary descriptive statistics, and then testing relationship between different variables, and then doing the necessary steps for inference statistics. A quick report in [21] explains briefly a comparison between online and onsite exams done for same students and same course in our university.

5.1 Descriptive statistics of each variable
Table 3 shows the sample descriptive statistics of each of the three variables and the total: 1) the Central Tendency (Mean-Median-Mode); 2) Dispersion (Standard deviation – Range – Maximum – Minimum); 3) Position (Quartile – Decile – Percentile); 4) The Distribution (Skewness & Kurtosis). The data presented are 66 grades for 66 students and no missing values.

Table 3: The descriptive statistics of each of the three variables and the total.

	Onsite	Participation	Online	Total
Mean	37.27	36.86	34.74	36.33
Median	37.50	38.00	37.00	38.00
Mode	31[a]	42	40[a]	38
Stdev	7.161	8.280	9.152	6.664
Skewness	-.426	-1.234	-.244	-.510
Kurtosis	-.134	.756	-1.033	-.296
Range	32	35	36	27
Minimum	18	15	14	21
Maximum	50	50	50	48
Q1	32.75	35.00	27.00	32.00
Q2	37.50	38.00	37.00	38.00
Q3	43.25	42.00	41.00	41.25
a. Multiple modes exist. The smallest value is shown				

Starting analysis with onsite exam at the university, the central tendency is 37.27/50 with mode 31/50. The dispersion has standard deviation 7.161, 50/50 maximum value, 18/50 minimum value, 32/50 range value. Fourth of the data are less than 32.75/50 and half of the data are less than 37.50/50 and fourth of the data are greater than 43.25/50. The distribution of grades is fairly symmetrical (since skewness value is between -0.5 and 0.5), and tends to high values (since skewness value is negative) and platykurtic distribution (since kurtosis is less than 3).

Analysis of Online exam through internet has the following statistical characteristics: the central tendency is nearly 34.74/50 with mode 40/50. The dispersion has standard deviation 9.152, 50/50 maximum value, 14/50 minimum value, 36/50 range value. Fourth of the data are less than 27/50 and half of the data are less than 37/50 and fourth of the data greater than 41/50. The distribution of grades is fairly symmetrical (since skewness value is between -0.5 and 0.5), and tends to high values (since skewness value is negative) and platykurtic distribution (since kurtosis is less than 3).

Analysis of students' Participation has the following statistical characteristics: the central tendency is nearly 36.86/50 with mode 42/50. The dispersion has standard deviation 8.280, 50/50 maximum value, 15/50 minimum value, 35/50 range value. Fourth of the data are less than 35/50 and half of the data are less than 38/50 and fourth of the data greater than 42/50. The distribution of grades is highly negatively (since skewness value is less than -1), and tends to highest values (minus skewness value) and platykurtic distribution (kurtosis < 3). The relative histogram of the three variables and the total are shown in Figure 2, Figure 3, Figure 4 and Figure 5.
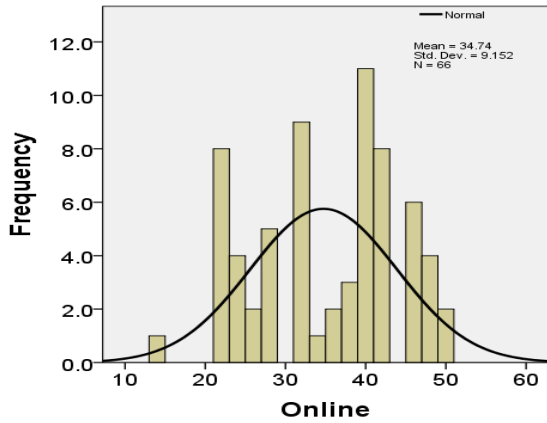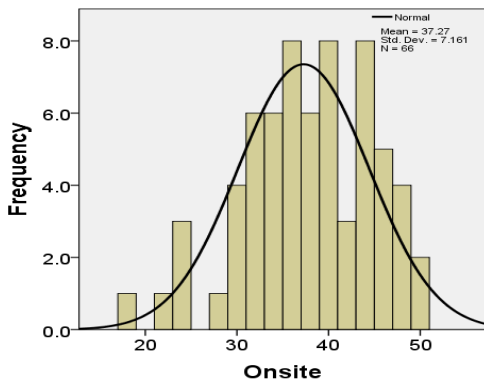
Figure 2: Histogram of Online Exam Grades.

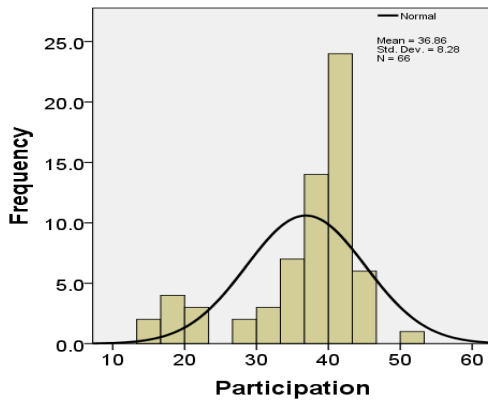Figure 3: Histogram of Onsite Exam Grades.

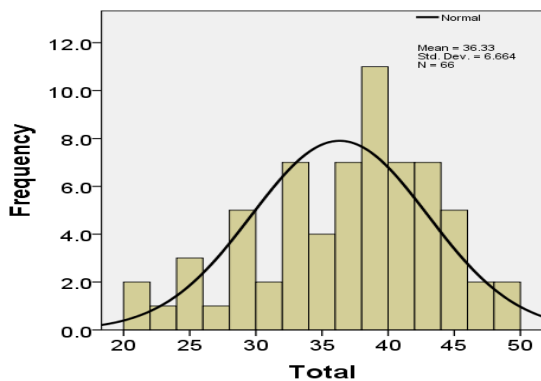Figure 4: Histogram of Students' Participation Grades.

Figure 5: Histogram of Students' Total Grades.

Figure 6 shows a comparison of box and whisker plot of the three departments for online exam. It shows clearly the descriptive statistics "especially the range and the quartiles" in each department; while Figure 7 shows the same results for onsite exam.
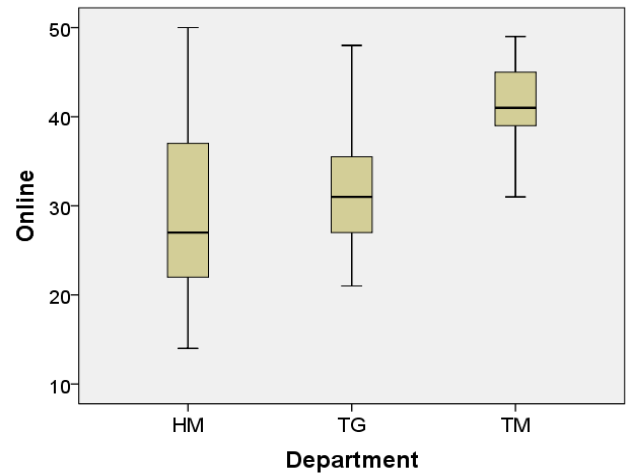

Figure 6: Box and Whisker Plot for Online exam for the three departments.
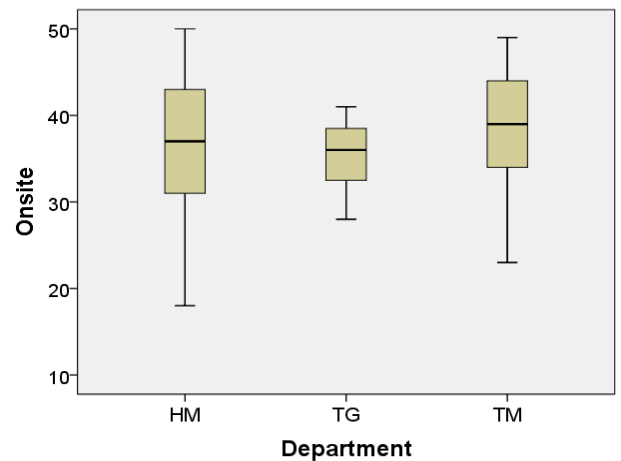

Figure 7: Box and Whisker Plot for Onsite exam for the three departments.

5.2 Testing relationship between different variables

In order to test relationship between different variables, we have to test all of the three possibilities:
1- "**Onsite**" onsite exam grades & "**Online**" online exam grades.
2- "**Participation**" Number of Presences & Continuous Assessments & "**Online**" online exam grades.
3- "**Participation**" Number of Presences & Continuous Assessments & "**Onsite**" online exam grades.

Table 4 shows the Pearson Correlation, p-value Sig. (2-tailed) and the N Number of students for each of the above three cases. Since p-value Sig. (2-tailed) in all three different cases is 0.00, which is less than 1%, then we conclude that the null hypotheses H1–H2-H3 are rejected, and consequently the alternative hypotheses are accepted.

This leads to say that Onsite–Participation, Online–Participation, and Onsite–Online are not independent or they are dependent.

Table 4: Correlations between different variables.

	Onsite - Participation	Online – Participation	Onsite – Online
Pearson Correlation	53.91%	47.28%	48.44%
Sig. (2-tailed)	.000	.000	.000
N	66	66	66

The Pearson Correlation shows the strength of the correlation in each case. Comparing the correlations' values in Table 4 with Table 5 [2], we conclude that the correlations is relatively strong between the Onsite and Online Exams grades and also the two exams grades are relatively strong with the Participation grades of students. The regression equation & the scatter plot for the Onsite–Participation, Online–Participation and Onsite–Online are shown respectively in Figure 8, Figure 9 and Figure 10.

Table 5: Description of the strength of the correlation.

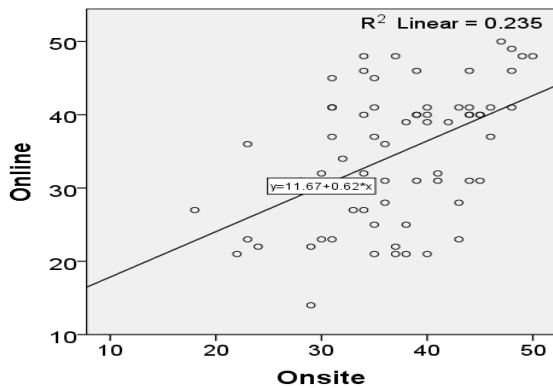| Correlation Strength	Correlation Value
Negligible	0.00 < 0.10
Weak	0.10 < 0.20
Moderate	0.20 < 0.40
Relatively strong	0.40 < 0.60
Strong	0.60 < 0.80
Very strong	0.80 < 1.00

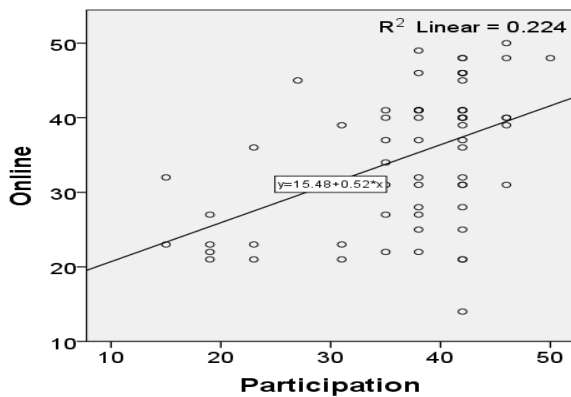Figure 8: The regression equation & the scatter plot between Online grades and Onsite grades.

Figure 9: The regression equation & the scatter plot between Online grades and Participation grades.
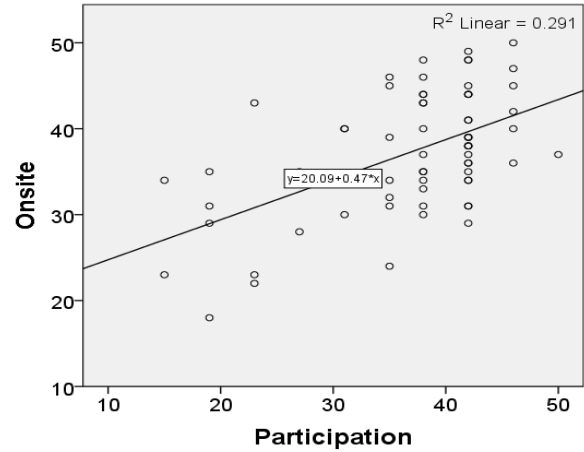

Figure 10: The regression equation & the scatter plot between Onsite grades and Participation grades.

5.3 ANOVA Test Among the Online-Onsite-Participation Grades

In order to test the Null Hypothesis H4 among Participation-Onsite-Online grades, which assume that they have the same mean, the one way ANOVA test has been used. Table 6 shows an analysis of variance (ANOVA), which it has been made for the grades of students in the three variables "onsite exam grades – online exam grades – participation grades". Since P-value = 27% and it is greater than 5%, then Null hypothesis H4 is accepted and ANOVA tests showed same means between groups (no significant different among them). If ANOVA test showed significant different among them (with P-value < 5%), and because they have similar histogram distribution, then a multiplication factor for online average can be used to increase or decrease the grades of online exam to have similar average like the onsite exam.

Table 6: One Way ANOVA Test Analysis.

SUMMARY of ANOVA: Single Factor				
Groups	*Count*	*Sum*	*Average*	*Variance*
Onsite/50	66	2460	37.27	51.28
Participation/50	66	2433	36.86	68.55
Online/50	66	2293	34.74	83.76
Total /50	66	2398	36.33	44.41

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	243.61	3	81	1.3	0.27	2.64
Within Groups	16120.2	260	62			
Total	16363.8	263				

VI.   CONCLUSION

In conclusion, let's say that, to face the different problems of going to university to give lessons and consequently

take exams; Sure, we can do online lessons, but we can also do online exams with some constraints. This paper shows that: the three null hypotheses H1-H2-H3 are rejected and then the three alternative hypotheses are accepted, that to say that the three variables have relationship among them and they are dependent; the correlations are relatively strong between Onsite Grade - Online Grade (48.44%), Online Grade – Participation Grade (47.28%), and Onsite Grade - Participation Grade (53.91%); the null hypothesis H4 is accepted, that is to say that the three exams have the same average. So, we can conclude that onsite exam grades and online exam grades depend (they have a similar grade histogram). Furthermore, we can conclude that online and onsite grades depend on the participation grades of students. This paper demonstrated that online exam grades have the same distribution of onsite exam grades; both have fairly symmetrical skewness (-0.5<Skewness<0.5) and both have platykurtic distribution (kurtosis<3); both have similar central tendency and dispersion. It also demonstrated that student participation grades in online classes are essential and have a relationship to grades of online exams. Finally, it is recommended to use the online exam during COVID19 with the proposed constraints, in order to simplify the learning process and specially to take the exam on time.

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