

## Electronic Exam Practices among Minia University Academic Staff: Perspectives and Improvement Strategies

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### Abstract

Universal technological developments induced changes in the high education, especially with accelerated increase in student numbers and scarce resources leading to assessment workloads and applying electronic exam. **Aim:** to assess the electronic exam practices at Minia University from academic staff perspectives and their improvement strategies. **Design:** Cross-sectional exploratory study design was used. **Settings:** the study conducted at faculties of Nursing, Dentistry, Pharmacy and Medicine. **Sample:** A purposive sample of 120 participant academic staff. **Tool:** I- academic staff criteria questionnaire. II- Effective implementation questionnaire. III- Suggested strategies questionnaire. **Results: revealed** three quarters are lecturers divided into third, about one sixth, minority and one fifth from Nursing, Dentistry, Pharmacy and Medicine faculties respectively. Fast majority of them reported that electronic exam design permits maintaining a bank of filtered and revised questions for performing exams. Great majority of the participant staff reported that e exam is linked to ILOs. Two thirds of the sample agreed that e- exam took longer effort and time to prepare as compared to the paper-based exam revealing significant difference:  $p=0.000^*$ . The current study results explained institutional support features as majority of the participant staff reported integrating the electronic exam is within the strategic plan revealing significant difference:  $p=0.004^*$ . **Conclusion** electronic exams enhance an opportunity to have both accurate scores, and feedback as reported by majority of the studied sample. Also, majority of the academic staff suggested enhancing unified training on how to extract question bank. **Recommendations:** Providing continuous training for academic staff and allowing additional modifications to accommodate the traditional exam (paper type).

**Keywords:** Electronic Exam Practices, Pedagogy, Staff perspectives

### Introduction:

Electronic examinations (e-exams) is an official exam including replying questions and / or exercises using electronic devices. (Triantis and Venturous, 2016). Functionally, e-exams could be applied through a specialized system or involved as a unit within a learning management system (LMS) such as Blackboard, Moodle, or Sakai (Conley et al. 2020). Electronic exams are varied questions designed by a software application, known as the learning management system, to detect a student's performance (Ahmed, et al., 2021). The assigned module of performing e-exam permits the academic staff to design and put examinations including different types of questions as MCQs, true-false and brief reply to ones. The designed exam questions are kept

in a bank for reusing in different next exams. Varied Exam questions can be assorted to be used as a bank for future exams. E-exams are automatically scored having beneficial options as allowing feedback and appearing the right answers (Moodle, 2017). Electronic exam systems can simplify the ordinary paper-based exams process, specifically in case of huge class sizes, from setting them up and delivering the exam to grading, documenting, keeping the results and performing statistical analysis (Saha et al.,2023).

Universal technological developments induced changes in the high education sector, especially with accelerated growth of students. Also, a accompanying resources shortage leading to elevated ratios of staff to student and staff responsibilities and evaluation load. So, academic staff can shift to throughput marking

styles solutions. Specific types of evaluation designed and introduces applying a course LMS can be graded automatically that immediately provide specific feedback to students involving a short interpretation of the valid and invalid answers. When designing electronic exams that measure varied and challenging cognitive levels consuming large amounts of time, electronic grading, and feedback of specific types of questions such as multiple choice or true/false, can improve efficiency for teachers and students. So, these types of evaluations are applied for undergraduate level globally as a formative and summative assessment **(Mate, and Weidenhofer, 2022)**.

Pedagogical techniques must be embedded in information and Communication Technology (ICT) training programs to obtain desired objectives. Methods of quality concerning education and academic staff training, and development are vital to achieve the intended learning outcomes for assuring global quality levels. Bloom's taxonomy is one of the internationally approved quality educational methodologies of education and learning. Although, other techniques pedagogy can be implemented for the quality development of ICT education **(Fernando,2017)**.

Evaluation is a vital phase in the learning process as a success or failure indicator of student performance; so, it could improve learning. Selecting the methods of evaluation depends on the aim of its use and its classification as a summative or formative or both. Summative assessment is outcome-dependent while formative assessment relates to in-process evaluation of students' performance **(Khalaf, et al., 2020)**.

Academic staff are responsible for ensuring suitable and accessible assessment environments. Commonly used LMSs are ruled and set in accordance with the globally approved Web Content Accessibility Guidelines, consequently, they can be used by all students. Delivery of electronic assessments within a compliant LMS, will benefit all

learners. The mark that a student achieves in it should reflect their achievement against course learning goals, not their IT skills **(Conley et al., 2020)**.

Exams enhance teaching by aiding the teacher's planning and preparing student preparation consistently. Examinations are not only limited to measuring intended learning outcomes or students' needs but also involved in coping with the teaching system. Examinations generally assess the extent of achieving the intended learning outcomes (ILOs) and the extent of serve the requirements of the whole community. Exams have a crucial role in specifying what is done in terms of educational courses and its methods, students have learnt and its effect on the educational process. The rapid development of Information and Communication Technologies (ICT) in education has transformed the paradigm from traditional paper-based to electronic system of exams **(Al-Qdah, and Ababneh, 2017)**. Consequently, the significance of achieving academic integrity for ongoing advancement and improving the electronic exam process **(Fahd et al., 2021)**.

There are several crucial advantages of electronic examinations, and some challenges as perceived by learners and academic staff. Some benefits of electronic exams examinations are that they represent a totally automated process that enhance evaluation validity to constitute a fair measure of the learners' skills and determining which uses improved question format including interactivity and multimedia. Electronic exams enhance the reliability of grading and the accuracy of exams results, supporting more accurate interpretations. Also, e-exams provide immediate feedback **(Gilbert, 2023)**.

Although electronic exams are increasingly being implemented by the electronic exam center to be applied for faculties of health sector including Dentistry, Nursing, Medicine and pharmacy of Minia University in Egypt, academic staff' perspectives on their use remain unexplored.

Theoretical concepts:

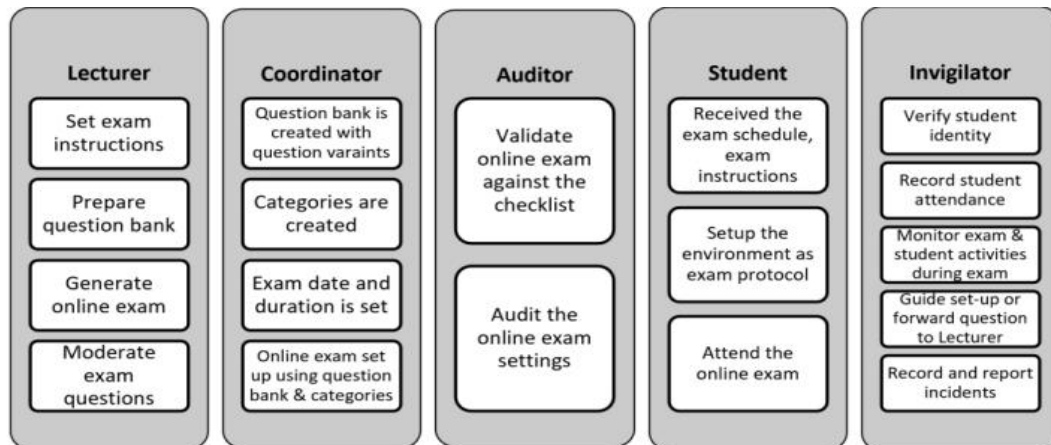


Figure (1): Stakeholder roles and responsibilities framework for e- exam applied at Minia University, health sector faculties (Sanad, 2023).

Theoretical Definitions

The improvement of higher education sector relies on aspects of quality learning environments, quality courses, quality procedures and quality graduates (Fernando, 2017).

The effectiveness of the teaching and learning (TL) process includes five domains as the design of the curriculum and pedagogy, the correct implementation, outcomes assessment and resource accessibility (Chai et al. 2013).

Pedagogy

Pedagogy is defined as the art, profession or science of teaching. So, it is an effective

method of explaining the relationship between teaching, learning and assessment in classrooms. Also, pedagogy is the suitable ways staff interact with learners (Fernando 2017).

Improving quality with Bloom’s taxonomy

Bloom’s taxonomy is known as a globally accepted validated educational pedagogy. The theoretical foundation of Bloom’s taxonomy shows that the standards of learning and similar applicable and suitable verbs (figure 2) of Bloom’s taxonomy can be utilized to achieve accurate educational processes. Developed countries apply educational methods of it to improve the quality of the educational processes (Chai et al. 2013).

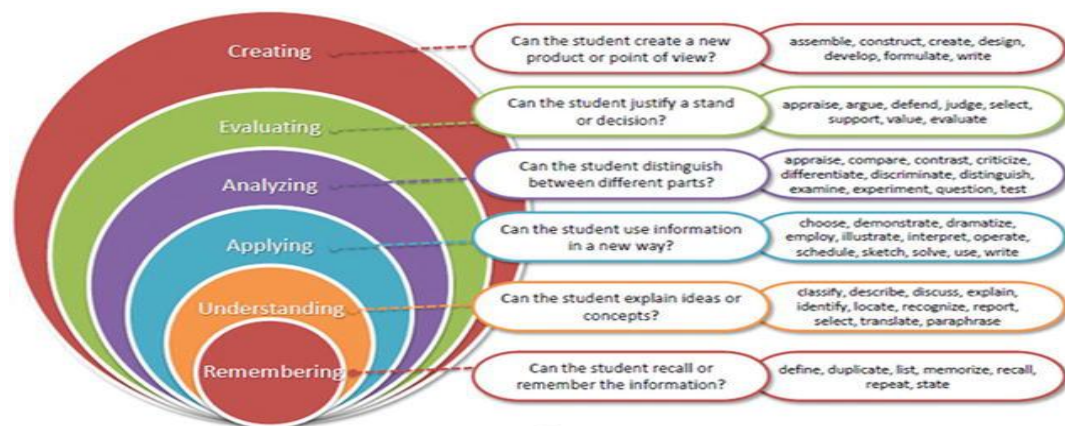


Figure (2): Revised Bloom’s taxonomy (Fernando, 2017)

**Significance:**

Evaluating the learning experience can motivate both staff and students to finally enhance the learning process and facilitate a positive attitude towards future learning. Perspectives and opinions of the staff can affect technological utilization. So, the effective use of the electronic evaluation process relies basically on staff members' background, preparedness, and approval of such system (Khalaf et al., 2020).

A recent report on the future of evaluation in faculties stated that technology can be applied to make evaluation more valid, accessible, secure, accurate, and efficient (Pauli and Ferrell, 2020). The introduction and increasing demand of electronic evaluation in universities education are attributed to efficiency and pedagogical reasons, instead of presence of practical barriers especially for summative evaluation (Boitshwarelo et al., 2017). Paper-based evaluation are replaced by automated evaluation globally on a gradual basis, but it is not oblivious yet, the extent to which changes will be beneficial to the academic staff (Jacob, and Gokbel, 2018).

Although electronic evaluation has increased the validity associated with the previous difference between teaching and evaluation methods with electronic learning, much debate, both nationally and internationally, on whether electronic evaluations, particularly exams, provide the same academic integrity as a traditional evaluation (Mate, and Weidenhofer, 2022).

**Aim of the study:**

To determine the electronic exam practices at Minia University from academic staff perspectives and their improvement strategies.

**Objectives:**

1. To assess the staff experience of implementing electronic exams as perceived by the participant academic staff.
2. To assess the suggested strategies for improvement as perceived by the participant academic staff.

**Research questions: -**

1. What are the domains of electronic exam practices as perceived by the participant staff
2. What are the suggested strategies in relation to training, accessibility, equity, academic integrity, validity and reliability?

**Design:** Cross-sectional exploratory design was used.

**Settings:** the present study was implemented at health sector faculties who performed exam at formative and summative level including Nursing, Dentistry, Pharmacy and Medicine.

**Electronic exam practices at Minia University (Sanad, 2023) :-**

The Electronic exam center at Minia University started the first trial at the study year 2020-2021 at Faculty of Nursing, Minia University then its efforts extended to include the medical sector involving faculties of pharmacy, Medicine, and Dentistry. It implements electronic exams for midterm and final exams instead of the paper ones. The electronic questions bank is launched using Arabic or English language with basic computer skills. The mid-term, and summative final examinations are mandatory exams, instead of traditional paper-based evaluation. The aim of them is to assess students' progress and to obtain automated scoring. Furthermore, all examinations are organized within schedules for 3 consecutive weeks, to accommodate the labs capacity for medical sector faculties. The faculty of pharmacy exam starts in the morning, medicine, Dentistry and Nursing exams start in the afternoon and another extended period for Faculty of Nursing. The exams are performed on 3 occasions (10:12, 12- 2 and 3.30: 6.30).

*Technical support for academics:* a bank of questions is uploaded for each course under the supervision and training of engineers and academics. A filter has been added to whose function is to automatically delete all archives after the device is turned off, ensuring that the recorded history or user identification data is not preserved.

The questions are prepared by academic staff to add them to question banks for sending to the e-examination center, having members who are affiliated to the Computer Department after uploading the question bank to the electronic system. The center members are concerned with revising exam template and implementing the electronic exams after receiving a course matrix from the course coordinator. Engineers or technicians of the computer labs revise the uploading process. For ensuing safety, students must signify the personal card or their faculty ID to the inspectors, then make registration into the assigned platform using their university ID and password. During the examination time, the students can revise their replies by utilizing the 'next' or 'back' buttons allowing multiple trials for modifications. Web accessibility is banned during examinations. Immediate feedback on subject results is not allowed for the students until final declaration through faculty control unit after receiving the automated student grades from the electronic center.

Examinations are signed by the electronic system and the student scores are sent to the center members, who send them as Excel files to the selected faculties. Statistical report can be obtained by the committee members responsible only for reporting how students statistics of passed or failed, good, very good or excellent or in the form of menu grades.

#### **The applied exam system:**

Is an exam live system using a set called F5 appliance which checks server of the university. If it does not work another 2 pack up servers called HQ or DR servers. Another pack up method is to use offline MOODLE. A fourth pack up method is to prepare for the paper exam.

#### **Center maintenance system:**

**Before final and mid-term exams:** performing one by one check.

**During final and mid-term exams:** every exam class has spare computers in anticipation of malfunctions during the exam. So, the system is prepared as the actual time of the student is calculated from the operating time.

**Sample:** a purposive sample of 120 academic staff was participated. The number of academic courses was equal 275 per term including 25 teaching academic courses for nursing, 100 for pharmacy, 45 for medicine and 105 for dentistry faculties (Samir 2023).

The academic courses were allocated by number of coordinators for each faculty as following, 25 from the faculty of Nursing, 90 for Pharmacy, 35 for Medicine, 100 for dentistry

Total = 250 target staff

Using Epi-info version 2023, with population size equal 250, acceptable margin of error = 50 %, expected frequency equal 50 %, acceptable margin of error equal 5%, design effect equal 1 and cluster = 1. So, sample size equals 151 at 95 % confidence level

The actual participant staff =120 with response rate via electronic questionnaires = 79.5 % after excluding incomplete and no response questionnaires (31).

#### **Inclusion criteria:**

- Course coordinators who shared in educating the assigned subject(s) currently or previously.
- Course coordinators who designed or participate in designing the exam template currently or previously.

#### **The study Tool:**

It consisted of three questionnaires as follows:

#### **I- Academic staff criteria questionnaire: it consisted of 5 subparts including MCQs as following:**

1. **The scientific degree with 4 responses including** assistant lecturer, lecturer, assistant professor and professor.
2. **Departments of faculty of Dentistry include** preservative treatment, oral biology, oral and maxillofacial pathology oral and maxillofacial pathology, Root canal treatment, Crown and bridges and dental prothesis.
3. **Departments of faculty of Medicine including** Surgery, Radiology, Microbiology, Pharmacology, General medicine, Anatomy and Public health

4. **Departments of faculty of Pharmacy including** Microbiology and immunity, Biochemistry, Medical chemistry, Pharmacology and Clinical pharmacy.
5. **Departments of faculty of Nursing including** Community health nursing, obstetric nursing, nursing administration, psychiatric nursing, medical surgical nursing and pediatric nursing

**II- Effective implementation questionnaire :** it was designed after extensive review of literature (Khalaf, et al 2020, Bloom et al 2018, Mate, K., & Weidenhofer, J. 2022). It was used to assess the different domains of practices. From part 1 to part 9 all the responses are yes or no. for part 10 only, responses are strongly disagreed, disagree, strongly agree, agree, neutral.

It consisted of 9 sub parts as follows:

1. **Electronic exam purpose: it consisted of 3 questions including** Formative and summative exam for learning, aligning electronic examinations to the intended learning outcomes, and binding analysis of results to quality assurance standards.
2. **Electronic exam design: it consisted of 3 questions to include** maintaining a bank of revised and filtered questions for the required exams testing, developing varied sorts of question types and providing meaningful feedback through electronic correction.
3. **Preparation:** it consisted of 4 questions, such as providing enough training and allowing enough practice leading to comfortable use of software.
4. **Performance:** it consisted of 4 questions such as the presence of balanced time needed for completion and grading with achieving the learning objectives and after designing multiple electronic exams, still preferring paper-based exams.
5. **Feedback on performance:** it consisted of 2 questions to include if seeing the benefits to taking electronic exams or not and the feedback provided on the interface portal helping the staff to understand his/ her performance.
6. **Pedagogy:** it consisted of 2 questions to include determining the type of questions used and if the electronic testing provides an opportunity to provide grading and specific feedback about correct responses.
7. **Practicality of electronic exam:** it consisted of 13 questions such as expending longer effort and time for preparing the electronic exam in comparison with the paper-based exam and smoothly electronic invigilation process used.
8. **Validity:** it consisted of 6 questions with yes, no responses such as electronic exams accurately reflect the assessed learning objectives, e- exam, provide the exact academic integrity paper-based assessment and e-exams can meet expectations of the academic staff.
9. **Reliability:** it consisted of 4 questions such as the technology utilized for designing and administering the electronic exams were reliable and the methods utilized for observing and controlling the exam ( e.g. MS Teams and Blackboard) were reliable.
10. **Institutional support:** it consisted of 4 questions involving the electronic examination within the strategic plan and allocating necessary resources and applying suitable procedures.

**III- Suggested Strategies questionnaire:** it was designed by researchers after a wide range of reviewing literature (James, 2016, Mate and Weidenhofer, 2022, Conley et al. 2020, Appiah and Van Tonder, 2018). It is used to assess the suggested strategies for improving electronic exam practices. It consisted of 6 domains as follows:

1. **Training: it included 1 question about** enhancing unified training on how to extract question bank and bank updating for each faculty of the medical sector or not.
2. **Accessibility of electronic exam:** it included 1 question about continuous technical support for learners and academic staff or not.

3. **Equity: it included 2 questions about** providing learners with the chance to demonstrate their learning and allowing with enough time and other adaptations to the traditional paper-based exams.
4. **Academic integrity: it consists of 3 questions with yes no responses including** setting questions with answers necessitating higher cognitive standards that cannot be found directly in notes, textbooks, or electronic engines, using novel pictures and graphs are an effective method to design higher order questions and using software solutions that notice eye movement or other motions of the students.
5. **Validity and Reliability:** it consisted of 3 questions with yes, no responses such as fairness, particularly is achieved from the first time through information, guidance, rules, organizing more flexible frameworks for designing multiple choice questions aiming varied Bloom's taxonomy standards at different course areas are needed can enhance the authenticity of questions that could be designed in comparison with traditional evaluations.

**Validity of the study tool:** The questionnaires were reviewed for content validity by a six professors at specialties of Obstetric Medicine, Community Health Nursing and Medical-Surgical Nursing and Maternity and Obstetric Health Nursing. Likewise, professors evaluated the tool for wholeness and clarity (content validity). The consistency, appropriateness, and clarity of each component in the questionnaires were examined by the Experts and they found the study tool is applicable and appropriate. All modifications were included in the used tool.

**Reliability of the study tool:** The researchers measured the internal consistency of the instrument. It is the administration of the same tool to the same participants under similar circumstances on one or more occasions. The Cronbach' alpha for the effective implementation questionnaire was 0.81. The reliability of suggested strategies questionnaire was 0.83 which indicates that the

questionnaires are reliable to meet the study objectives (**Ranganathan and Caduff, 2023**).

**Pilot Study:** it was performed on ten percent of the total sample and was involved to ensure stability of the replies. It was performed to confirm the applicability of the instrument. Also, it aided in estimating the time needed to complete the questionnaires (15: 20 minutes by online response).

#### **Procedures for Data Collection:**

- The data was collected from the participant staff who were directly involved in teaching and evaluating students by designing the exam mapping (exam template) previously or at the time of the study (have previous experience of performing e exams). The study period started from January 2024 to June 2024.
- Academic staff from the participating faculties of the health sector were contacted by email sent through the electronic exam center, Minia University, through the following steps:

#### **Administrative design (Human rights protection):**

##### **Administrative approval: -**

- Before starting the actual data collection, the director of the electronic exam center sends letters to the selected faculty Deans declaring the significance of the study participation for the center and the selected faculties to gain their co-operation.
- The researchers established the three mentioned questionnaires as electronic form and sent the link by the director of the electronic exam center to the general co-ordinator of each faculty who resend them to each assigned faculty members according to their e- mails or WhatsApp numbers.
- The researchers received the academic staff responses as a google form and exported their responses as an excel sheet which is re-entered as an SPSS work file

#### **Ethical considerations:**

Verbal agreement was taken from each participant before completing the questionnaires. Each participant staff was

confirmed about the right to refuse or withdraw from the study at any time. Also, they were assured that, the information would be remained confidential and used for the research purpose only.

### **Statistical Analysis and data management:**

The data was entered and analyzed by using SPSS program (statistical package for social science software) version 22. Data was presented in numbers and percentage (No. & %). Chi-square ( $\chi^2$ ) and P value to test the relationships among variables, highly statistical significance or statistical significance was started at p-value <0.001 or <0.05 respectively.

### **Results:**

Table 1 explains academic staff criteria regarding the scientific degree, as 73.3 % are lecturers divided into 28.3 %,15.8% ,9.2% and 20 % from Nursing, Dentistry, pharmacy and Medicine faculties respectively. 52 % of the Dentistry faculty were affiliated to oral and maxillofacial pathology department. 26.7 % of the participant staff of the faculty of Medicine are affiliated with the General medicine department. 25 % of the participant staff of the faculty of Pharmacy are affiliated with Plant and microbiology department. 26 % and 20 % of the participant staff of faculty of Nursing are affiliated with Community health nursing and medical surgical nursing.

Table 2 illustrated the effective implementation of e exam as regarding e-exam exam purpose, 95.8 % of the total sample divided into 37.5%,19%.15% and 24% from Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that e exam is used for Formative and summative exam for learning. 97.5 % of the participant staff divided into 37.5 %,20.8%,15 %and 24.2% from Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that e exam is linked to ILOs.

93.4 % of the participant staff divided into 35%,19.2%, 15 %and 24.2% from Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that electronic exam design permits maintaining a bank of validated questions for adaptive testing. Also 65 % of the participant staff divided into 25.8 %,10.8 %,9.2 % and 19.2 % from Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that

electronic exam permits Develop different types of question types. Regarding the preparation, 61.6% of the participant staff divided into 18.3 %,14.2 %,8.3 %, and 20.8 % from Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that they have been provided with enough training on how to utilize the testing software revealing significant difference:  $p=.014^*$ .

Table (2. A) showed the performance, 78.4 % of the total sample divided into 29.2 % ,16.7 %, 12.5 % and 20 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that required time for completing and scoring is balanced with meeting the desired objectives. 55.8 % of the total sample divided into 17.5 %, 15.8 %, 6.7 % and 15.8 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that they do not prefer paper type exam revealing significant difference:  $p=.039^*$ .

Regarding Pedagogy, 85 % of the participant staff divided into 35.8 %,15.8 %,11.7 % and 21.7 % from Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that electronic exams provide grading, and specified feedback revealing significant difference:  $p=..023^*$

Table (2. B) illustrated the effective implementation regarding practicality of electronic exam among Minia University participant staff as 64.1 % of the participant staff divided into 28.3 %, 10.8 %, 10.8 % and 14.2 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively agreed that a great effort and time are required to design electronic exam in comparison with the paper based exam revealing significant difference : $p=.000^*$ .Also, 65.9 % of the participant staff divided into 22.5 %, 19.2 %, 10 % and 14.2 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively disagreed about the e-exam is often frustrating because of having technical problem revealing significant difference:  $p=.001^*$ .

62.5% of the participant staff divided into 21.7 %, 17.5 %, 10.8 % and 12.5 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively agreed they had to be more creative in using the resources for the electronic exam revealing significant difference:  $p=.000^*$ .61.7 % of the participant staff divided into 23.3 %, 10 % ,14.2 % and 14.2 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively



agreed the electronic exam was conducted in a satisfying way revealing significant difference:  $p=0.000$ .

56.7 % of the participant staff divided into 20 % ,7.5 % ,4.2 % and 25 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively strongly disagreed that the electronic final format exam evaluated varied mental and practical objectives that cannot be evaluated with paper- based exam. 36.7 % of the participant staff divided into 18.3 % ,0.8 % ,8.3 % and 9.2 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively agreed that overall, electronic is preferred by them for grading compared with paper-based exam grading. Also, 55% of the participant staff divided into 17.5 % ,14.2 % , 0 % and 23.3 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that they agreed that electronic exam is satisfied for them. 70% of the participant staff divided into 30.8 % , 10 % , 11.7 % and 17.5 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively agreed that there is access to reliable systems that can provide synchronous delivery to huge students' numbers from the institutional perspective revealing significant difference:  $p= .004^*$ .

60.8% of the participant staff divided into 28.3 % ,6.7 % , 12.5 % and 13.3 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively agreed about presence of pack up exams for managing any technical failures when delivering evaluations revealing significant difference:  $p=.001^*$ . 73.4 % of the participant staff divided into 29.2 % , 16.7 % ,10.8 % and 16.7 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively agreed that the security and protection of user privacy is obtained through presentation of identity- proctoring camera.

Table (2.c) illustrated the effective implementation regarding Validity and Reliability of\_ electronic exam among Minia University participant staff

Concerning validity 60.8% of the participant staff divided into 25.8 % , 10 % ,10 % and 15 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that electronic exams accurately reflect the assessed learning objectives. 43.3% of the participant staff divided into 15 % , 12.5 % , 8.3 % and 7.5 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that well- designed

multiple-choice questions cannot fairly measure learning objectives across higher cognitive standards such as practice, analysis, and problem solving.

Also, 80% of the participant staff divided into 30 % , 16.7 % , 14.2 % and 19.2 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that electronic exams provide the same academic integrity as paper-based exams.

Likewise, 82.5 % of the participant staff divided into 30% ,15.8 ,16.7 % and 20 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported authentic and valid assessment, the selection of questions must be designed to ensure randomization of its distribution and equal chance of choice.

Regarding reliability: 97.5 % of the participant staff divided into 35.8 % , 20.8 % , 16.7 % % and 25 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that the applied technology for designing and managing the electronic exam and MS Teams and Blackboard as applicable invigilating methods used for e-exam was reliable. Also, 90% of the participant staff divided into 34.2 % , 20.8 % ,15 % and 20 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that developing a large number of questions can confirm equal selection of questions of different topics and different cognitive standards is allowed for students.

30 % , 15.8 % , 16.7 % and 20 % (82.5%) of Nursing, Dentistry, Pharmacy and Medicine faculties respectively of the total sample reported that e-exam ensured authentic and valid assessment showing significant difference :  $p =.034^*$ . 90.8 % of the participant staff divided into 35.8 % , 20.8 % ,12.5 % and 21.7 of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that electronic grading criteria can improve reliability, making e-exams an attractive solution revealing significant difference:  $p =.011^*$

Table (2.d) explained institutional support features as 90.8% of the participant staff divided into 35 % , 18.3 % ,15.8 % and 21.7 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that the electronic exam is integrating within the strategic plan revealing significant difference:  $p= .004^*$ . Also, 85.9 % of the participant staff divided into 36.7 % , 15 % , 15 % and 19.2 % of Nursing,

Dentistry, Pharmacy and Medicine faculties respectively reported that their institutions are providing resources and facilitating procedures revealing significant difference:  $p=0.004^*$

Figure 3: Regarding training, 37.5 %, 19.2 %, 14.2% and 20 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively recommended enhance unified training on how to extract question bank and bank updating for each faculty of the medical sector. Regarding accessibility of electronic exam ,35.8%, 18.8 %, 15.8 % and 23.3 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively recommended continuous technical support for staff and students. Regarding equity 36.7 %,15.8 %,15.8% and 21.7 % of of Nursing,

Dentistry, Pharmacy and Medicine faculties respectively suggested allowing additional adaptations to accommodate the usual paper-based exam.

Figure 4: Regarding academic integrity, 35 %, 17 %, 11.7 % and 16.7 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively suggested setting questions with answers necessitating higher cognitive standards cannot be found in notes, textbooks.

Figure 5: Regarding validity and reliability, 35.8 %,21.7 %, 18 % and 23 % of Nursing, Dentistry, Pharmacy and Medicine faculties respectively recommended organizing more specialized workshops for designing MCQs targeting different Bloom's taxonomy standards.

**Table (1):** Distribution of academic staff criteria among Minia University participant staff (N= 120):

Criteria	Faculties								
	Nursing (N=45)		Dentistry (N=25)		Pharmacy (N=20)		Medicine (N=30)		Total %
	N	%	N	%	N	%	N	%	
<b>The scientific degree:</b>	-	-	5	4.2	1	0.8			5
Assistant lecturer:									
Lecturer:	34	28.3	19	15.8	11	9.2	24	20	73.3
Assistant professor:	11	9.2	1	0.8	7	5.8	3	2.5	18.3
Professor:	-	-	-	-	1	0.8	3	2.5	3.3
<b>Departments of faculty of Dentistry</b>	--	--	3	12	--	--	--	--	2.5
Preservative treatment									
Oral biology			2	8					1.6
Oral and maxillofacial pathology			13	52					10.8
Root canal treatment			3	12					2.5
Crown and bridges			3	12					2.5
Dental prothesis			1	4					0.8
<b>Departments of faculty of Medicine:</b>							3	10	2.5
Surgery									
Radiology							4	13.3	3.3
Microbiology							6	20	5
Pharmacology							4	13.3	3.3
General medicine							8	26.7	6.6
Anatomy							2	6.7	1.6
Public health							3	10	2.5
<b>Departments of faculty of Pharmacy:</b>					5	25			4.1
Microbiology and immunity									
Biochemistry					3	15			2.5
Medical chemistry					4	20			3.3
Pharmacology					6	30			5
Clinical pharmacy					2	10			1.6
<b>Departments of faculty of Nursing:</b>	9	20							7.5
Community health nursing									
obstetric nursing	6	13.3							5
nursing administration	6	13.3							5
psychaitric nursing	6	13.3							5
medical surgical nursing	12	26.7							10
pediatric nursing	6	13.3							5

**Table (2):** Distribution of domains of the effective implementations concerning purpose, design and Preparation of e-exams among Minia University participant staff (N= 120):

Items	Faculties								Total %	X <sup>2</sup> P
	Nursing (N=45)		Dentistry (N=25)		Pharmacy (N=20)		Medicine (N=30)			
	N	%	N	%	N	%	N	%		
<b>Electronic exam purpose:</b> - Formative and summative exam for learning:	0	0	2	1.7	2	1.7	1	0.8	4.2	5.859 .119
No	45	37.5	23	19.1	18	15	29	24.2	95.8	
Yes										
- Aligning electronic examinations to intended learning outcomes:	0	0	0	0	2	1.7	1	0.8	2.5	6.28 .099
No	45	37.5	25	20.8	18	15	29	24.2	97.5	
Yes										
- Linking analysis of results to quality assurance criteria:	15	12.5	6	5	7	5.8	2	1.7	25	8.124 .044
No	30	25	19	15.8	13	10.8	28	23.3	74.9	
Yes										
<b>Electronic exam design:</b> - keeping a bank of refined and revised questions	3	2.5	2	1.7	2	1.7	1	0.8	6.7	1.029 .794
No										
Yes	42	35	23	19.2	18	15	29	24.2	93.4	
- Develop different types of question.	14	11.7	12	10	9	7.5	7	5.8	35	4.830 0.185
No	31	25.8	13	10.8	11	9.2	23	19.2	65	
Yes										
- Provide meaningful feedback through electronic correction.	5	4.2	4	3.3	3	2.5	4	3.3	13.3	395.941
No										
Yes	40	33.3	21	17.5	17	14.2	26	21.7	86.7	
<b>Preparation:</b> - I have been provided with enough training on how to utilize the software system for designing exams.	23	19.2	8	6.7	10	8.3	5	4.2	38.4	10.642 .014*
No										
Yes	22	18.3	17	14.2	10	8.3	25	20.8	61.6	
- I received enough practice before so that I had the ability to utilize the exam software.	36	30	19	15.8	18	15	18	15	75.8	6.721 .081
No	9	7.5	6	5	2	1.7	12	10	24.2	
Yes										
- From my first attempt on a computer, I felt prepared to design an electronic exam.	28	23.3	22	18.3	3	2.5	13	10.8	54.9	26.527 .000*
Yes										
No	17	14.2	3	2.5	17	14.2	17	14.2	45.1	
- After having designed different e-exams, I felt comfortable with the format:	10	8.3	4	3.3	8	6.7	6	5	23.3	4.075 .254
No	35	29.2	21	17.5	12	10	24	20	76.7	
Yes										

\*Significant (P&lt;0.05), \*\* Highly Significant(P&lt;0.01)

**Table (2. A):** Distribution of domains of the effective implementation regarding performance, feedback and pedagogy of e-exams among Minia University participant staff (N= 120):

Items	Faculties										X <sup>2</sup> P
	Nursing (N=45)		Dentistry (N=25)		Pharmacy (N=20)		Medicine (N=30)		Total %		
	N	%	N	%	N	%	N	%			
<b>Performance:</b>											
The required time for completing and scoring is balanced with meeting the desired objectives	10	8.3	5	4.2	5	4.2	6	5	21.7	.229 .973	
	35	29.2	20	16.7	15	12.5	24	20	78.4		
After designing multiple electronic exams, I would still prefer paper type	21	17.5	19	15.8	8	6.7	19	15.8	55.8	8.374 .039*	
	24	20	6	5	12	10	11	9.2	44.2		
Type of applied exam by the assigned faculty: -summative - both summative and formative	3	2.5	1	0.8	2	1.7	3	2.5	7.5	3.771 .287	
	42	35	24	20	18	15	27	22.5	92.5		
Computer Based Teaching negatively impacts my exam performance:	39	32.5	22	18.3	17	14.2	24	20	85	.831 .842	
	6	5	3	2.5	3	2.5	6	5	15		
<b>Feedback of performance:</b>											
I see benefits to taking electronic exams.	1	0.8	0	0	0	0	2	1.7	2.5	3.771 .287	
	44	36.6	25	20.7	20	17	28	23.2	97.9		
The feedback received on the interface portal aids me comprehend my performance	7	5.8	11	9.2	4	3.3	9	7.5	25.8	7.414 .060	
	38	31.7	14	11.7	16	13.3	21	17.5	74.2		
<b>Pedagogy:</b>											
Type of question used: MCQ True and false Both	6	5	9	7.7	12	10	18	15	37.7	39.418 .000*	
	0	0	0	0	0	0	4	3.3	3.3		
	39	32.5	16	13.3	8	6.6	8	6.6	59.5		
Electronic exams provide grading , and specified feedback.	2	1.7	6	5	6	5	4	3.3	15	9.537 .023*	
	43	35.8	19	15.8	14	11.7	26	21.7	85		

\*Significant (P&lt;0.05), \*\* Highly Significant(P&lt;0.01)

**Table (2. B):** Distribution of domains of the effective implementation regarding practicality of electronic exam among Minia University participant staff (N= 120):

Practicality of electronic exam items	Faculties									X <sup>2</sup> P
	Nursing (N=45)		Dentistry (N=25)		Pharmacy (N=20)		Medicine (N=30)		Total %	
	N	%	N	%	N	%	N	%		
A great effort and time are required to design electronic exam in comparison with the paper based exam Strongly Disagree Disagree Agree Strongly Agree	2	1.7	6	5	1	<b>0.8</b>	4	3.3	10.8	47.204 .000*
	3	2.5	0	0	5	<b>4.2</b>	3	2.5	9.	
	34	28.3	13	10.8	13	<b>10.8</b>	17	14.2	64.1	
	6	5	6	5	1	<b>0.8</b>	6	5	16.3	
The electronic utilized invigilation process was administrated flexibly. Strongly Disagree Disagree Agree Strongly Agree	2	1.7	2	1.7	0	0	5	4.2	7.6	19.921 .018*
	27	22.5	23	19.2	12	10	17	14.2	65.9	
	14	11.7	0	0	7	5.8	5	4.2	21.7	
	2	1.7	0	0	1	0.8	3	2.5	5	
Electronic exam is often frustrating because of technical problems. Strongly Disagree Disagree Agree Strongly Agree	2	1.7	2	1.7	0	0	5	4.2	7.6	27.118 .001*
	27	22.5	23	19.2	12	10	17	14.1	65.9	
	14	11.7	0	0	7	5.8	5	4.1	21.7	
	2	1.7	0	0	1	0.8	3	2.5	5	
I should be more creative in using the resources for the electronic exam. Strongly Disagree Disagree Agree Strongly Agree	1	<b>0.8</b>	0	0	2	1.7	1	<b>0.8</b>	3.3	34.453 .000*
	14	11.7	0	0	5	4.2	3	2.5	18.4	
	26	21.7	21	17.5	13	10.8	15	12.5	62.5	
	4	3.3	4	3.3	0	0	11	9.2	15.8	
It was so hard for me to design the electronic multiformat exam items than in paper-based exam Strongly Disagree Disagree Neutral Agree Strongly Agree	0	0	0	0	5	4.2	0	0	4.2	71.924 .000*
	9	7.5	4	3.3	15	12.5	17	14.2	37.5	
	6	5	7	5.8	0	0	1	0.8	11.6	
	29	24.2	12	10	0	0	12	10	44.2	
	1	0.8	2	1.7	0	0	0	0	2.5	
I was satisfied with the way the electronic exam was performed Disagree Neutral Agree Strongly Agree	0	0	1	0.8	3	2.5	5	4.2	7.5	51.781 .000*
	6	5	12	10	0	0	1	0.8	15.8	
	28	23.3	12	10	17	14.2	17	14.2	61.7	
	11	9.2	0	0	0	0	7	5.8	15	

\*Significant (P&lt;0.05), \*\* Highly Significant(P&lt;0.01)

**Continue Table (2.B)** Distribution of domains of the effective implementation regarding practicality of electronic exam among Minia University participant staff (N= 120):

Items	Faculties									X <sup>2</sup> P
	Nursing (N=45)		Dentistry (N=25)		Pharmacy (N=20)		Medicine (N=30)		Total %	
	N	%	N	%	N	%	N	%		
<b>The electronic final exam formats can evaluate varied mental and practical objectives that cannot be assessed with the paper-based one.</b> Strongly Disagree Disagree Neutral	24	20	9	7.5	5	4.2	30	25	56.7	54.795 .000*
	21	17.5	16	13.3	12	10	0	0	40.8	
	0	0	0	0	3	2.5	0	0	2.5	
<b>In general, I prefer electronic scoring in comparison with traditional exam scoring.</b> Strongly Disagree Disagree Agree Strongly Agree	5	4.2	0	0	4	3.3	3	2.5	10	56.1134 .000*
	5	4.2	0	0	5	4.2	6	5	13.4	
	22	18.3	1	0.8	10	8.3	11	9.3	36.7	
	13	10.8	24	20	1	0.8	10	8.3	39.9	
<b>I was satisfied with the electronic examination.</b> Disagree Neutral Agree Strongly Agree	0	0	1	0.8	9	7.5	0	0	8.3	105.309 .000**
	0	0	5	4.2	0	0	2	1.7	5.9	
	21	17.5	17	14.2	0	0	28	23.3	55	
	24	20	2	1.6	11	9.2	0	0	30.8	
<b>The electronic exam process may have pitfalls in designing varied forms of exam items i.e., filling blanks or short replies</b> Strongly Disagree Disagree Neutral Agree Strongly Agree	1	0.8	0	0	1	0.8	2	1.7	3.3	50.944 .000**
	15	12.5	0	0	4	3.3	12	10	25.8	
	0	0	0	0	0	0	0	0	0	
	24	20	0	0	12	10	13	10.8	40.8	
	5	4.2	25	20.8	3	2.5	3	2.5	30	
<b>The accessibility of reliable systems can provide synchronous delivery to huge students' numbers from the institutional perspective</b> Strongly Disagree Disagree Agree Strongly Agree	2	1.7	0	0	0	0	0	0	1.7	24.533 .004*
	0	0	0	0	2	1.7	3	2.5	4.2	
	37	30.8	12	10	14	11.7	21	17.5	70	
	6	5	13	10.8	4	3.3	6	5	24.1	
<b>There is pack up exams for managing any technical failures when delivering evaluations</b> Strongly Disagree Disagree Agree Strongly Agree	2	1.7	0	0	0	0	1	0.8	2.5	28.546 .001**
	3	2.5	0	0	0	0	2	1.7	4.2	
	34	28.3	8	6.7	15	12.5	16	13.3	60.8	
	6	5	17	14.2	5	4.2	11	9.1	32.5	
<b>The security and protection of user privacy is obtained through presentation of identity- proctoring camera</b> Strongly Disagree Disagree Agree Strongly Agree	0	0	0	0	0	0	1	0.8	0.8	8.545 .480
	3	2.5	3	2.5	2	1.7	1	0.8	7.5	
	35	29.2	20	16.7	13	10.8	20	16.7	73.4	
	7	5.8	2	1.7	5	4.2	8	6.7	18.4	

\*Significant (P&lt;0.05), \*\* Highly Significant(P&lt;0.01)

**Table (2.c):** Distribution of domains of the effective implementation regarding validity and reliability of electronic exam among Minia University participant staff (N= 120):

Validity and Reliability items	Faculties									X <sup>2</sup> P
	Nursing (N=45)		Dentistry (N=25)		Pharmacy (N=20)		Medicine (N=30)		Total %	
	N	%	N	%	N	%	N	%		
<b>Validity:</b>										
Electronic exams accurately reflect the assessed learning objectives No Yes	14	11.7	13	10.8	8	6.7	12	10	39.2	2.968 .397
	31	25.8	12	10	12	10	18	15	60.8	
Electronic exams provide the same academic integrity as paper-based exams Yes No	36	30	20	16.6	17	14.2	23	19.2	80	521 .914
	9	7.5	5	4.2	3	2.5	7	5.8	20	
Technical difficulties related to the internet quality No Yes	28	23.3	18	15	15	12.5	20	16.7	67.5	1.324 .723
	17	14.2	7	5.8	5	4.2	10	8.3	32.5	
Validity: Electronic exams can meet expectations of the assessors No Yes	8	6.7	4	3.3	3	2.5	5	4.2	16.7	.089 .993
	37	30.8	21	17.5	17	14.2	25	20.8	83.3	
Authentic and valid assessment: the selection of questions must be designed to ensure randomization of its distribution and equal chance of choice No Yes	9	7.5	6	5	0	0	6	5	17.5	8.680 .034*
	36	30	19	15.8	20	16.7	24	20	82.5	
Well-designed multiple-choice questions can fairly measure learning objectives across higher cognitive standards such as practice, analysis, and problem solving. No Yes	18	15	15	12.5	10	8.3	9	7.5	43.3	5.566 .135
	27	22.5	10	8.3	10	8.3	21	17.5	56.6	
<b>Reliability</b>										
The applied technology for designing and managing the electronic exam was reliable. No Yes	2	1.7	0	0	2	1.7	0	0	3.4	5.708 .127
	43	35.8	25	20.8	18	15	30	25	96.6	
MS Teams and Blackboard as applicable invigilating methods used for e-exam was reliable. No Yes	3	2.5	0	0	0	0	0	0	2.5	6.014 .111
	42	35	25	20.8	20	16.7	30	25	97.5	
Electronic grading criteria can improve reliability, making e-exams an attractive solution. No Yes	2	1.7	0	0	5	4.2	4	3.3	9.2	11.113 .011*
	43	35.8	25	20.8	15	12.5	26	21.7	90.8	
Developing many questions can confirm equal selection of questions of different topics and different cognitive standards is allowed for students No Yes	4	3.3	0	0	2	1.7	6	5	10	7.996 .046
	41	34.2	25	20.8	18	15	24	20	90	

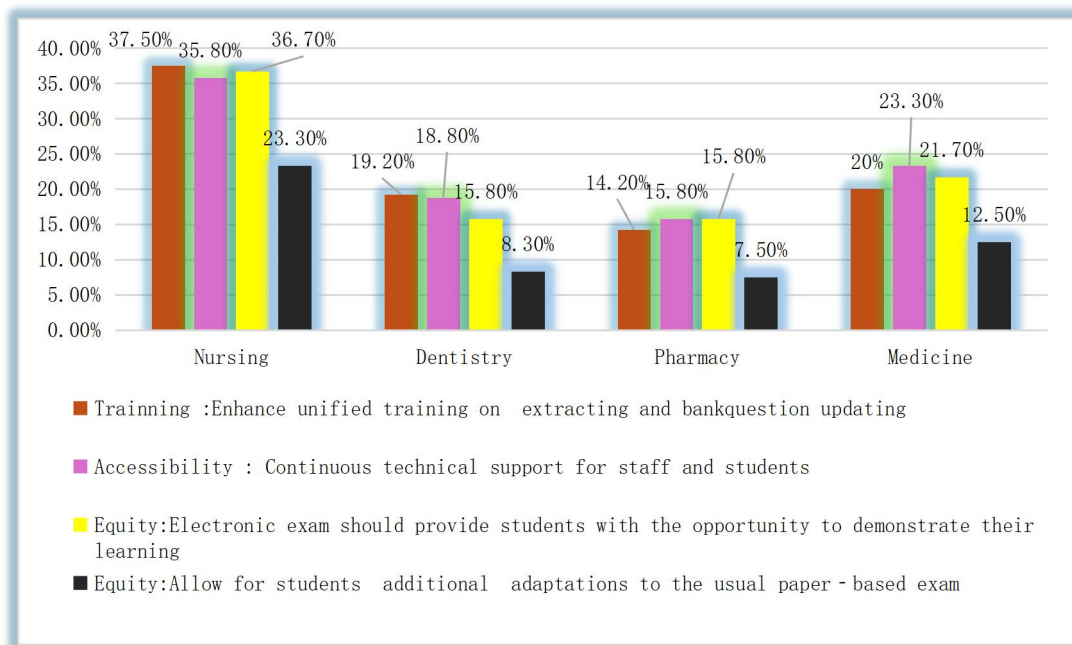
\*Significant (P&lt;0.05), \*\* Highly Significant(P&lt;0.01)

**Table (2.d):** Distribution of domains of the effective implementation regarding institutional support to electronic exam among Minia University participant staff (N= 120):

Institutional support items	Faculties									X <sup>2</sup> P
	Nursing (N=45)		Dentistry (N=25)		Pharmacy (N=20)		Medicine (N=30)		Total %	
	N	%	N	%	N	%	N	%		
Integrating the electronic exam within the strategic plan	3	2.5	3	2.5	1	0.8	4	3.4	9.2	13.639 .650
	42	35	22	18.3	19	15.8	26	21.7	90.8	
Providing resources and facilitating procedures	1	0.8	7	5.8	2	1.7	7	5.8	14.1	13.076 .004*
	44	36.7	18	15	18	15	23	19.2	85.9	
Providing support for teachers and students	2	1.7	4	3.3	2	1.7	5	4.2	10.9	3.940 .268
	43	35.8	21	17.5	18	15	25	20.8	89.1	
Electronic exam center allow equity for different faculties in access to appropriate technology and technical support for accelerated transmission to e-exams for coping with updating technology	1	0.8	0	0	2	1.7	7	5.8	8.3	13.650 .003*
	44	36.7	25	20.8	18	15	23	19.2	91.7	

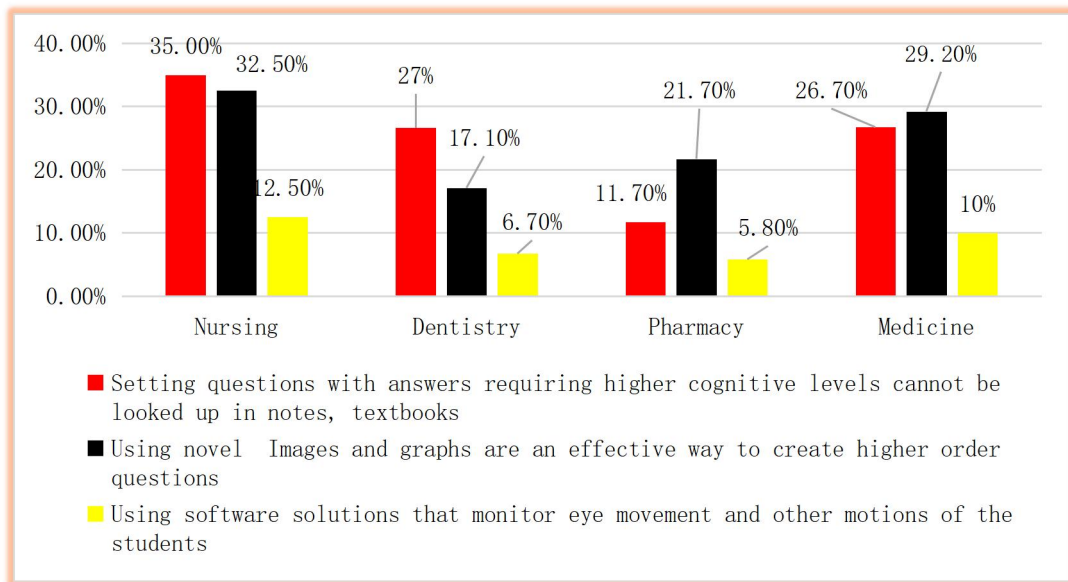
\*Significant (P<0.05), \*\* Highly Significant(P<0.01)

**Figure (3):** Percent Distribution of suggested strategies for improving the implementation of electronic exam regarding training, accessibility and equity of e -exam among Minia University participant staff (N= 120)

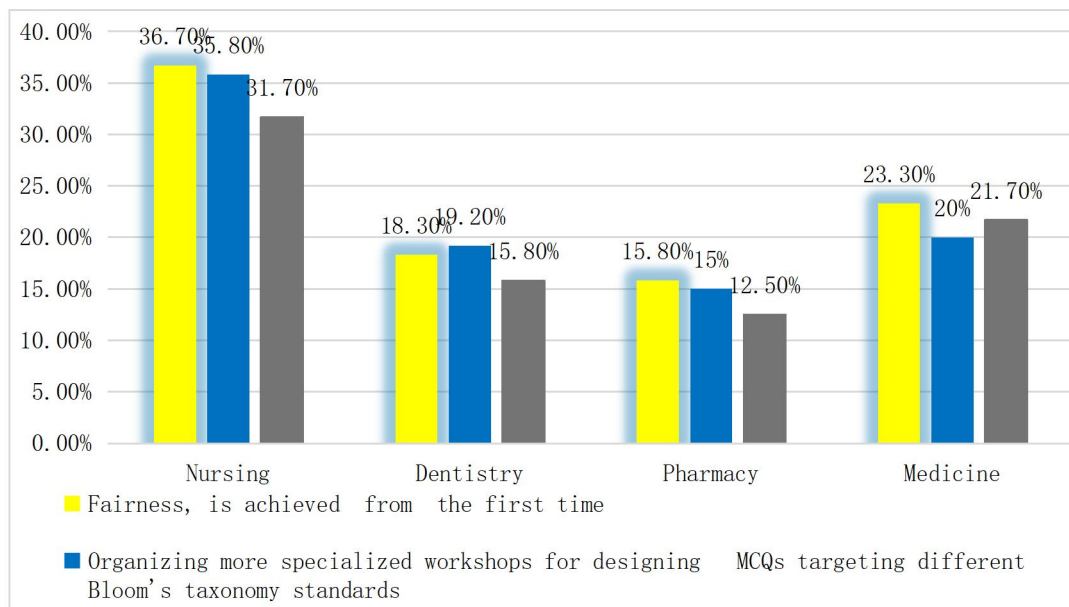




**Figure (4):** Percent Distribution of suggested strategies for improving the implementation of electronic exam regarding Academic integrity of e -exam among Minia University participant staff (N= 120)



**Figure (5):** Percent Distribution of suggested strategies for improving the implementation of electronic exam regarding Validity and Reliability of e -exam among Minia University participant staff (N= 120):-



**Discussion**

Teaching and learning in tertiary education sector has been become increasingly linked with the electronic environment over last decades, although, the urgent need for electronic education

and evaluation due to COVID-19 pandemic led to the accelerated coping of evaluation process to be by electronic delivery (Acharya et al., 2021). Mate and Weidenhofer, 2022 who studied considerations and strategies for effective

electronic assessment focusing on the biomedical courses stated that the effects of shifting to electronic evaluation enhancing practical strategies for achieving authentic evaluation of students electronically, while ensuring standards and accountability against professional accrediting needs.

The current study results revealed the academic staff criteria regarding the scientific degree as about three quarters are lecturers divided into less than third, less than sixth, minority and one fifth from Nursing, Dentistry, pharmacy and Medicine faculties respectively. More than half of the Dentistry faculty were affiliated with the oral and maxillofacial pathology department. More than one quarter of the participant staff of the faculty of Medicine are affiliated with the General Medicine department. One quarter of the participant staff of faculty of Pharmacy are affiliated with Plant and microbiology department. More than one quarter and one fifth of the participant staff of faculty of Nursing are affiliated with Community health nursing and medical surgical nursing respectively.

The current study results are consistent with **Khadka et al. 2020** who studied perceptions, concerns, and challenges towards electronic and alternative examinations system found that half of educators were lecturers of Education, a third were from humanities, and minority were from Management, Engineering and Science faculties. At the current study, e- exams are applied for the health sector faculties only. Also, **Bloom et al. 2018** conducted a survey titled perceptions and practice using e- exam, found that replies were obtained from thirty-five college participants with fifty one percent of them being female and sixty percent aged 41 years or more.

#### **The domains of effective implementation as perceived by academic staff:**

The present study results illustrated the effective implementation of e exam as regarding online exam purpose, fast majority of the total sample divided into more than a third, fifth, sixth and a quarter were from Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that e- exam is used for formative and summative exam for learning. Fast majority (97.5 %) of the participant staff divided into less than two fifths, one fifth, less than one sixth and about quarter were from Nursing, Dentistry,

Pharmacy and Medicine faculties respectively reported that e- exam is linked to ILOs.

The present study results are relevant to **Clotilda 2020** reported that educational institutions across the globe have now come to the realization that conducting exams online is the future of exams management. They believe that online examination software could help in conducting assessments irrespective of whatever situations they encounter. Also, **Bearman et al. 2020** who conducted a study titled assuring academic integrity and evaluation safety with redesigned electronic delivery: stated that a transmission to electronic evaluation forms occurred including formative and summative ones, in various disciplines and countries final e-exams continues to be approved form of evaluation.

The current study results illustrated that most of the participant staff divided into more than a third, about one fifth, less than one sixth and about one quarter from were Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that electronic exam design permits maintaining a bank of filtered and revised questions for performing exams. Also, more than three fifths of the participant staff divided into quarter, one tenth, less than one tenth and about a fifth were from Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that electronic exam permits develop different types of question types.

The present study findings are congruent with **Bloom et al. 2018** who conducted a study titled Perceptions and practices using electronic examination, stated that, electronic exams benefits include saving time and designing a bank of filtered reusable multiple-choice questions with easy storage and revised for subsequent uses by cohort studies. Though participants equally reported agreement or disagreement (mean = 3). Questions of electronic exam should ensure quality assurance criteria which confirm designing questions in manner achieving expected learning outcomes. For example, creating MCQs and obtaining feedback require technical support and educational skills.

The current study results are consistent with **Williamson, 2018** who studied electronic exams: The necessity for Best Practices and Overcoming Challenges, reported that, however, maintaining the higher levels of Bloom's taxonomy relies on

the method of constructing e- exams and to what extent the questions are utilized to assess the learning process in higher cognitive levels. Likewise, Functionally, e -exams are applied utilizing a specialized system or involved as a chapter within a learning management system such as Blackboard or Moodle. The E-exam activity module allows the staff to create and design tests involving different types of questions including multiple choice, true-false and short replies to questions. The designed questions are stored in a question bank for reusing in subsequent trials. E-exams are automatically graded, and staff can abstain or permit giving feedback and showing the right replies (**Moodle, 2017**). This process and system are exactly what is used at Minia center for electronic exams.

Regarding the preparation, the current study results illustrated that more than two fifths of the participant staff divided into less than one fifth, more than tenth, minority and fifth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that they had adequate training on method of using the exam software revealing significant difference:  $p=.014^*$ .

The present study results are relevant to the explained significance of staff training as reported by **Kuikka et al., 2014** and illustrated that it is critical to assure valid evaluation on a large scale. Technical support for staff is required to ensure reliability. Also, prepared staff are fully responsible for ensuring staff development. Dedicated support should provide appropriate guidelines for using electronic tools. Also, **Shram, 2019** who studied electronic exam implementation in higher education institutions: students' perspectives, reported that two-thirds of respondents recognized the importance of training and good preparation for e-exams also, they stated that the analysis of findings should be lied with quality assurance standards. Reflecting serious training is needed to prepare teachers technically and pedagogically to appropriate construction of multiple-choice questions and different sorts of questions measuring different cognitive levels of the course objectives.

Regarding performance, the present study results indicated that more than three quarters of the total participant staff divided into about one third, one sixth, more than tenth and one fifth of Nursing, Dentistry, Pharmacy and Medicine

faculties respectively reported that the required time for completing and scoring is balanced with meeting the learning objective. Also, more than half of the total sample divided into more than one sixth and minority of Nursing and Pharmacy faculties respectively and less than one sixth of both Dentistry, and Medicine faculties reported that they do not prefer paper type exam revealing significant difference:  $p=.039^*$ .

The present study results are contradictory to **Kuikka et al. 2014** performed a study for teachers to assess the barriers facing them when starting electronic testing such as the difficulty of constructing varied types of questions for e-exams as short complete. Also, the researchers reported that the staff studied did not desire to replace their testing rules and methods. From the previous contradictory 2 studies, it is concluded that adequate training and preparation are the main key of e – exam implementation successfully in overcoming this obstacle.

Regarding Pedagogy, most of the participant staff divided into more than one third, less than one sixth, about tenth and fifth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that e-exams enhance the opportunity to have automated grading and specialized feedback revealing significant difference:  $p=0.023^*$

The present study results are congruent with **Bloom et al. 2018** who found that more than quarter and a sixth of participant staff strongly agreed that e- exam provide feedback immediately. E- exams help students to understand the course deeply. Also, as feedback aid in correcting mistakes and enhance learning of the students, it is essential to be received for them feedback on both intermediate and final evaluation (**Kuikka et al. 2014**).

The present study results showed the effective implementation regarding practicality of electronic exam among Minia University participant staff as more than three fifths of the participant staff divided into more than quarter, one tenth, more than one tenth and less than one sixth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively agreed that e-exam took longer effort and time to prepare as compared to the paper based exam revealing significant difference : $p=.000^*$ .Also, more than three fifths of the participant staff divided into

more than one fifth, less than one fifth, tenth and less than one sixth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively disagreed that e-exam is often frustrating because of having technical problem revealing significant difference:  $p=.001^*$ .

Likewise, more than three fifths of the participant staff divided into one fifth, more than one sixth, a tenth and more than a tenth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively agreed they ought to be more creative in utilizing the resources needed for the electronic exam revealing significant difference:  $p=0.000^*$ . About three fifths of the participant staff divided into more than one fifth, a tenth, more than one fifth of Nursing, Dentistry faculties respectively and more than one tenth of both Pharmacy and Medicine faculties agreed the electronic exam was conducted in a satisfying way revealing a highly significant difference:  $p=.000$ .

The present study results are relevant to **Guangul et al, 2020** who studied the challenges of remote evaluation in higher education institutions in the context of COVID-19, reported that when deciding to implement e-exams, the required time for designing electronic exams questions was found to be a challenge. Therefore, it is important to provide time and guidance for dedicated staff. Moreover, automatic assessment and grading are an essential advantage for staff, which is time saving. So, academic staff can allocate greater effort for improving test items.

The present study results are in accordance with results also show that **Shram, 2019** who studied electronic exam implementation in higher education institutions: students' perspectives, reported that more than three quarters of participants reported that e-exams are more time saving than traditional tests, also, they require less effort and cost. E-exam items should achieve quality assurance criteria by assuring that its design is appropriately linked with the intended learning outcomes. For instance, designing multiple choice questions with correct answers is time consuming for staff and will require overcoming any problems and providing adequate preparation and guidance.

In the same line, **Baleni, 2015** who studied advantages and disadvantages of electronic formative evaluation in higher education, reported

that the complete automation prevents printing, signing, analysis of the results, inspection and traditional procedures of exams causing staff overload, specifically for large student numbers. To benefit from the new technologies and reduce overload, it is necessary to firstly transform from traditional examination to electronic approach to pedagogy and learning, which indicate more time and cost at the early stage of application (**Kuikka et al., 2014**).

The current study results indicated that more than half of the participant staff divided into one fifth, and one quarter of Nursing and minority Medicine faculties respectively and minority of both Dentistry and Pharmacy faculties respectively strongly disagreed that the electronic final exam evaluated varied cognitive, mental and practical skills that could not be evaluated with the traditional one.

The preset study results are consistent with **Williamson, 2018** who studied electronic Examinations s: The necessity for best performance and overcoming barriers, reported that maintaining higher levels of Bloom's taxonomy relies on the method of designing the examinations are constructed and evaluating the educational process at higher cognitive standards. The researchers see that e-exams can be tailored to be bilingual for the benefits of paper-based exam in assessing different levels of learning objectives with the benefit of ease of presentation and automating grading as the question design is based on staff experience and good preparation and training.

Also, about one fifth the participant staff divided into less than one fifth of faculty of Nursing and minority of Dentistry, Pharmacy and Medicine faculties agreed that overall, electronic is preferred by them for grading compared with paper-based exam grading.

The current findings are congruent with **Baleni, 2015** who who studied advantages and disadvantages of electronic formative evaluation in higher education, stated that participants were satisfied with adequate grading on the Blackboard platform, as computers are free of human mistakes and the utilized technology for electronic evaluation is reliable.

Also, more than half of the participant staff divided into about one sixth of Nursing, Dentistry

faculties, no one and more than one fifth of Pharmacy and Medicine faculties respectively reported that electronic exam is satisfied for them. The current study results are consistent with **Shram, 2019** who studied electronic exams implementations in higher education institutions: students' perspectives, reported that although the electronic tests applied at at Palestine Technical University-Kadoorie are final ones running in computer labs, about three quarters of the studied sample agreed that electronic examinations are more satisfying than written ones.

Less than three quarters of the participant staff divided into one third, a tenth, more than a tenth and more than one sixth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively agreed that there is accessibility to reliable systems that provide synchronous delivery to huge numbers of learners from the institutional perspective revealing significant difference:  $p=.004^*$ .

The present study results are relevant to **Farzin, 2016** who studied attitude of learners Towards electronic exams process, ascertained that e- exams can be structured to permit multiple trials for enormous number of students at the same time. Each trial is automatically graded, and the staff can select whether to give feedback or not (**Moodle, 2017**). So, electronic exams process can simplify the written exams process, specifically with large students' numbers. Also, from configuring and introducing the test, grading, documenting, keeping the findings and performing statistical analysis.

More than two fifths of the participant staff divided into less than one third ,minority of Nursing, Dentistry faculties respectively more than one tenth of both Pharmacy and Medicine faculties agreed about presence of pack up solutions for dealing with technical failures when starting evaluations revealing significant difference:  $p=0.001^*$ .The applied policy at Minia University for health sector faculties of the mentioned sample includes using a pack up paper-based exam (**Samir, 2023**).

The present study results revealed that less than three quarters of the participant staff divided into one third, one sixth, a tenth and less than one sixth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively agreed that the security and protection of user privacy is obtained

through presentation of identity- proctoring cameras.

The present study results are supported by **Al-Saleem & Ullah, 2014** who studied safety Considerations and Recommendations for electronic exams, explained the necessity of safety of e-exams and suggested varied methods for improving like students cheating in the form of communication with each other or exploring the web. The researchers recommended utilizing webcams to monitor students using weblock software such as Secureexam Browser and Respondus Lock Down Browser, by which only the electronic test material is browsed on the screen. The authors also proposed locking any other applications throughout e-exam, thus preventing features such as screen capture, copy and paste, right-click menu, browser menus, toolbar options and function keys. Another vital security necessity is to authenticate the identity of students. This can be achieved by applying different software and hardware materials such as webcams, fingerprint readers and biometric face recognition. Minia center for electronic exams uses different procedures for protecting security such as weblock software such as Secureexam Browser and high-resolution webcams (**Samir, 2023**).

Concerning validity, more than two fifths of the participant staff divided into one quarter less than a sixth of Nursing and Medicine faculties respectively and a tenth of both Dentistry and Pharmacy faculties, reported that electronic exams accurately reflect the assessed learning objectives. More than two fifths (43.3 %) of the participant staff divided into less than one fifth, and more than a tenth of Nursing, Dentistry respectively and minority of both Pharmacy and Medicine faculties reported that well-designed multiple-choice questions could not fairly evaluate learning objectives through higher cognitive standards such as application, analysis, and problem solving.

The present study results revealed that most of the participant staff divided into one third, one sixth, less than one sixth and about one fifth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that electronic evaluations, especially exams, provide the same academic integrity as the written exams.

Most of the participant staff divided into one third and one fifth of Nursing and Medicine faculties respectively and about one sixth of both Dentistry, Pharmacy faculties reported authentic and valid assessment, it is a necessity that the selected questions are designed for confirming objectivity during the random distribution of questions.

The present study results are different from **Shram, 2019** who studied electronic exam implementation in higher education: students' perspectives, showed that the studied sample reported that e-exams are invalid, not appropriate for many courses representing three quarters and not appropriate for evaluating the higher cognitive skills representing majority. A prevailing critique of multiple-choice questions is testing knowledge of facts only. The difference can be attributed to the pre-training from the first trial at Minia University that is recorded as a constant reference for work. Also, the prepared computer labs introduced by the electronic center with their technical preparations. A learner who is not sure about the right selection can guess it. Although 66 % of the participants agreed that e-exams more authentic evaluation than written exams by integrating multimedia and simulations, etc. Also, two-thirds of the participants recognized the necessity of ensuring quality standards by linking the analysis of findings to quality assurance criteria. Other findings are illustrated by **Kuikka et al. 2014 and Chua et al. 2019**, who reported that recent technologies permit the students to show video, audio or simulations before replying to varied sorts of questions concerning the multimedia, thus making e-exams more engaging than written ones.

Regarding reliability: the current research results illustrated most of the studied staff divided into more than one third, one fifth, one sixth and quarter of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that the utilizing technology for designing and delivering the e-exam, and the utilizing method for monitoring the exam (MS Teams and Blackboard) were reliable. Majority of the participant staff divided into more than one third, one fifth, one sixth and and fifth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that the deigning huge number of questions confirming an equal choosing of them

(of varied topics and cognitive levels) is delivered to each learner.

The present study results revealed a majority of of the participant staff divided into one third, less than one sixth, one sixth and one fifth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported the necessity of selecting designed questions to confirm objectivity during the random distribution of exam items (authentic and valid assessment) reveling significant difference : $p = .034^*$ .Fast majority (90.8 % )of the participant staff divided into more than one third, one fifth, more than one tenth and more than fifth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that free of human mistakes grading process that can enhance reliability, making electronic evaluation an attractive method reveling significant difference : $p = .011^*$

The current paper findings are in accordance with **Shram, 2019**, who studied electronic exam implementation in higher education: students' opinions, assessed reliability from staff point of view and found that 77 % of them grading e-exams automatically is more precise than written exams, and 24.5 % of them agreed that the utilizing technology in e-exams is reliable.

A reliable and cost-effective bandwidth and a robust network are vital requirements for the successful application of e-exams. The present study results are congruent with **Baleni 2015**, who who studied advantages and disadvantages of electronic formative evaluation in higher education, stated that objective scoring and immediate delivery of scores make the students more confident in the findings than written exams.

The present study results are different from **Farzen, 2016** who studied Attitude of learners Towards electronic exam process, confirmed that the randomization process of exam items from the revised bank may mean that some learners can be asked relatively easy questions and other more difficult items. So, to confirm that e-exam questions appropriately evaluate the same intended learning outcomes for all recipients and are of equal difficulty, it is necessary to take into consideration adaptive examinations, of varied question sorts are chosen from the bank and algorithmic materials are utilized to allocate them to varied levels of difficulty. This is obtained through the introduced template which includes a

defined map of specific ILOS. Also, the exams are the same for all students in their levels of difficulties and the induced change is changing the order or rank of the same question from student to other to prevent cheating. Minia Electronic Exam Center made use of the existing IT infrastructure at Minia appropriately to accommodate with the elevating number of students performing electronic exams.

The current study results explained institutional support features as fast majority of the participant staff divided into more than one third, less than one fifth, less than one sixth and one fifth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively reported that the electronic exam is integrating within the strategic plan revealing significant difference:  $p=0.004^*$ . Also, majority of the participant staff divided into Medicine faculties respectively of Nursing and Medicine faculties respectively and less than one sixth of both Dentistry, Pharmacy faculties reported that their institutions are providing resources and facilitating procedures revealing significant difference:  $p=0.004^*$ . The current research results are congruent with the rules of quality accreditation system, **Ministry of High Education 2023** of integrating recent and updating methods of teaching and evaluation within the strategic plan and achieving Egypt vision 2030 toward digitalization.

#### **Improvement Strategies as suggested by academic participant staff:**

Regarding training, the current study results showed more than one third, about one fifth, more than one tenth and one fifth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively recommended enhance unified training on how to extract question bank and bank updating for each faculty of the medical sector. Regarding accessibility of electronic exams, more than one third, less than one fifth, less than one sixth and more than one fifth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively recommend continuous technical support for academic staff and learners. Regarding academic integrity, more than one third, one sixth, more than one tenth and one sixth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively suggested setting questions with answers need elevating cognitive standards cannot be searched in handouts, textbooks, or by electronic engines.

Regarding validity and reliability, more than one third, one fifth less than one fifth and more than one fifth of Nursing, Dentistry, Pharmacy and Medicine faculties respectively of the total sample recommended organizing more specifying workshops for designing of multiple-choice questions aiming at varied Bloom's taxonomy standards in different specialties.

The present study results are in accordance with **Kundu, and Bej, 2021** who studied the experience of electronic evaluation COVID-19 analyzing learners' opinions ascertained that appropriate practices of e- assessment necessitate enhancing the efficacy of the staff and equipping them with continuous training, preparation and with technical and educational support.

#### **Conclusion:**

The present paper highlighted the experiences of Minia University in the management of e-exams as part of the formative and summative evaluation. Specifically, discusses practices from academic staff perspectives as a majority reported it as beneficial tool maintaining a bank of filtered and revised questions for performing exams permits design varied sorts of questions with enough training.

Likewise, as a pedagogical approach, electronic examination enhances the opportunity for automated grading and providing specialized feedback. From the participant staff opinions, it could be concluded that e-exams are the extended form of an original paper exam after making necessary modifications and accommodations in a trial to keep pace with the new technology use and the increasing number of students with limited resources linked to ILOs. On the other hand, two thirds reported that well-deigned multiple-choice questions could not fairly evaluate course objectives via varied cognitive standards such as applicable, analytic, and problem-solving skills. This can be overcome by differentiating the forms of exams to include clinical assessment in a simulated and real environment, by introducing questions including cases studied, and writing ones which permit students to express themselves, enhance unified training on how to extract highly intellectual question bank. The present study results revealed vigorous institutional support by providing resources and facilitating procedures.

**Recommendations:**

The main recommendations include providing continuous training for academic staff with predetermined and fixed annual appointments before beginning final exams for improving the academic staff abilities and equipping them with appropriate guidelines and with specialized and educational support.

- Allowing additional adaptations to accommodate the usual paper-based exam as filling the gaps etc.
- To prepare questions papers in accordance with Bloom's taxonomy standards, it includes question paper styles and a large question bank.
- Successful implementation requires institutional support, including the following
  - Enhancing managerial procedures.
  - Providing the essential financial support, accommodating the infrastructure to accommodate with the increasing number of students.

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