

CONDUCTING REMOTE ELECTRONIC EXAMINATIONS IN DISTANCE HIGHER EDUCATION: STUDENTS' PERCEPTIONS

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ABSTRACT

The COVID-19 pandemic forced Higher Education Institutes (HEIs) to adopt alternative approaches to the delivery of their learning activities, including examinations. Many HEIs choose Remote Electronic Examinations (REEs) as a one-way solution due to physical presence restriction measures imposed by governments around the world. The present study aimed to record and analyze students' perceptions of the implementation of remote electronic examinations by the Hellenic Open University (HOU). A number of 5412 students participated voluntarily and filled out a questionnaire. Both qualitative and quantitative analyses were employed. Results revealed that students were satisfied in general with the examination process. Regarding integrity assurance issues, students were also satisfied. Furthermore, they expressed their desire to be examined remotely again. Avoiding traveling and saving money were the main benefits of remote electronic examinations. Regarding the examination topics and the duration of the examination sessions, some issues were reported. Finally, students suggested the provision of more time length.

Keywords: Remote electronic examinations, COVID-19, examination evaluation, challenges, suggestions.

INTRODUCTION

COVID-19 has affected healthcare systems and economies around the world. Measures imposed by governments, such as lockdown, social distancing, and remote working, have entered into citizens' daily routines around the world and created a new normality. Higher Education was also impacted by the pandemic. The closure of universities and colleges' campuses, in order to slow down the spread of the virus, forced the majority of their academic activities (e.g., teaching, assessment, research, etc.) and management services to be delivered online (Marinoni, van't Land, & Jensen, 2020).

During the pandemic, students' examinations with a physical presence were not permitted in many countries. Ministries of Education around the world have encouraged a shift toward alternative examination methods. As a result, many HEIs adopted remote examinations (OECD, 2020). Admittedly, over the last years, there has been an increasing interest in HEIs to move from paper-and-pencil to computer-based examinations (Hillier & Grant 2018). Electronic examinations should be flexible enough, taking into account the requirements and the expectations of multiple stakeholders. To this end, faculty members, with the respective heads, should provide a flexible examination process so as not to put students at a disadvantage (Bothwell, 2020). Electronic examinations allow a range of assessment types and can frame questions that require very complex responses which can not be supported by the traditional examination approach (Fluck & Hillier, 2016). However, electronic examinations may face challenges that should be addressed by HEIs, such as dishonest behavior (e.g., cheating), difficulty in assessing courses with practical orientation, difficulty in fair treatment of test-takers, technical failure risks, etc. (Hillier, Kumar, & Wijenayake, 2020; Sahu, 2020).

Research Aim

HOU is a public university founded in 1992 and fully operational since 1997. It is the sole university offering exclusively open distance education in our country with approximately 45.000 active undergraduate and postgraduate students. HOU supports the learning process by using special educational materials and teaching methods. Traditionally, the meetings between tutors and students took place in physical classrooms on the university premises. Since 2016, the university has gradually shifted from face-to-face to online meetings. Regarding online learning, research has shown that it can also be delivered in high quality (Ahmed et al. 2021). However, students' participation in final examinations was done by physical presence in predefined examination venues throughout the country.

During the pandemic outbreak, HOU was the first university in our country which officially announced that students' examinations will be conducted remotely via electronic means (e.g., personal computers, tablets, smartphones, etc.). Although REEs are increasingly implemented by HEIs around the world, students' perceptions remain rather unexplored. Students' perceptions could reveal important and useful aspects for the effective design and implementation of REEs. In response to this transition, the present study aimed to record and analyze students' perceptions of the implementation of REEs. The contribution of the present study is twofold: a) to support the decision -making authorities of the HOU about the effective employment of REE in the future, and b) to present findings to the academic community about the benefits and drawbacks of REEs in Distance Higher Education Environments. More specifically, the following research questions were stated:

1. To what extent students are satisfied with REEs?
2. What are students' perceptions about the positive and negative aspects of REEs?
3. What are students' suggestions for the improvement of REEs?

LITERATURE REVIEW

Assessment is the process of collecting and analyzing data about learners' performance and it can be formative or summative. Formative assessment focuses on improving a learner's performance during a course, while summative assessment focuses on grading the learner either at the end of a course or at specific periods (Ilgaz & Afacan Adanir, 2020). The term electronic assessment (e-assessment) describes assessment procedures and activities that are carried out electronically with the use of information and communication technology

(ICT) (Alruwais, 2018). The term electronic evaluation (e-evaluation) refers to the summative assessment that is conducted using ICTs (Fluck et al., 2017). Finally, the term REEs describes examinations that are conducted electronically at a remote location apart from the examination venue (Thomas et al., 2002).

Literature has shown several advantages of electronic assessments and examinations, such as speed up testing and immediate (automated or semi-automated) student feedback (Betlej, 2013; Nguyen et al., 2017; Osuji, 2012; Shraim, 2019). Electronic assessments/examinations can provide automated question generation (Sindre & Chirumamilla 2015), question banks (Washburn, Herman, & Stewart, 2017), a variety of question styles, multimedia types (e.g., text, image, video), and virtual environments (James, 2016; Kuikka, Kitola, & Laakso 2014; Pagram et al., 2018) as well as automated records of learning analytics (Ilgaz & Afacan Adanir, 2020; Washburn et al., 2017) and secure data storage (Ilgaz & Afacan Adanir, 2020). Also, they reduce the possibility of cheating (Farzin, 2017), they are flexible regarding location and time (Alruwais, 2018; Datsenka, Stankov, & Kurbel, 2012), and adaptable regarding students' characteristics (e.g., people with special needs or people located far away from examination venues) (Sindre & Chirumamilla, 2015). Additionally, they are conducted in a comfortable, relaxed, and friendly environment, reducing anxiety (James, 2016; Thomas et al., 2002), and they save time, effort and cost for students, tutors, and universities (Ilgaz & Afacan Adanir, 2020). In particular, tutors save time and effort from correcting and grading written tests, and have the time to provide essential student feedback (Shraim, 2019).

Nevertheless, literature has shown up several challenges of electronic assessments and examinations such as reliability and usability issues of the assessment/examination systems (e.g., login issues, overloading, complex and challenging environments, answer submission problems, etc.) (Dammam, 2016; Hillier, Grant, & Coleman, 2018; Khan & Khan, 2019; Kuikka et al., 2014; Snodgrass et al., 2014; Wibowo et al., 2016), poor network quality, speed or internet connectivity issues, (Bashitialshaaer, Alhendawi, & Lassoued, 2021; Ilgaz & Afacan Adanir, 2020; Pagram et al., 2018), unreliable devices or infrastructures, power cuts, (Bashitialshaaer et al., 2021), authentication and security issues (Adebayo & Abdulhamid, 2014; Dammam, 2016), little defense against cheating (Sindre & Chirumamilla, 2015).

Furthermore, students consider that reading the screen and typing are quite demanding and tiring tasks (Bayazit & Askar, 2012; Nardi & Ranieri, 2019) since they are often inexperienced with the assessment/examination process and spend more time due to the lack of typing skills (Betlej, 2013; Khan & Khan, 2019; Osuji, 2012). Factors like slow typing, periodically saving answers, (Thomas et al., 2002), paper -and -pencil and computer tasks jointly (Ilgaz & Afacan Adanir, 2020), are major issues that might result in a loss of time. Disturbing noises/interruptions during an examination (e.g., typing noises, scrolling noises, or other environmental sounds) can burden the whole process (Bayazit & Askar, 2012; Thomas et al., 2002). Student anxiety during remote examinations is related to factors like inexperience with online format (Khan & Khan, 2019), unsatisfying technical or tutor support (James, 2016; Khan & Khan, 2019), time duration (Elsalem et al., 2020), inadequate information (Bashitialshaaer et al., 2021), fear of losing data due to the technical failure of the examination system or due to poor internet connection (Gotlib et al., 2015; Ilgaz & Afacan Adanir, 2020; Pagram et al., 2018).

Also, electronic assessments/examinations are not always representative of students' way of thinking (Betlej, 2013), they don't show students' real level of skills and knowledge (Bashitialshaaer et al., 2021) and they tend to downplay the evaluation of students' high order competencies and critical thinking skills due to an orientation mostly to close-ended formats (e.g., Multiple Choice Quizzes, [MCQs], true-false, matching, etc.) (Hodgson & Pang, 2012). Gotlib et al. (2015) mention in their survey that students disagreed to a considerable degree that electronic examinations were better for testing their knowledge, compared to traditional pen-and-paper examinations. Shraim (2019) reports that almost half of the participants in her survey stated that electronic examinations were not appropriate for any subject area and also not always appropriate to test students' level of knowledge. Responders considered as an aspect of the effectiveness of electronic examinations the presence of different question types. Iannone and Simpson (2017) mention in their research that students of education studies tend to prefer methods like projects and dissertations in comparison to mathematics students who tend to prefer closed-book exams. Both groups of students considered these preferences to be more appropriate for discriminating between their abilities than the MCQ method. MCQs have been proved as an effective and fair mode of e-assessment and examination in general (Babo et al., 2020; Ranganth, Rajalakshmi, & Simon, 2017). Nevertheless, MCQs have been charged

with drawbacks such as the testing only of factual knowledge and not of understanding (Shraim, 2019) and higher-order cognitive abilities (Hodgson & Pang, 2012). Khan and Khan (2019) state that participants in their research complained that MCQs did not truly test their abilities on the course and suggested that a variety of question forms should be incorporated into their assessment (e.g., long or short answers).

Besides the type of format, Walker and Handley (2016) mention the issue of balance and volume of questions per allotted time, and Jimoh et al. (2012) point out that erroneous questions are one of the major causes of students' failure with the Computer Based Test (CBT) mode of assessment.

Literature has shown the need for elements that contribute to students' better examination preparation, such as clearer instructions (Hillier, 2015), more training and practice (Washburn et al., 2017), more digital skills (Adegbija, 2012; Walker & Handley, 2016), more resources and facilitating procedures (Shraim, 2019). Improvements in the affordances of examination softwares are also considered important (James, 2016; Pagram et al., 2018; Wibowo et al., 2016).

CONTEXT OF REMOTE EXAMINATIONS IN THE HOU

HOU has been working towards addressing most of the challenges of REEs. More specifically, ten days before the scheduled examination date, students were given instructions regarding the submission procedures as well as demos to perform simulations in the examination environment and get themselves familiarized with the REEs process. Regarding the examination platform, Moodle was used to support the REEs process (Figure 1 – part 1). Considering proctoring, it was decided to avoid using certain software solutions (e.g., ProctorExam, 2022; Proctortrack, 2022). Instead of that, Skype for Business (SfB) was used for student monitoring and authentication (Figure 1 - part 2). Furthermore, tutors were further supported by administration staff – one staff member per tutor- during the examination session (Figure 1 – part 3).

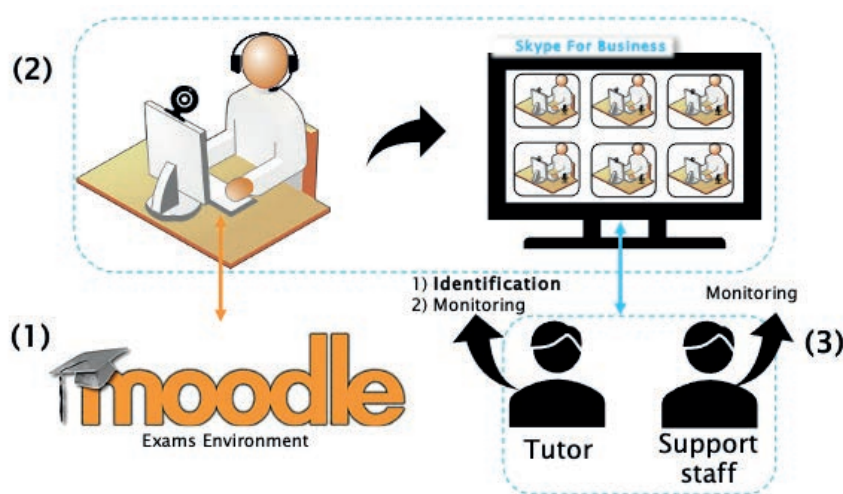


Figure 1. REEs' monitoring process

Examinations were conducted using the following methods:

- Written examination with open questions
- Written examination with MCQs
- Written examination with MCQs and open questions
- Oral examination
- Final written assignment-project
- Final written assignment with potential oral presentation
- Written examination with oral presentation

Depending on the examination method, students could submit their answers directly to the platform (e.g., in the case of written examinations with MCQs) or upload files with their written answers (e.g., in the case of written assignment projects). In the case of a possible oral presentation, tutors, after having graded the students' answers, had the opportunity - if necessary - to invite someone for an oral presentation. The oral examination was synchronous and took place exclusively in the SfB environment.

METHOD

Research Design and Participants

This paper presents a survey study, which is a cross-sectional design where data are collected from subjects at a single point in time through a questionnaire (Bryman, 2014). A survey is a relatively quick and rigorous research approach and can be employed by researchers in order to explain trends or reveal characteristics of large groups (Straits, 2005), such as in our case. The survey was conducted by the Internal Evaluation Unit (IEU) of the HOU. A total of 5412 (36.03%) students (out of 25744) participated in the research voluntarily and anonymously. More specifically, 2040 students from the School of Humanities, 1059 students from the School of Sciences and Technology, 2252 students from the School of Social Sciences, and 61 students from the School of Applied Arts participated.

Data Collection and Analysis

Students were asked to fill out a questionnaire consisting of 11 questions (8 closed-ended Likert-type and 3 open-ended). Regarding closed-ended questions, 6 Likert-type questions were used to record students' satisfaction with each dimension of the examination process (figure 3). One Likert-type question was used to record students' opinions about integrity assurance and 1 Likert-type question was used to record students' desire to be remotely examined in the future. The scale of each question ranges from 1 (not at all) to 5 (very much). In order to record students' positive/negative comments and suggestions, 3 open-ended questions were also provided at the end of the questionnaire.

Before the main study, the questionnaire was pilot-tested with a group of 100 students in order to check reliability issues. What is more, face validity (Bryman, 2014) was checked by three experts on educational assessment and evaluation. To minimize any bias or memory recall issues, the survey was conducted exactly after the end of the examinations. The survey lasted one month (from August 4th, 2020 to September 4th, 2020).

With regard to the collected quantitative data, descriptive and inferential analyses were applied. Violations of the sphericity and homogeneity assumptions led to the use of non-parametric tests. More specifically, the Friedman and Kruskal-Wallis tests were used. A thematic analysis (Guest, MacQueen, & Namey, 2012), supported by hierarchical text clustering (Zhai and Massung 2016), was applied to the analysis of open-ended questions. Figure 2 depicts the process of open-ended data analysis. More specifically, the process consisted of 4 steps: a) students' answers (N=4344) were automatically segmented into sentences, then word tokens per sentence were replaced by their lemmas and frequently common words were removed, b) sentences were transformed into vectors and the pairwise distances among them were calculated with the cosine similarity measure, c) distance matrix data were used for hierarchical text clustering according to Ward's method (Ward, 1963) and d) the proposed clusters were checked for their content quality (e.g., silhouette scores) and, where necessary, they were manually grouped into related themes.

The above analysis resulted in a total of 9894 classified sentences (positive = 3348, negative = 4165 and improvements = 2381). Open-ended data preprocessing was performed using the R statistical environment and hierarchical text clustering was performed using Orange Data Mining Software.

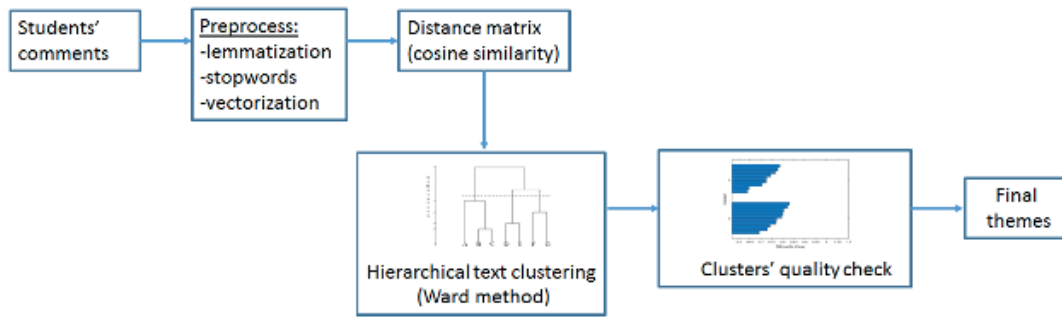


Figure 2. The text mining process applied for the thematic analysis

FINDINGS

Regarding satisfaction from each dimension of the REEs' process, students stated satisfied (Mean score > 3 – see Figure 3). Weak statistically significant differences resulted between dimensions (Friedman Test: $\chi^2(5) = 5025.95$, $p < 0.01$, $W = 0.114$). More specifically, the Dunn-Bonferroni correction for multiple pairwise tests showed that students were more satisfied with the examination platform, the examination methods, and the briefing of the examination procedure. Students were less satisfied with the available examination time.

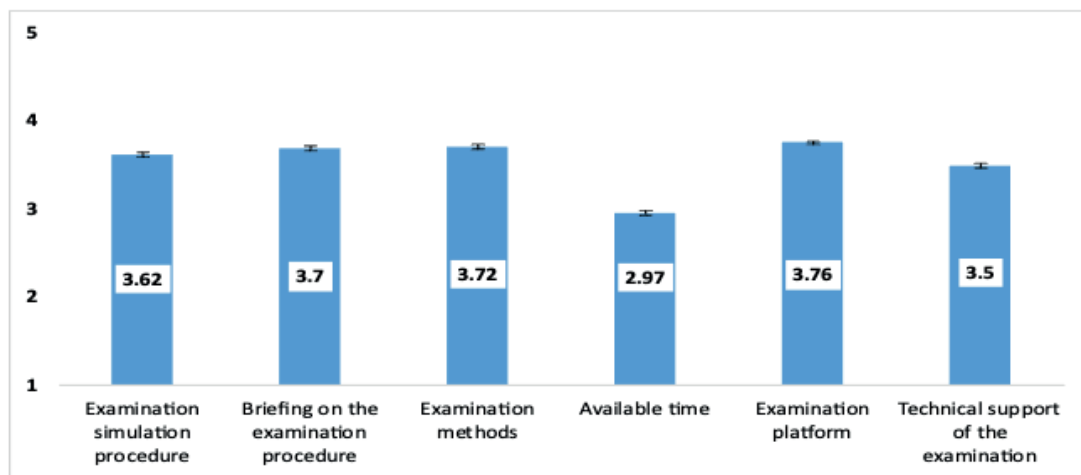


Figure 3. Means and 95% CI of student satisfaction per dimension of the REEs' process

The variable Overall Satisfaction (Cronbach's $\alpha = 0.90$) was constructed from the dimensions of REEs and showed that students were satisfied with REEs in total (Figure 4). Respondents also considered that the integrity assurance of REEs was ensured and they were positive to be examined remotely in the future (Figure 4). A moderate positive correlation was found between students' overall satisfaction with REEs and their desire to be examined remotely in the future ($r_s = 0.62$, $p < 0.01$).



Figure 4. Means and 95% CI of student overall satisfaction, integrity assurance, and desire to be examined remotely in the future

Considering satisfaction per examination method, weak statistically significant differences were found (Kruskal-Wallis test: $\chi^2(6) = 127.66$, $p < 0.01$, $\eta^2 = 0.014$). More specifically, the Dunn-Bonferroni correction for multiple pairwise tests showed that students were more satisfied with: a) written examination with MCQs, b) final written assignment-project, c) final written assignment with potential oral presentation and less satisfied with: a) written examination with MCQs and open questions, and b) oral examination (Figure 5).

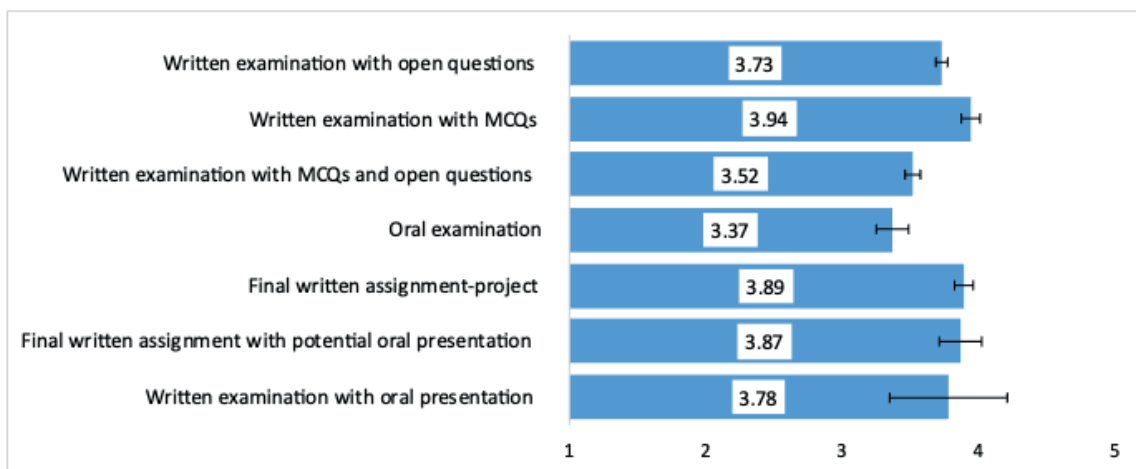


Figure 5. Means and 95% CI of students' satisfaction per examination method

Students' perceptions of the positive and negative aspects of REEs were grouped into nine themes (Figure 6). Students considered that a great benefit of REEs was the fact that they did not have to travel to any examination venue, and as a result, they saved time and money.

Regarding the examination topics, students mainly complained about ambiguities or errors in wording, ambiguities in the grading criteria, the number of questions, and the level of difficulty compared to the examination duration (which was judged to be limited). Students also reported issues with topics' modes of presentation. More specifically, for topics that were examined in the MCQs format, students complained about the lack of a backward navigation option. Students could not check or answer previous questions. However, a small portion of comments reports that examination topics were considered clear, comprehensible,

logical in number, passable, were given on time, and promoted critical thinking. Students reported that the available examination time was not enough. The issue of the limited examination time, although less frequent, runs through students' comments regarding examination topics and methods. Comments about technical issues and anxiety were also reported.

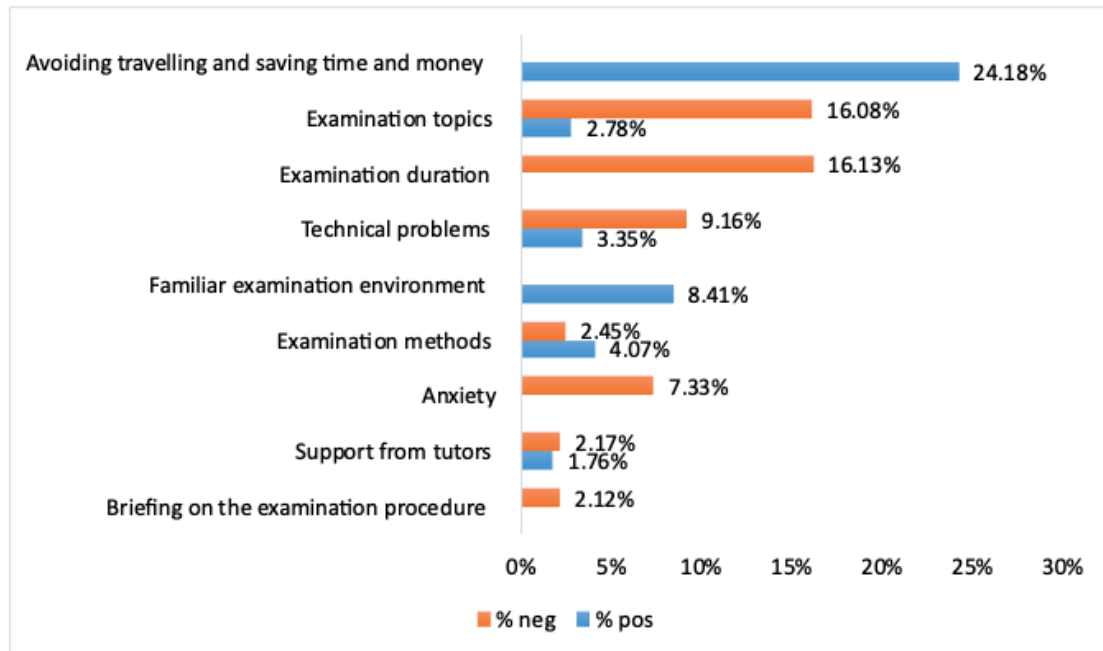


Figure 6. Distribution of Students' positive and negative aspects of the REEs ($N_{\text{pos} + \text{neg}} = 7513$)

Negative comments were made regarding technical problems with the examination platform (mostly answer submission problems or difficulty to use) and with SfB (image freezing and poor audio/video quality). However, a small portion of positive comments referred either to the absence of technical problems during the REEs or to their timely treatment. According to students' comments, the fact that they were allowed to be examined in a familiar environment (e.g., home or office) contributed to a less stressful condition. Nevertheless, 7.33% of students' comments showed that during the examination they were very anxious due to the fear of technical problems and connection loss, limited available time, and the unprecedented character of the examination process. Most of the students reported that the examination methods were ideal or suitable for their course; easy, fast, transparent, and fair. A portion of comments concerned the written assignment-project and the written examination with open questions, highlighting mostly that these two examination methods were appropriate or ideal for the module. However, they did not lack, albeit to a lesser extent, comments where the examination methods were considered inappropriate, unacceptable, unclear, not satisfactory, not representative of students' learning process, stressful and limited in time.

Students' comments, positive and negative, about their support by tutors were balanced. Students highlighted the fact that tutors during the examination were cooperative, supportive, organizing, well prepared, and provided ongoing information. Comments where tutors were distant, strict, disorganized, not at all properly informed about the examination process, unable to impose order during the examination and deficient regarding the use of information technologies, were also reported. Finally, students stated that they were not completely or timely informed about the examination process (e.g., types of questions, starting time of the examination, available time, etc.)

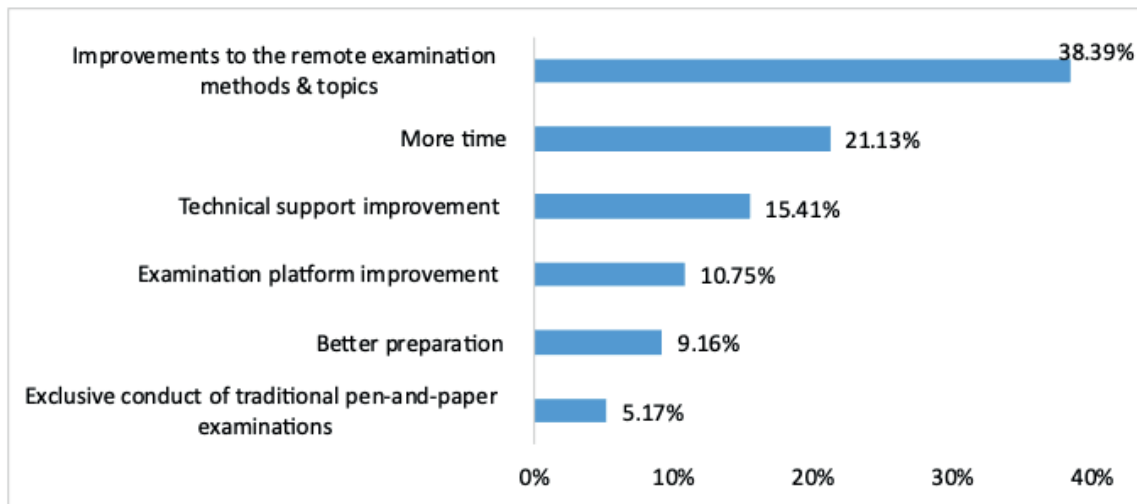


Figure 7. Suggestions for the improvement of remote examinations (N=2381)

Six themes of students' suggestions on the improvement of REEs resulted from the thematic analysis (Figure 7). First of all, students suggested a variety of improvements to the examination methods and topics. More specifically, they want fewer examination topics, a sensible distribution of available examination time among examination topics, and the simultaneous display of all examination topics during the examination. Students want to be examined either with a combination of methods or with a sole method only (mostly with MCQs or with final written assignment-project).

Students also want the examination duration to be longer, the providence on behalf of the university for better technical support, the improvement of the examination platform features (e.g., data recovery after disconnection or appropriate notification before the expiration of the examination, and simplification of the submission process). Regarding the preparation procedure of REEs, students want to receive timely and complete information. Regarding the simulations of REEs, students want them to be implemented on time, adapted to more realistic scenarios, or customized to each examination method. Finally, a small student portion wants the option to be able to exclusively participate in traditional examinations.

DISCUSSION AND CONCLUSIONS

The purpose of the present research was to present student's perceptions on the implementation of the REEs' process that was adopted by the HOU during the health crisis of COVID-19 so as to inform decision-making about the future of remote examinations at the largest distance education institute in our country. The research was conducted by the Internal Evaluation Unit of the HOU. Regarding quantitative data, a set of 9276 students' responses were recorded. A total of 9894 classified sentences (positives = 3348, negatives = 4165 and improvements = 2381) were used for the qualitative analysis session.

Results revealed that students were satisfied with most of REEs' dimensions (see Figure 2) and they expressed their desire to be examined remotely in the future (see Figure 3). Students' open-ended responses showed that avoiding traveling to examination venues and saving money were the most prevailing positive comments. These findings are following studies in which students show acceptance and positive attitudes towards online assessment/examination (Alrways, 2018; Joshi et al., 2020; Senel & Senel, 2021). Such findings suggest that REEs were conducted in an effective context and HOU authorities should encourage REEs' adoption in the future.

Regarding the available examination topics, most comments related to issues such as difficulties in comprehension, presentation errors, and an imbalance between the number of examination topics and the available time. Such issues should be addressed by the HOU administration through appropriate workshops where best practices of producing examination topics of different types and delivery modes will be presented. After all, the quality of examination topics partly reflects the quality of the examination process, and students tend to adopt positive attitudes towards the latter when they feel that it fairly helps to improve their learning and understanding of the curriculum instead of lowering their academic performance (Alsalhi et al., 2022; Khan & Khan, 2019; Shraim, 2019).

Students' comments varied in their preferences to be examined with particular methods in the future. This variation seems to depend rather on the subject of each module (Iannone & Simpson, 2017). Furthermore, it is related to students who complained about the inadequacy of some examination methods to be representative of either the course's nature or their skills. Workshops for faculty members should be provided regarding the advantages and disadvantages of the available examination methods as well as best practices for their implementation under each discipline's requirements. This will guarantee an assessment of both lower and higher-order cognitive skills (Sharadgah & Sa'di, 2020).

Examinations' duration was a prevailing issue pointed out by students, a finding which is in alignment with the literature review (Adanir, 2020; Jimoh et al. 2012; Khan & Khan, 2019). On the one hand, provision should be made for a reasonable treatment of the examinations' duration so that students can complete their examinations within the predefined time limits, always taking into account the examination method and the type of topics. On the other hand, it should be stressed that any restriction on the duration of examinations may prove to be an effective way of reducing cheating behaviors, but provisions should be made for time adequacy regarding students with special needs (ElSalem, 2021). Complaints of students regarding their difficulty in typing or their lack of digital skills, which are related to personal time management during the examination, should be addressed through online workshops that will help students improve their ICT skills (Adewale, 2011). Several technical problems during the examination process, such as poor connection, submission failures, and usability issues were reported and charged as responsible for causing anxiety to students. It is suggested that the HOU administration should exploit its highly skilled technical personnel better in order to improve the examination platform's affordances and adequately address students' requests in the future.

LIMITATIONS AND FUTURE WORK

The sample size was large enough. Nevertheless, the analysis was conducted without further investigating possible differences in students' perceptions, based on demographic characteristics such as age, gender, and school of study. However, university policymakers could get insight on how to improve REEs and increase students' academic performance in an open distance education context. The study was conducted in the first year of the pandemic outbreak, so all students had their first-time experience with REEs, which was not always captured with clarity in their short-written comments (Popping, 2015). In future work, semi-structured interviews with students should be conducted in order to investigate in depth their experience of the REEs' process. Also, the study explored only students' perceptions. Faculty members' perceptions should also be explored through a similar study. Findings should be compared in order to help the HOU to shape a complete image of REEs through convergences and divergences between these groups. Correlations between students' technological competencies and perceived satisfaction from REEs could also be investigated.

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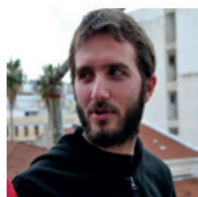
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