Teacher's Attitudes towards Electronic Examination - a Qualitative Perspective

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***Abstract*—The objective of this paper is to present new research on teacher perspective on electronic examinations and their use in a university environment. The motivation for this lecturer-centered research stems from the fact that most articles concerning e-exams contain research with regard to students and their performance while taking part in this type of tests. In order to obtain information about their attitude towards e-exams eight lecturers from a private Polish university with different backgrounds were interviewed in detail. This qualitative research determined the main advantages and disadvantages of performing electronic exams instead of traditional pen and paper exams. Those factors were divided into four main groups – advantages and drawbacks concerning the process of preparation this kind of exams, process of conducting them, process of assessment and also some general statements. According to the conducted research, introducing electronic exams at the university has a lot of positive impacts on lecturer work. In most of the cases it saves a lot of professor's time and effort. The lecturer does need to create many different groups of the test, as the questions can be randomly assigned from the databases. Answers for closed-ended questions are automatically checked, while those for open-ended questions are easy to read. However, at the same time it is very important for the university to provide suitable conditions for lecturers to enable them to conduct e-exams in teachers-friendly manner, such as - proper classroom equipment or technical support.**

***Index Terms*—electronic exam, e-exam, lecturers' attitudes**

I. Introduction

Computers have been in the lives of modern people for some time now. Just a few decades ago they were rare machines which could be afforded only by the wealthiest and they were so massive that they could fill a whole room. In comparison, today we use computers in everyday life – both at work and at home, for business as well as for pleasure. Computers are light, can store huge amounts of data, and make many actions easier. In education, the usage of computers is becoming more and more common as well – not only during classes but also as a tool to carry out tests and exams. In this article the idea of computer-based testing will be analysed, focusing mainly on one of the most important target audiences – faculty.

This paper is divided into five main parts. In the first one, definition of computer-based examination and the frequency of its usage in academia will be discussed. In the second part, the research that has been conducted so far in the topic of computer based assessment will be discussed, followed by the part containing the results of the conducted qualitative research. The last part includes a discussion of the results.

II. Electronic Exams

Electronic exams, e-exams or computer-based exams are all the forms of tests presented using digital means (most often personal computers, but also tablets etc.) and submitted electronically [1]. The history of conducting e-exams started with the introduction of the first computers in the 1970s, when the potential of this new technology to generate completely new settings for the design and administration of tests was recognized. The first computer-based exams were simple and with exactly the same types of questions as their paper-based counterparts. Academics now have access to more sophisticated software dedicated to conducting computer-based exams -with multiple question types, security or scoring options.

The potential changes that the introduction of computer-based testing would imply for the field of educational measurement were described by Bunderson in 1988 [2]. He predicted four generations of computerized tests to come: beginning with computerized testing (administering conventional tests by computer) to intelligent measurement (providing intelligent scoring, individual profiles, advice to learners and teachers). Despite the initial optimism and major advances in the field over the last decades, it needs to be acknowledged from the present-day perspective that the field of computer-based testing has not evolved as rapidly as initially forecast but some major changes have been introduced in those last 30 years.

Using e-examination is getting more and more popular. The first computer-based exams were conducted when computer labs were introduced at the universities. In many academies, however, traditional pen and paper exams are still much more popular. The research in this area is becoming more popular and this tendency is presented in Fig. 1. This is a graph showing the number of scientific papers that are published every year concerning the described subject. The search for those

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papers was performed using the Scopus database [3], which is one of the biggest scientific databases available and contains journal articles as well as conference papers and book chapters. The search query used to find the papers had the following form:

TITLE-ABS-KEY ("computer based test" OR "computer based assessment" OR "computer exam" OR "eexamination" OR "eexam") AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "ch")).

Keywords regarding computer based test, e-examination and computer based assessment were chosen. Journal articles, conference papers and book chapters were included in the search.

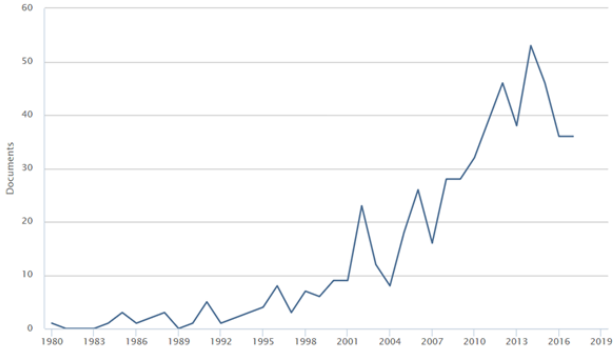

Figure 1. The number of scientific papers written every year on the subject of e-examination

As can be observed in Fig. 1, at the end of the 20th century papers concerning the subject of e-examination were not very popular. However, this number started rising quite rapidly at the beginning of the 21st Century and currently around 50 papers concerning the described subject are published every year.

This tendency can also be observed in everyday life, where the use of computer-based assessment is increasing. Examples include theoretical drivers' licence exams, job application exams, language exams and entrance exams in postsecondary education in highly developed countries [4]; [5].

III. Previous Research

A. From the Student Perspective

In previous research the process of conducting computer based exams has been widely analysed, especially from the perspective of students. One of the main benefits claimed for computer-based assessment in comparison with pen and paper assessment is that it can improve student performance. However, the results of research are not consentaneous. Some of the papers prove that it has a positive impact on student results [6]-[9] whereas other papers disprove this thesis [2]. In one of the literature reviews of electronic exams [2] 23 papers were analysed, among which only three studies showed a superiority of e-exams, nine of paper-based tests and in the remaining ones no significant differences in student performance were observed.

According to Rickett and Wilks [10], who analysed introducing e-exams in biology lessons, the impact of introducing computer-based assessment can be both positive and negative. If one wants to observe a positive change in student performance, special care needs to be taken in the student-assessment interface. If the interface is not clear and transparent, students will have problems interacting with it and the process of writing the exam becomes more stressful for them. The only group of students that benefited when applying computer-based examination (independent of the interface type), were students with dyslexia. It was much easier for them to write using the computer keyboard and as a result - less stressful. The other observed advantage of e-exams is the fact that students can get results and feedback immediately after the test (when it consists of closed-ended questions) [10], [11].

What is interesting, according to Clariana and Wallace [12], gender, level of competitiveness or computer familiarity of students are not related to the performance difference between pen and paper and computer-based exams. However, it seems that women are more influenced by the perceived ease of use of the software [8]; [13], so it is especially important to design a user-friendly experience for them.

The findings from more recent studies, for example the one conducted by Fluck, Pullen and Harper [14] are similar to the ones described earlier. In this study opinions about computer-based and paper-based exams were divided among students, with 46% favouring each alternative and the rest selecting both of the options as equivalent. Interestingly, students who had already taken e-exams, preferred this kind of tests (63% of respondents). The conclusion is as follows - once the student knows the software, it is less stressful for him to write an e-exam and he is more willing to accept this form of assessment. Furthermore, in modern times many people write faster on a computer than on a piece of paper, and it is easier to correct and change the answers in open-ended questions. The only drawback of writing essays on a computer is the noise that many computer keyboards in one room create.

B. From Academic Perspective

Interestingly, most of the studies conducted on the subject of computer-based assessment take into account only student performance and opinions. However, there is a different group of people whose opinions should be taken into consideration while researching the above-mentioned subject. These are teachers and lecturers who use e-examination during their classes.

Only a few articles underline advantages and disadvantages of conducting computer-based exams from the perspective of the teacher. Thelwall [15] found that the toughest part of conducting an e-exam from the lecturer's perspective is to create one - design questions, enter them into a certain software etc. In all of the other stages, computer-based exams are more timesaving in comparison to their traditional paper-based counterparts. They have longer lifespans - one can use the same question set a few times, because questions can be randomly chosen from the base. As reported by Terzis and Economides [9], those kinds of tests are also more

secure and can be used in the process of distance learning. The other advantage for academics is that they can have access to more information about test takers [16] and as a result more deeply analyse student results [17]. Conducting e-exams also results in the reduction of massive printing costs [18].

From these papers it can be concluded that academics have no problems with electronic exams and that using them has almost no disadvantages. However, not as many analyses as about student performance have been conducted. Therefore, it was decided to perform similar research but taking into consideration only the lecturer's point of view. In this article results of qualitative research conducted with a group of academic teachers from a private Polish university will be shown. The main objective of the study is to examine what are the main challenges for academics while introducing e-exams and how they can gain from conducting them. In the research the attitudes towards computer-based exams are analysed - do they differ among academics and why.

IV. Results

In order to examine attitudes of higher education teachers towards computer-based testing a qualitative research has been conducted. As the technology is changing rapidly nowadays, there is a need to examine the faculty's attitudes towards the newest trends and software available on the market. Faculty in the researched University have access to two main types of e-exam software – Australian Classmarker [19] and Norwegian Inspera [20]. Both of them need internet access on the devices to conduct an exam. The types of questions that can be placed in exams are diversified: open-ended essay questions, closed-ended multiple choice questions, true or false, grab and drop etc. The second software has also a „safe exam browser" option, which enables to block access to all of the other websites during the exam. However, in the research the main interest is focused on attitudes not towards certain types of software, but overall opportunities that teachers have as far as computer-based testing is concerned. To address this research problem, a series of individual in-depth interviews has been designed and performed.

Interviews were conducted in one of the main private business universities in Central-Eastern Europe. Eight lecturers with different backgrounds, from various departments, of different ages and gender participated in them. All of those lecturers have experience with conducting computer-based tests. The majority of respondents used to organize traditional pen and paper exams in the past.

One of the main comments about the computer-based test is that undoubtedly it has more advantages than drawbacks. However, there are also some problems that lecturers face while conducting this kind of assessment and these problems should be studied in order to eliminate them in the future and to provide suggestions for lecturers about how to get used to using this type of software.

The advantages and disadvantages of computer-based tests from the lecturer point of view will be presented divided into four main groups: those that can be encountered while 1) preparing the test, 2) conducting tests, 3) checking the results and 4) general ones.

In the following part, advantages and drawbacks of conducting computer based exams will be discussed, with division based on the stage of conducting the exam. Firstly, the ones concerning the preparation stage will be discussed, then we will move on to the process of carrying out the exam. The next step is connected with assessment and in the end we will summarize some general opinions of lecturers about e-examination. All of the lecturers' comments are summarized in Tab. 1.

A. Preparation Stage

In the process of preparing computer based tests, lecturers enumerate as main advantages some functions of computer exam systems that are not accessible when one conducts a traditional pen and paper exam. Computers can draw questions from a bigger question bank and present them in random order. Lecturers do not have to prepare a few groups of a certain test; one big question bank is enough and the rest of the work is performed by the computer.

TABLE I. Summary of Advantages and Disadvantages of Conducting E-Examinations

	Preparing	Conducting	Assessing	General
+	Random draw of questions Random order of questions and answers No need to prepare different exam groups	Less cheating Faster writing Help of Center of Examination	Easy to read Automatic results of closed-ended questions Easy archiving	Similarities to universities abroad Ecological
-	Time consuming Labor intensive Lack of computer labs	Student reluctance Dependence on other people Technical: internet or computer not working	Need to know the system Incentive to use closed-ended questions	Abilities to cheat the system

"Opportunity to introduce more homogenous exams, easier preparation of exams, when a subject is taught by two or more lecturers. One can create joint question banks for everyone teaching a certain subject."

Sometimes exam preparation can be time-consuming and labor-intensive, which was also noticed by the respondents, especially during the first computer-based exams, when one needs to get to know the computer system. However, when a lecturer needs to conduct an

electronic exam from the same subject for the second time and the question bank is big enough, he can use the same set of questions and actually spend less time preparing a test. Another enumerated drawback is that before the test the lecturer needs to provide a suitable room for it. It should be big enough for all of the students from certain group but at the same time the room should be a computer lab. At universities the number of computer labs is limited and some of our respondents faced problems with booking one for their e-exam.

B. Conducting the E-exam

The next stage is conducting the computer based test itself. It is the moment, when students come to the university to write the exam, and as it turns out from our research – this stage can be less problematic when conducting an electronic examination in comparison to traditional pen and paper tests. Faculty noticed that students try to cheat less during e-exams. The questions and answers are displayed in random order, test takers are often not allowed to go back to previous questions and change their answers, so they need to concentrate on their own tests, their own screens and not on the answers of their colleagues. Lecturers also tend to think that for many people writing on a computer nowadays is easier and faster that on paper. In the case of the researched university, while conducting e-exams, lecturers get help from the Examination Center, which is responsible for the technical aspects of computer based tests, but as it turns out – it is also helpful in maintaining the order of the test and assuring proper student behavior.

"Writing on a computer replaces writing on a piece of paper. It is common knowledge that today's generation is using computers almost from the cradle, so it is easier for them to write using a computer than using a pen."

Nevertheless, some problems can be encountered while conducting e-exams, especially technical ones. Respondents said that sometimes the Internet did not work, which is needed in the case of most computer based exams nowadays. Sometimes there were technical problems with computers – they freeze or stop working. Situations like this are considered by some of the lecturers to be stressful and the teachers should not be responsible for solving these technical problems. Furthermore, faculty observe some reluctance from the students when they want to prepare a computer based exam instead of a traditional one. This can be actually a good sign, if the reason for this reluctance is that it is harder to cheat, students need to work alone and write the whole test by themselves.

C. Assessment

The next stage is assessment and this is where the process differs from traditional exams. When faculty has only closed-ended questions in their e-exams, then usually it is automatically assessed by the computer, the lecturer gets a file with final results. When there are also open-ended questions in the test, the lecturer needs to check them, give a proper number of points for student answers and only then will he have the final results. However, there is one other advantage of assessing answers for open-ended questions – they are much easier to read than pen written ones. Answers are clear and legible. When a test is conducted on a computer, results can be stored on a disk or cloud, they do not have to be printed and stored in a locker. This enables a more ecological, practical and safe way to store students' exam results.

"No negotiations. When the system automatically sums up the points from closed-ended questions and students can see the result – there are no negotiations about the grade. I hate negotiations! it is not me giving you the grade. [...] Students are not coming and asking you "Sir what is my grade?", but you are asking them "what is your grade?", and this is working really well. So the students know their grades even before me."

"I used to get answers for open-ended questions in traditional exams written in a way that I could not unscramble! Here some arrows, here something added, here crossed out - I did not know what is right and what is wrong. Now exams are easily legible"

"I do not have to send it to a printery, I do not have to xerox the exams, I do not have to carry everything home and back. Until e-exams were introduced, I had a cabinet full of student tests because we need to keep them for 5 years. And now I can check the exams wherever I am - at home, in the bus… I just open the computer and have them"

As it has been already mentioned, if there are only closed-ended questions in the test it can be automatically assessed by the computer. If that is so – there is an incentive for lecturers to use only those kinds of questions in the test. However, it is common knowledge that it is impossible to check all of the students' skills using only closed-ended test questions. What is more, if a lecturer wants to assess the open-ended questions in the system, of course they need first of all to get to know it.

D. General

Some of the characteristics of e-exams that were mentioned in the research could not be fitted into any of three stages mentioned above. That is the reason for the creation of the fourth category – which contains general advantages and disadvantages of computer based examination. One of the undeniable advantages of electronic examination is its ecological character. When conducting e-exams lecturers do not have to print tests which saves a lot of paper. It is estimated that during one year after introducing computer based exams in the researched university, around 600 e-exams were conducted. If each exam is 2-3 pages long on average when printed, it accounts for around 1500 pages saved during only the introductory year of computer based exams. It also accounts for many trees saved.

Furthermore, computer based assessment is more and more often introduced at the best universities and conducting this type of exams makes the university more similar to the best ones abroad.

"If someone is on an Erasmus exchange, I can send him a link to the exam, the student fills it and he will not have a backlog at the University."

At the same time, it needs to be remembered that when the system is already deployed for some time – it gives more opportunities for students to find possible gaps and its shortcomings and to find ways how to cheat.

V. Conclusions

In this part of the article all of the main outcomes from the research will be summarized with the greatest attention paid to the ways of solving possible problems encountered while conducting e-exams.

Probably in the near future there will be a chance to overcome most of the drawbacks enumerated by the lecturers. For example, the one concerning the preparation stage – that a test needs to take place in a computer lab – can be overcome by the so-called bring your own device exams. Students come with their own laptops, notebooks or tablets, access the university's WiFi and write a test. The main problem here is how to block access to all of the other websites, but some of today's software has this option (for example Inspera).

In the stage of conducting an e-exam it is necessary for some of the lecturers to have technical support provided. When anything happens with the computer, there should be a person responsible for solving this kind of technical problem. At the same time – it should not be the lecturer's duty so the university should employ people responsible for technical support who are at the university during each of the computer based exams.

In the next stage of assessing electronic exams there is an incentive for lecturers to use only closed-ended questions as they can be automatically checked by the computer. A University can require that the lecturers use different kinds of assessment and types of questions within the tests. It is possible also that in the near future some of the programs will check open-ended questions on the basis of some key words. However, this way of assessing essays needs to be more deeply researched.

Summing up, introducing e-exams at the university level seems to be advantageous for lecturers. However, some of the possible drawbacks and threats connected with this need to be taken into account.

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