The Statistical Evaluation of E-Exams in Higher Education Institutions during COVID-19 Pandemic: A Case of Iraq

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Abstract

After the COVID-19 Pandemic, electronic Learning has become the unique means of completing curricula, conducting assessments and examinations in Iraqi universities. The present research evaluates an electronic test (E-exam) implementation at one of the Iraqi technical universities (as a case study) based on two samples of 532 teachers and 5268 students. Descriptive and inference statistics were used to analyze the two samples' responses to two questionnaires' questionnaires. The results showed that 84% of the teachers and 68% of the students indicated that the implemented E-exam could not distinguish the outstanding students, leading to unreal scores. On the other hand, 21% of teachers have confidence with E-exam, while 60% of students trust it.

Furthermore, the Lakeland Triangular classification test shows that the Grand Mean for the two samples' responses was moderate weight (1.67-2.33), and the teachers' responses were more homogenous with a lower Variance. Both samples' reflections revealed an adverse reaction towards E-exam's suitability for assessment in Technical Education, and so Blended Learning is recommended to meet this requirement. However, enhancement of the infrastructure and more training is needed to obtain effective monitoring.

Keywords

Introduction

The COVID-19 Pandemic and complete lockdown forced most universities worldwide to switch to electronic Learning (E-learning) and online electronic examination (E-exam) (HAMEEDI, AL-FATLAWI, ALI, & ALMAGTOME, 2021; Marinoni, Van’t Land, & Jensen, 2020). Many Countries like Denmark, Estonia, Finland, France, and Germany (which have already been invested in E-learning and digitalization) experienced an easy shift process while others have encountered significant challenges (Kee, 2021). Since the 1990s, when Information and Communication Technology (ICT) has been effectively introduced in education, E-exam has been adopted, and the learning process has developed fundamentally (Balart, Ezquerra, & Hernandez-Arenaz, 2021; Llamas-Nistal, Mikic-FOnte, Caiero-Rodriguez, & Liz-Dominguez, 2021; Nicol, 2007). E-exam is a part of the electronic end-to-end assessment's (E-assessment) procedures, including proposition, composing papers, signing up, examining, batching, statistics, and analysis. This exam means that the design, test implementation, response recording, and feedback are all completed using ICT despite the students living in remote areas (Al-Fatlawi, Al Fartoosi, & Almagtome, 2021).

Different researchers (Alruwais, Wills, & Wald, 2018; Appiah & Van Tonder, 2018; Brink & Lautenbach, 2011; Crews & Curtis, 2011; Dermo, 2009; Osuji, 2012; Ridgway, McCusker, & Pead, 2004) discussed E-exam's advantages and challenges compared with the traditional measure (paper and pen test). Students prefer E-exam due to its easy control, friendly interfaces, fast use, immediate feedback, and assessment anywhere and anytime. Teachers prefer E-exam to save time, especially in large numbers, improved feedback, and ease of tracking student performance. However, the quality of E-exam may be affected by some challenges like poor infrastructure, particularly in developing and developing countries, security, and cheating, lack of skill for teachers and students, as well as some technical obstacles like scoring questions with the open response and assessing skills and group project (Adegbija, 2012; A. Almagtome, Khaghaany, & Önce, 2020; A.H. Almagtome, Al-Yasiri, Ali, Kadhim, & Bekheet, 2020; Hettiarachchi, Huertas, & Mor, 2013).

Research Problem

Due to the recent experience of the online E-exam in Iraq, several challenges arose from teachers' and students' points of view. These challenges led to many questions about the quality of these examinations at Higher Education and particularly Technical Education (TE).
Research Objectives

- Analysis of the online E-exam status at one of the Iraqi technical universities for 2019/2020.
- They communicated with teachers and students to identify their responses and indicate the advantages and challenges of adopting an E-exam.
- To provide a level of the E-exam in the next academic years that achieves the sobriety of higher education in general and TE in particular.

Research Hypotheses

To answer the research problem's questions and achieve its objectives, it is necessary to develop some statistical hypotheses that can be tested (proven or denied) concerning the common questions between the teachers' sample and the students' sample about E-exam. The two designed questionnaires contained (18) common questions, (9) of them are answered with (Yes or No), and the other (9) are responded to with three options (trilogy choices). Therefore, three hypotheses can be formulated to test the differences between the responses of the two samples as follows:

Hypothesis 1: There are no statistically significant differences between the two samples' responses regarding questions with (Yes or No) answers.
Hypothesis 2: There are no statistically significant differences between the two samples' responses regarding trilogy choices answers.
Hypothesis 3: There is no correlation between the respondents of the exams (teachers and students) and their answers to the trilogy choices questions.

Previous Studies

E-exam has been adopted in higher education in Iraq on a minimal scale, such as competitive examinations for postgraduate applicants and proficiency tests in continuing education centers in Iraqi universities. However, ABIDI and ALDHALEMI (2020) stated that E-learning was adopted in Iraq as the unique method for completing the curriculum and assessing student's performance after the spread of the COVID-19 Pandemic. So, the E-exam was one of the pillars of E-learning that was adopted for formative and summative assessments.

Neuman and Baydoun (1998) studied the goal of achieving parity between paper and computerized (electronic) tests in undergraduate students. The study included a random
sample of 411 students from various levels and disciplines and underwent many pre and post-tests for different years. The main findings were:

- There are no statistically significant differences between the results of the paper examinations and the E-exam results for all levels of the students who applied for them.
- The conditions in which both tests are conducted should be adjusted to ensure a fair evaluation of students' performance.

Lim, Ong, Wilder-Smith, and Seet (2006) conducted a study to get feedback from the students of Singapore University to know the students' attitudes towards computer-based tests (CBT) compared with paper and pen (PNP) tests. The study was applied to a total of 213 students (only 114 of them responded) who used two types of CBT, one containing multiple-choice questions (MCQ) and the other containing modified essay questions (MEQ). The results showed that about 80% of the responded students preferred the CBT over the MCQ traditional PNP test, while 55% preferred the CBT over the MEQ definitive test. The reasons are given to explain the preference for CBT over PNP included:

- Independence from the seating position.
- Better image quality (personal computer screens instead of projected onto a typical screen).
- CBT allowed students to proceed at their own pace.
- Neater answer scripts and a better indication of answer length in CBT.

Adegbija (2012) accomplished research on the importance of new technologies in conducting an E-exam through a random sample of 25 examination management staff at the National Open University in Nigeria. They analyzed the responses statistically using the mean and standard deviation. The results showed that E-exam is worthwhile and capable of assessing students because it can control all the traditional exams' harmful practices. However, the study also concluded that the inadequate electricity power supply represents a severe challenge in implementing E-exam, lecturers and students are generally need more training, and examination centers need more equipment and infrastructure.

Kuikka, Kitola, and Laakso (2014) were interested in the lecturers' difficulties when submitting an E-exam at the University of Turku Applied Sciences in Finland by collecting data from 48 out of 450 university faculty. Based on the survey results and according to the teachers' responses, the researchers reported that the following features and services are essential in the E-exam system: support and training, simple user interface, usage of usual
network credentials, automatic evaluation, immediate feedback, search and sharing functions, reservation calendar for E-exam, and exam statistics.

Alshahrani (2015) presented a study on electronic the quality standards of electronic testing at King Khalid University from teachers' and students' points of view. They surveyed a sample of (79) teachers and (124) students depending on each group's questionnaire. The feedback from teachers and students indicated adherence to E-exam's quality standards, but the researchers do not support this conclusion. Nevertheless, the results of the achievement tests indicate high success rates and high scores. In addition, the committees concerned with evaluating the exams confirmed the ease of questions and technical and objective mistakes in preparing for the test.

Based on a statistical evaluation, Farzin (2017) conducted a questionnaire of 300 students in an Iranian university to find out their attitude towards the E-exam. The results revealed that students with little knowledge of computers do not have a high degree of acceptance of the E-exam and need more training. Furthermore, the researcher indicated that software developers should pay more attention to security issues and the program's user interface to facilitate its use by students and teachers after realizing its usefulness.

Al-Qdah and Ababneh (2017) investigated the effects of the E-exam on (100) Saudi students' achievements compared with traditional paper exams. The students' performances were measured in each question type (MCQ, True or false (TF), short answer, essay, numerical, and descriptive). The results showed that the mean and standard deviation were similar between paper-based and E-exam in the MCQ, TF, and numerical types of questions. Students preferred to answer the essay questions on paper rather than type on the computer screen. The students chose certain facilities of the E-exam, such as automatic results and feedback.

Appiah and Tonder (2018) conducted a review paper dealing with the E-assessment (E-exam) in higher education and its significant concepts. They discussed the tasks that can be assessed through the E-exam and its principles, benefits, and challenges. The researchers believed that if the E-exam was appropriately designed, it could support and improve student learning. They reported that teachers should make mutual efforts to get a reliable E-exam to get authentic, consistent, transparent, and practical exams. They believed that the E-exam is more convenient than the traditional exam because it can reduce students' stress, enhance the institutions' ability to make decisions, and reduce time and cost.
Shraim (2019) explored the perceptions of (342) Palestinian undergraduate students about the E-exam. The questionnaire asked the students to show their perceptions toward E-exam in terms of pedagogy, validity, reliability, affective factors, practicality, and security. The results showed that E-exam was preferable to the paper exam because of its benefits of reliability, time-saving, and less effort and money spent on the exam process. On the other hand, students showed many challenges facing E-exam's successful implementation like security, validity, and fairness. The researcher indicated that E-exam is more suitable for formative assessment rather than summative assessment.

The current study is distinguished from all previous studies by:

1. The Ministry of Higher Education's decision to adopt E-learning and E-exam in Iraqi universities was not planned previously. Still, it was the most appropriate solution to deal with the urgent lockdown imposed on 20 February 2020 because of the COVID-19 Pandemic. Accordingly, it is expected that some serious challenges will appear due to the lack of sufficient time to provide the necessary infrastructure and to complete adequate training for all teachers and students since the movement was electronic and via the Internet.

2. The online E-exam included all university students and not a limited number of colleges or a selected number of scientific departments in a particular college. Therefore, the number of students who took online E-exam in the university was very high (more than 20000), representing the student's statistical community. Likewise, the teacher's statistical community was also high and included (950) teachers.

3. All the online exams were implemented out of the university campuses because they were not allowed to reach their colleges or institutes. Some students have taken the exam while they were in quarantine of hospitals or were infected with the Pandemic at home. Some teachers also experienced similar cases and continued to test their students while suffering from the Pandemic or even under ventilators. Very few of the personnel responsible for administering the exams were present inside the university campuses, and the monitoring process was not wholly sufficient.

Methodology

Two questionnaires were designed, one for the teachers and the other for the students. Each questionnaire covered the main aspects of the online E-exam relating to the teachers and students. They were announced through the university website and accessed online with an electronic link from 10/8/2020 to 24/8/2020. Responses were collected, managed to exclude incomplete ones, arranged in Excel sheets, and finally statistically analyzed. The number
of the teachers' responses was (532) out of (950) faculty with a high ratio of (53%), while the number of the students' responses was (5268) out of (20000) with a balance of (26%). Accordingly, the two samples represent the two statistical communities well. Furthermore, the teachers' sample included different specializations and scientific ranks, while the students' sample included various fields (Technology, Management, Health, and Agriculture).

Descriptive Statistics was used through binary tables of the study variables and their percentages. Besides, inference statistics were adopted to test the three research hypotheses using three statistical measures (Bonett, 2006).

6.1. Two-Proportions Test (Z-Test). The research hypothesis 1 could be formulated by the following Null Hypothesis (Ho):

Ho: There is no statistically significant difference between the first proportion \(P_1\) and the second proportion \(P_2\) or \([P_1=P_2]\)

(1)

The test statistics for this hypothesis (Z-Test) could be explained according to the mathematical formula:

\[
Z_c = \frac{\hat{p}_1 - \hat{p}_2 - H_0}{\sqrt{\hat{p}*(1-\hat{p})*(\frac{1}{n_1} + \frac{1}{n_2})}}
\]

(2)

The hypothesis is rejected if P-value<\(\alpha/2\) as \(\alpha=0.05,0.025,0.01\).

6.2. Lakeland Triangular Classification (LTC) Two-Means Test. The research hypothesis the following Null Hypothesis could formulate 2:

Ho: There is no statistically significant difference between the first Mean \(\mu_1\) and the second Mean \(\mu_2\) or \([\mu_1=\mu_2]\)

(3)

The test statistics for this hypothesis (LTC) could be explained according to the mathematical formula:

\[
T_c = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}
\]

(4)
6.3. Independence Test. The research hypothesis 3 could be formulated by the following Null Hypothesis (H0):

\[ \text{Ho: There is no relationship between factor A and factor B (factor A and factor B are independent)} \] (5)

The test statistics for this hypothesis (Chi-square) can be explained according to the mathematical formula:

\[
\chi^2 = \sum_{i,j}^c \frac{(O_{ij} - E_{ij})^2}{E_{ij}}; \text{ Where } \chi^2 \text{ is distributed as chi-square distribution} \] (6)

Analysis and Results

1. Responses of Teachers

1.1. General information. Based on teachers' specialization, we note that 42% of the sample was from the technological field, 26% from the Management specialization, 21% from the medical discipline, and 11% from the agricultural field. At the teachers' scientific ranks, 5% of the sample was with the status of professor, 16% assistant professor, 28% lecturers, and 54% assistant lecturers.

1.2. The responses about the E-exam. Although the percentage of teachers who benefited from the E-exam experience at the university was 62%, 79% of the teaching staff said they had no confidence in the student's assessment through E-exam. As for this response's reasons, 67% pointed out that the nature of the E-exam led to the creation of unreal scores for the student, and 84% of them think that the E-exam does not distinguish the outstanding students. This is in line with 89% of the teachers who prefer to introduce random questions to identify the exceptional students. Regarding the E-exam suitability for TE, only 8% answered that it is suitable for TE. Only 11% indicated that it evaluates students' skills, and 49% of them noted that the questions were general and theoretical. The E-exam time was sufficient as 97% replied, and 60% of teachers desire to continue E-learning.

1.3. The responses about the training. 83% of teachers explained that students underwent training about dealing with the electronic platform, downloading question files, and uploading their answers in addition to an experimental E-exam. In the exercise of teachers, 53% of them urged practical training, while 27% needed training for the E-exam design, and 20% of teachers required training for the assessment and evaluation.
2. Responses of the Students

2.1. General information. The distribution of students' sample by specialization was as follows: the ratio of the management specialization 36%, the medical specialization 33%, the technological specialization 28%, and the agricultural specialization 3%.

2.2. The responses about the E-exam. 76% of the students responded that they have benefited from the E-exam experience at the university, and 60% of them have confidence in the E-exam assessment. On the other hand, 76% of the students consider that the E-exam's nature has led to unreal scores, and 68% believe that the E-exam does not distinguish the outstanding student. Accordingly, 51% of the students agreed to add questions to identify exceptional students. Regarding the suitability of the electronic exam for TE, only 33% answered that TE is suitable. Only 12% of them indicated that it evaluates students' skills, and 52% noted that the questions were general and theoretical. The time of the E-exam was sufficient as 91% of the students replied. 77% agreed that the students' teaching staff carried out training, and an experimental E-exam was implemented. However, 57% of students have the desire to continue E-learning.

3. Results of Testing Research Hypotheses

Table 1 Results of the Two-Proportions Test (Z-Test)

<table>
<thead>
<tr>
<th>Item</th>
<th>Teachers' Response</th>
<th>Students' Response</th>
<th>Z-test</th>
<th>p-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>The desire to continue E-learning</td>
<td>0.6</td>
<td>0.57</td>
<td>1.345</td>
<td>0.089</td>
<td>No Rejection</td>
</tr>
<tr>
<td>Did you benefit from the application of E-learning and E- E-E-E-E-exams this year?</td>
<td>0.62</td>
<td>0.76</td>
<td>3.626</td>
<td>0</td>
<td>Rejection</td>
</tr>
<tr>
<td>Have experimental E-exam been conducted?</td>
<td>0.83</td>
<td>0.77</td>
<td>3.471</td>
<td>0</td>
<td>Rejection</td>
</tr>
<tr>
<td>Do you agree with the method of calculating the average for this year and its current weight in the final graduation rate?</td>
<td>0.41</td>
<td>0.75</td>
<td>15.355</td>
<td>0</td>
<td>Rejection</td>
</tr>
<tr>
<td>The time of the final E-exam was sufficient.</td>
<td>0.97</td>
<td>0.91</td>
<td>7.159</td>
<td>0</td>
<td>Rejection</td>
</tr>
<tr>
<td>The E-exam doesn't distinguish the outstanding students</td>
<td>0.84</td>
<td>0.68</td>
<td>9.33</td>
<td>0</td>
<td>Rejection</td>
</tr>
<tr>
<td>Do you have confidence in E- E-exams for student evaluation compared to traditional exams?</td>
<td>0.21</td>
<td>0.6</td>
<td>20.63</td>
<td>0</td>
<td>Rejection</td>
</tr>
<tr>
<td>Were; questions and their contents presented randomly?</td>
<td>0.71</td>
<td>0.48</td>
<td>11.035</td>
<td>0</td>
<td>Rejection</td>
</tr>
<tr>
<td>Do you prefer to assign a random question to identify the outstanding students?</td>
<td>0.89</td>
<td>0.51</td>
<td>24.977</td>
<td>0</td>
<td>Rejection</td>
</tr>
</tbody>
</table>
Table 1. shows the proportions of positive responses and the results of testing the first null hypothesis (Z-Test) according to equation (2). The null hypothesis is not rejected (P-value > 0.05) only in item 1 concerning the desire of each of the teachers and students to continue E-learning. So, it can be said that the match between the responses of teachers and students concerning this item is statistically significant. On the other hand, table 1 shows no statistically substantial matching between the two samples' reactions about the rest eight items, and hypothesis 1 is rejected (p-value > 0.0001). Accordingly, it can be concluded that there are significant differences between teachers' and students' responses regarding eight items. To test the differences between the two samples’ responses regarding their answers to the common trilogy questions, LTC based on the two means (Equation (4)) was used to check null hypothesis 2. The summary of the results is shown in Table 2.

Table 2 Test of the two means of responses of the two samples by LTC (T-test) scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Teachers</th>
<th>Students</th>
<th>T-test</th>
<th>P-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Var.</td>
<td>Mean</td>
<td>Var.</td>
<td></td>
</tr>
<tr>
<td>The quality of lectures presented during the semester</td>
<td>2.271</td>
<td>0.458</td>
<td>1.790</td>
<td>0.506</td>
<td>14.916</td>
</tr>
<tr>
<td>The quality of homework performed during the semester</td>
<td>2.092</td>
<td>0.483</td>
<td>2.070</td>
<td>0.605</td>
<td>0.629</td>
</tr>
<tr>
<td>E-exams were conducted during the semester</td>
<td>1.882</td>
<td>0.707</td>
<td>2.080</td>
<td>0.714</td>
<td>5.163</td>
</tr>
<tr>
<td>The benefit from the E-learning and E-exam</td>
<td>2.568</td>
<td>0.348</td>
<td>2.060</td>
<td>0.517</td>
<td>15.764</td>
</tr>
<tr>
<td>E-exam results in unreal scores</td>
<td>2.662</td>
<td>0.243</td>
<td>2.100</td>
<td>0.570</td>
<td>16.799</td>
</tr>
<tr>
<td>The questions in the E-exam assessing the practical side</td>
<td>2.079</td>
<td>0.634</td>
<td>2.100</td>
<td>0.530</td>
<td>0.631</td>
</tr>
<tr>
<td>The effect of using the follow-up program (monitoring) on the fairness of exam</td>
<td>1.650</td>
<td>0.529</td>
<td>1.790</td>
<td>0.586</td>
<td>4.023</td>
</tr>
<tr>
<td>Questions measure student's theoretical knowledge as well as skills</td>
<td>1.659</td>
<td>0.466</td>
<td>1.590</td>
<td>0.462</td>
<td>2.218</td>
</tr>
<tr>
<td>E-exam is suitable for TE</td>
<td>1.882</td>
<td>0.267</td>
<td>2.030</td>
<td>0.629</td>
<td>4.231</td>
</tr>
<tr>
<td>Grand Mean</td>
<td>2.083</td>
<td>0.460</td>
<td>1.975</td>
<td>0.570</td>
<td></td>
</tr>
</tbody>
</table>
Table 2 shows no statistically significant differences between teachers' and students' responses about three items only. These items concern: (homework performed during the semester, \(p\)-value = 0.529 > 0.025), (the questions in the E-exam assessing the practical side, \(p\)-value = 0.528 > 0.025), and (questions that measure student's theoretical knowledge as well as skills, \(p\)-value = 0.027 > 0.025). As for the other responses, all \(P\)-values were less than 0.0001, indicating high statistical differences between the two samples' responses. From the same table, it can be concluded that the overall average of the two samples for all responses fell within the moderate weight (2.33-1.67). Still, the teachers' response was more homogenous because the variance was lower than that of the students' sample (0.460 < 0.570).

<table>
<thead>
<tr>
<th>Item</th>
<th>Chi-square</th>
<th>(P)-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>The quality of lectures presented during the semester</td>
<td>219.45</td>
<td>&lt;0.0001</td>
<td>Rejection</td>
</tr>
<tr>
<td>The quality of homework performed during the semester</td>
<td>29</td>
<td>&lt;0.001</td>
<td>Rejection</td>
</tr>
<tr>
<td>E-exams were conducted during the semester</td>
<td>31.82</td>
<td>&lt;0.001</td>
<td>Rejection</td>
</tr>
<tr>
<td>The benefit from the E-learning and E-exam</td>
<td>258.49</td>
<td>&lt;0.000001</td>
<td>Rejection</td>
</tr>
<tr>
<td>E-exam results in unreal scores</td>
<td>272.28</td>
<td>&lt;0.00001</td>
<td>Rejection</td>
</tr>
<tr>
<td>The questions in the E-exam assessing the practical side</td>
<td>20.51</td>
<td>0.0004</td>
<td>Rejection</td>
</tr>
<tr>
<td>The effect of using the follow-up program (monitoring) on the quality of the exam</td>
<td>16.15</td>
<td>0.0031</td>
<td>Rejection</td>
</tr>
<tr>
<td>Questions measure student's theoretical knowledge as well as skills</td>
<td>6.89</td>
<td>0.032</td>
<td>No Rejection</td>
</tr>
<tr>
<td>E-exam is suitable for TE</td>
<td>261.76</td>
<td>&lt;0.0001</td>
<td>Rejection</td>
</tr>
</tbody>
</table>

Depending on the Chi-Square test (Equation (6)), Table 3 shows that all \(P\)-values (except one) were less than 0.025, and so the null hypothesis 3 was rejected except for one item. Therefore, it can be concluded that there was no statistically significant correlation between the reply and the status of the respondent (teacher or student) except for the item related to (Questions that measure student's theoretical knowledge as well as skills). However, the \(P\)-value for the responses associated with this item was (0.032 > 0.025), and accordingly, there is a statistically significant correlation between the type of respondent and the type of response.

**Discussion**

The results showed that the questionnaire included all specializations at the university in a balanced way concerning the university's total number. For students, relative proportions
according to domains were noted except for the agriculture specialization, where the number of students is low.

1. Attitude Towards E-learning. Based on a questionnaire designed to evaluate E-learning, Abidi and Aldhalemi (2020) had reported that 71% of teachers and 28% of students in the same university responded that they agree to adopt E-learning as a supplement to traditional Learning. However, after implementing the E-exam at the end of the academic year, the teaching staff's approval towards E-learning decreased to 60%. In comparison, the percentage of students' desire increased remarkably to 57%, as shown in Table 1. These changes in attitudes of both teachers and students before and after the E-exam can be interpreted as follows:

A- During the E-learning that was implemented suddenly and with incomplete preparations and unsuitable infrastructures, the students suffered some learning problems. So, they had no strong desire to continuing E-learning. But, on the other hand, the teachers were enthusiastic and optimistic about switching to E-learning to benefit from its positive advantages despite the more significant effort they made during this transformation process.

B- After performing the E-exam, the teachers' desire decreased to 60% due to what they experienced in terms of weak monitoring and low-level questions. In contrast, students participated high pass ratios with higher scores, so their acceptance of E-learning increased from 28% to 57%.

However, there is no direct relationship between E-learning and implementing E-exam. E-learning could be adopted with traditional formative and summative assessments according to each university's available resources. So, both teachers' and students' perspectives may reveal a misunderstanding of E-learning and E-exam's correlation.

2. Confidence with E-exam. Table 2. shows statistically different responses of teachers and students concerning the effect of monitoring on exam quality. However, weak monitoring experienced during the implemented online E-exam highly impacts its fairness resulting in unreal scores and disability to distinguish outstanding students. Despite the benefits of the E-exam in saving each cost, effort, and time in printing, storing, and distributing questions papers to the examination halls, collecting the answer papers, maintaining confidentiality, and marking answers of large numbers of students [8,9,10]. Only 21% of the responded teachers replayed that they have confidence with the E-exam. The students were the biggest winner from the adoption of the E-exam because the exam time was sufficient. The student could take the exam anywhere outside the university campus with an open book and weak monitoring. The online final examination results
showed that the overall pass rates in all colleges and institutes of the university were much higher than the previous academic year's rates. Besides, the students' grades were also much higher. So, unlike the teachers, the response of students who trusted the E-exam was 60%. However, Almelwth & Elshrbeni (2015) indicated that the high pass rates and high grades indicate the ease of tests and their non-compliance with the quality assurance requirements.

Due to time constraints and lack of training, and teachers getting used to the traditional paper-based method of designing questions and evaluating answers, some teachers could not delve deeper to produce comprehensive questions able to distinguish outstanding students. However, Cook and Jenkins (2010) believed that there were challenges in designing relevant questions to assess the in-depth students' performance in E-exam. Marriott (2009) and Pachler, Daly, Mor, and Mellar (2010) also reported that e-assessment systems are based on tools that offer simple types of questions that can test lower levels of knowledge. These tools include MCQ, TF, short answers, and fill in blanks. To distinguish the outstanding students, the professors require high experience and practice in designing the E-exam questions and additional time for training. Table 1. indicates that there was a statistically significant difference between students and teachers about two items. The first item is the need to set particular and random questions to distinguish the outstanding students. The second is the desire to change the weighted average ratio of this year to the final graduation rate. It is because the evaluation this year differed completely from previous years when the exams were traditional face-to-face.

3. Cheating. The E-exam resulted in unreal grades for evaluating students. This critical response may refer to cheating during the exam outside the professors' proper supervision and monitoring. Conducting the exam inside the university halls provides adequate tracking, or as in Finnish universities that use ((the exam aquariums)) with video monitoring apart from direct staff supervision. Besides, Hettiarachchi et al. (2013) considered plagiarism detection, invigilation issues, and user identity as serious barriers to deal with when adopting an online E-exam.

Due to the COVID-19 Pandemic, the online E-exam in many universities worldwide was conducted outside the university campus. The monitoring efficiency was dependent on the available digital infrastructure, financial resources, and teacher training. Anusha, Soujanya, and Vasavi (2012) stated that the difference in location between the proctor and the examinee increases malpractice chances. So, they proposed many authentication techniques to avoid such examinee's behavior. Weak monitoring may encourage some students to communicate directly or through social communication through mobile or computer. Williamson (2018) explained how he reduced the cheating he had noticed in the E-exam.
He mentioned that he created his questions, that he used an open book and open notes, that he asked one question at a time, that he gave a set amount of time, that he forced completion, that he disabled the right-click option, that he used the Responds Lockdown Browser, and that he took many other measures. Most of these measures are applicable only inside the university campus, but it seems complicated to control cheating when the exam is implemented anywhere out of the campus. Despite the special restrictions adopted in Bring Your Device (BYOD) E-exam to prevent cheating, Dawson (2016) identified five probable hacks that the student could use to reach the computer functions or files prohibited by the examiner. These hacks had significant effects on the security of this type of E-exam. However, there were no similar restrictions in the E-exam implemented in the university under study. Shraim (2019) reported that 83 percent of students confirmed cheating in the E-exam at Palestine Technical University. She believed that tech-savvy students always develop innovative ways of cheating.

4. E-exam and Technical Education. The replies of both teachers and students reflected a negative response towards the E-exam's suitability for assessment in Technical Education (TE). Besides knowledge, TE provides practical skills, training, and technology (Marope, Chakroun, & Holmes, 2015). Evaluating the students' achievement in workshops and practical courses and assessing abilities is challenging to address through E-exam and insufficiently trained lecturers. Gruttmann, Böhm, and Kuchen (2008) indicated a need to adopt tools and questions measuring students' skills to get a higher level of analysis, synthesis, and evaluation. Hettiarachchi et al. (2013) reported that most E-assessment systems are designed for knowledge rather than skill assessment. They also believed that skill assessment is more time-consuming for setting training markers and detailing criteria. The results showed that teachers asked for more training for the E-exam design and evaluated the student's performance's theoretical and practical parts.

The assessment of student's skills is a critical issue in E-exam. It may seem necessary to use some traditional methods to evaluate the student's achievement's practical side. However, E-exam cannot implement some laboratory tests or workshop exercises at the final exam. So, traditional face-to-face examinations may be needed to evaluate the students' skills and their practical experience. This experience is an essential part of the student's achievement in TE. Accordingly, blending traditional exams with E-exam may be regarded as a suitable solution to assess students' theoretical knowledge and skills and practical application. Researchers reported that Blended Learning has many advantages that can be benefited in the development of TE and the transformation of its programs to meet the targets of the 2030 Agenda of Sustainable Development (Latchem, 2017; Şahin,
Jayalath and Esichaikul (2020) has developed a blended learning system based on game applications for TE to enhance students' motivation and engagement. They had adopted an online E-exam to assess the knowledge part of the subject and laboratory practical tests to assess students' skills.

With the expected continuation of the COVID-19 Pandemic in the next academic year 2020-2021, there is no substitute for Blended Learning in all the Iraqi universities, including the technical universities. Students can be present on the campus in small groups for one or two days a week to perform the practical training and carry out laboratory experiments, exercises, and workshops. It is possible to rely more on the formative assessment to check student's achievement during the semester, in addition to a practical face-to-face final exam.

Considering the above discussion and the response about TE and the results are shown in Tables 1, 2, and 3, the teachers' perspectives may seem closer to credibility and more consistent than the student's responses, which were biased towards the E-exam. Although 60% of the students have confidence with the E-exam at the same time. 67% of them believe that questions were not suitable for TE, 76% consider that the nature of the E-exam has led to unreal scores. Furthermore, 68% believe that the E-exam does not distinguish the outstanding student. Only 12% indicated that it could evaluate students' skills.

Conclusions

Online E-exam was adopted suddenly in the Iraqi universities, and their implementation was associated with significant challenges. The results showed that 21% of the responded teachers have confidence with E-exam while students were the biggest winner of the E-exam, so 60% of them trust it. Lack of infrastructure and training resulted in low-level questions, weak monitoring, and cheating probability. 68% of the students and 84% of the teachers indicated that the implemented E-exam could not distinguish the outstanding students, leading to unreal scores. Teachers and students reflected a negative response towards the suitability of the E-exam for assessment in TE. The perspectives of the teachers seem more homogenous with a lower statistical Variance.

Accordingly, enhancing the infrastructure and more training is recommended to obtain an online exam with higher-level questions and sufficient monitoring. Blended Learning is also recommended to meet the requirements of TE.
References


