COMPARISON OF OPINIONS OF STUDENTS AND UNIVERSITY TEACHERS FROM MEDICAL UNIVERSITY OF WARSAW ON E-ASSESSMENT – A PRELIMINARY REPORT

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Abstract: Background Until now, test exams at Warsaw Medical University were mostly carried out in the paper-and-pen test form. Beginning in the academic year 2014-2015, it is possible to get a credit and pass a test exam on the ASK Systems e-exam platform. In the academic year 2014-2015 there were three e-exams organised in WMU.The aim of the study The study aimed to compare opinion of students and university teachers from Medical University of Warsaw on e-assessment.Material Study group: 181 persons - 148 students: students, who took part in e-assessment on ASK Systems E-exam platfrom, (Group 1 - 59 students), and students, who did not take part in e-assessment (Group 2 - 89 students) and 33 university teachers (Group 3). Group 1 - 59 women, mean age: 24,96 (min.21, max.44, SD: 5,54). 25 of students has alredy took part in an e-exam apart from university. Group 2 – 55 women, 25 men, mean age: 22,53; min.19, max.32; SD: 2,15, 80 of students has alredy took part in an e-exam apart from university. Group 3 - mean age: 46,57; min. 29, max. 61, SD=10,99; 14 of women, 15 teachers took part in e-exam. Methods Participation in the study (February 22-27, 2015) was voluntary. An anonymus questionnaire survey. E-questionnaire consisted of 58 statements in 5 thematic domains, 5 step Likert scale. Links to the questionnaire were placed on an external server, which ensured anonymity. Reliability assessment of the questionnaire: Cronbach's Alpha coefficient. Analysis of significance of differences between Groups 1, 2, and 3: non-parametric Kruskal-Wallis test, $\alpha=0.05$. Results Among the study groups, statistically significant differences of opinions and attitudes towards e-exams concerned the following: phrasing questions that would be impossible to phrase in the case of a traditional pen-and-paper test ($H=9.661, p<0.008$), additional intellectual effort required from students during an e-exam ($H=13.283, p<0.001$), trends in methods of testing knowledge of students ($H=6.366, p<0.042$), results of course credits earned on an e-exam platform ($H=6.531, p<0.038$), possibility of technical error in the examination system ($H=7.834, p<0.020$), increase of examination stress during an e-exam ($H=17.689, p<0.001$), concentration problems when reading a question on a computer screen ($H=6.604, p<0.037$), drawing an individual set of test questions ($H=11.634, p<0.003$), using multimedia materials in test questions ($H=9.798, p<0.008$), reducing the opportunity of cheating on exams ($H=10.483, p<0.005$), and increasing chances for a better result in a test ($H=6.891, p<0.032$). Conclusions:Due to the fact that students had correct conception of organization of e-exams and positive attitudes towards EE, there is no need of organising special preparation for students regarding computer-aided examinations. It seems to be essential to develop procedures of grading computer-aided exams even before the introduction of this form of examination. Moreover, it also seems necessary to conduct training for university

teachers on possibilities that are provided by the ASK Systems e-exam platform with reference to test exam structuring and phrasing test questions, with particular focus on multimedia elements. Owing to a not numerous and non-representative study group, the present study results may be only of a pilot nature and the study needs to be continued in consecutive years.

Keywords: E-assessment, quality of assessment, modern technologies, health sciences students, university teachers

Background

In recent years, together with the increase in interest in using modern IT and the development of e-learning in educating students of medicine and health sciences, there has been also an increasing interest in the use of modern computer technologies and applying them in checking students' knowledge [1-5]. Application of modern IT in examining students may influence both the quality of an exam and the attractiveness of computer assisted exams (EE – electronic exams) [1-5].

Until now, test exams at Warsaw Medical University were mostly carried out in the paper-and-pen test form. Beginning in the academic year 2014-2015, it is possible to get a credit and pass a test exam on the ASK Systems e-exam platform. In the academic year 2014-2015 there were three e-exams organised in WMU.

The Aim of The Study

The study aimed to compare opinion of students and university teachers from Medical University of Warsaw on e-assessment.

Material and Methods

The study included 181 people in total: 148 students and 33 academic teachers. They were divided into three groups: Group 1 – students who took part in electronic exams through ASK Systems platform (59 people), Group 2 – students who did not participate in electronic exams (89 people), Group 3 – academic teachers of MUW (33 people). A detailed characteristic of the studied group of students is presented in Table 1 and the studied group of academic teachers in Table 2. Participation in the study was voluntary. Between February 22-27 2015, there was an anonymous self-prepared questionnaire carried out. It was constructed on the basis of the analysis of an accessible scientific literature, articles where the opinions of students concerning their participation in electronic exams were analysed. The questionnaire consisted of 58 statements and a 5-stage Likert scale was applied. The statements were divided into 5 thematic domains: 1. Using the electronic exam platform of ASK Systems, 2. Organisation of electronic exams on the ASK Systems platform, 3. Attitudes towards assessing knowledge using electronic exam platform, 4. Advantages of electronic exams, 5. Disadvantages of electronic exams. Questionnaires were in electronic forms and links to them were placed on the external server, which ensured anonymity.

The questionnaire for Group 1 included all 5 domains and was placed in the following link:
https://docs.google.com/forms/d/1XKw459AQXvfKhZrwayTDkLnlEENeFl0XVtXMoJFP5_o/viewform
The questionnaire for Group 2, due to the fact that students from this group did not participate in electronic exams, did not fill in the part of the questionnaire concerning using the ASK Systems platform, included only 3 domains and was available in the following link:
https://docs.google.com/forms/d/1cPHRzpLoDBMgfi5c4BktwJVDEW_Wd3RJ7O2CR6R1XwM/viewform
The questionnaire for Group 3 also included only 3 domains and was placed in the following link:
https://docs.google.com/forms/d/14Uh459tNykEbBaEcerd_Z9CQnbkSah4Cfw3oZRRo_mc/viewform
The link to the questionnaire for Group 1 was sent three times at the beginning of the summer semester by the employees of the MUW Exam Bureau who have the base of students electronic addresses at their disposal and could also administer the ASK Systems platform.
The link to Group 2 was sent to the students by the MUW Student Council.
The link to Group 3 was sent to every academic teacher at MUW who use electronic post in the domain of wum.edu.pl ; it was sent following the database of the MUW Promotion and Information Bureau.

The Analysis of The Survey Reliability

The assessment of the survey's reliability was carried out on the basis of the analysis of inner coherence for the entire scale of the singled sub-scales by determining appropriate reliability coefficients according to the formula suggested by Cronbach [6-7]. According to the Nunnaly's criterion, the acceptable reliability threshold for α ≥0,70 was accepted [8]. In order to assess the inter-scale compliance of individual statements, the matrix of inter-correlations was determined and as a cohesion criterion, the r-Pearson coefficient was accepted at the level of >0.10 [9].

The Analysis of Differences Between the Groups of Students

The analysis of differences relevance between Groups 1, 2 and 3 was carried out using Kruskall-Wallis non-parametric statistical test for three groups with a post-hoc test of multiple comparisons of average ranks, assuming that α=0.05.

Table 1. Detailed characteristic of the studied groups of students

Feature		Group 1	Group 2
Number of the studied group		59	89
Gender (%)	women	59	55
	men	-	25
Age		Mean: 24.96, min.21, max.44 SD: 5.54	Mean: 22.53 lat min.19, max.32 SD: 2.15
Type of studies	Full-time programme		74
	Extramural studies		6
Level of studies	Unified Master's programme	-	55
	Studies of the 1st degree	20	13
	Studies of the 2nd degree	39	12
Year of studies	Year 1	32	26
	Year 2	7	12
	Year 3	20	36
	Year 4	-	3
	Year 5	-	2
	Year 6	-	1
Faculty	I Faculty of Medicine	-	28
	II Facultu of Medicine	-	13
	Faculty of Pharmacy	-	12
	Faculty of Dentistry	-	5
	Faculty of Health Sciences	59	22
Direction of studies	Medical Analysis	-	1
	Dietetics	-	1
	Pharmacy	-	11
	Physiotherapy	-	1
	Medical	-	40
	Dentistry	-	4
	Nursing	54	8
	Obstetrics	-	9
	Dental technologies	-	1
	Public Health	5	4
Participation in another form of electronic exam			80

Group 1 – group of students who took part in an exam through a platform
Group 2 - group f students who did not take part in the exam

Table 2. Detailed characteristic of the studied group of academic teachers

Cecha		Grupa 3
Number of the studied group		33
Gender (%)	women	14
	men	19
Age	Mean: 46.57; min. 29, max. 61, SD=10.99	
Seniority at MUW	Mean: 16.41; min. 2, max. 35, SD=12.44	
Post	PhD	1
	Lecturer	2
	Senior Lecturer	1
	Assistant	6
	Tutor	11
	Professor	6
	Dean	1
Number of didactic hours performed in the last academic year	Mean: 264, min. 100 max. 450, SD=108.05	
Faculty	I Faculty of Medicine	14
	II Faculty of Medicine	7
	Faculty of Pharmacy	5
	Faculty of Dentistry	5
	Faculty of Health Sciences	6
Type of studies	Full-time programme	22
	Studies of the 1st degree	9
	Studies of the 2nd degree	3
Direction of studies	Medical	15
	nursing	7
	Medical-Dentistry	5
	Pharmacy	5
	Public Health	4
	Medical Analysis	4
	Medical Rescue	3
	Dietetics	3
	physiotherapy	3
	Obstetrics	2
Type of conducted classes	lectures	19
	seminars	25
	exercises	25
	laboratories	5
	faculties	5
Type of classes	General university subjects	3
	Subjects that are part of basic sciences	7
	Propaedeutics of clinical classes	11
	Clinical classes	18
	other	5
I have classes with students (year of studies)	I	7
	II	7
	III	20
	IV	8
	V	9
	VI	3
Have you ever taken part in any electronic exam?	Yes	15
	No	13
Would you like to carry out an electronic exam in your subject?	Yes	6
	No	5
	I don't know	8

Results

Evaluation of reliability of the questionnaire was performed for different sub-scales and survey groups, according to the results presented in Table 3. alpha-Cronbach coefficient for the whole measuring scale was 0.729 with the highest value observed for the group of teachers. For the scale evaluating the attitudes of the responders, two sub-scales were singled out (I-A and I-B) which were to measure the same feature in the cross-system. It was observed that in case of statements that had the role of internal control (sub-scale I-B), the value of alpha-Cronbach coefficient was lower than for the sub-scale of attitude evaluation (I-A). Whereas the high value of negative correlation between the two sub-scales confirms high reliability of the measurement (data not shown). Moreover, for the scale evaluating the advantages (sub-scale III), a higher internal compliance of the measurement was noted than in case of disadvantages (sub-scale II). In summation, despite the relatively low size of the studied groups, the obtained results of reliability analysis confirm the high internal compliance of the measurement using the applied scales.

Table 3. Analysis of the questionnaire reliability

	Total (N = 176)	Students before the exam (N = 89)	Students after the exam (N = 59)	Teachers (N = 28)
The whole scale	0.729	0.723	0.645	0.846
Sub-scale I-A (attitudes)	0.892	0.910	0.849	0.900
Sub-scale I-B (attitudes)	0.640	0.612	0.705	0.638
Sub-scale II (disadvantages)	0.819	0.839	0.753	0.790
Sub-scale III (advantages)	0.881	0.895	0.857	0.888

The comparative analysis of the opinions of students and academic teachers at MUW concerning computer-assisted exams showed that only in case of evaluating the disadvantages of such a system (sub-scale II), the attitudes of individual studied groups are significantly different (Table 4). The review of test results of the differences for this sub-scale shows that the group of academic teachers is significantly different in their opinions about the disadvantages with reference to both of the studied groups of students (Table 5).

Table 4. Analysis of differences significance concerning attitudes, advantages and disadvantages

	Mean rank Students before the exam (N = 89)	Mean rank Students after the exam (N = 59)	Mean rank Academic teachers (N = 28)	H	P-value*
Sub-scale I-A (attitudes)	87.101	85.949	98.321	1.257	0.533
Sub-scale I-B (attitudes)	86.758	95.542	79.196	2.176	0.337
Sub-scale II (disadvantages)	90.230	100.161	58.429	12.969	0.002
Sub-scale III (advantages)	81.972	91.932	102.018	3.706	0.157

* non-parametric Kruskal-Wallis ANOVA test

Table 5. Value of „Z" statistics and P-value for the *post hoc* test of multiple comparisons of mean ranges in evaluating the differences for sub-scale II (disadvantages)

	Mean rank Students before the exam R = 90.230	Mean rank Students after the exam R = 100.161	Mean rank Academic teachers R = 58.429
Students before the exam	---	1.161 / P = 0.737	2.881 / P = 0.012
Students after the exam	1.161 / P = 0.737	---	3.569 / P = 0.001
Teachers	2.881 / P = 0.012	3.569 / P = 0.001	---

Table 6. Attitudes of students and teachers at MUW towards testing knowledge using an electronic exam platform

Question	Agree/ Strongly agree			H	P-value*
	Group 1	Group 2	Group 3		
Electronic exams are an effective form of testing knowledge of the students of medicine and health sciences.	25	38	22	5.035	0.081
Electronic exams may have a positive influence on the quality of evaluation	26	38	19	2.320	0.314
Electronic exams may have a positive influence on the quality and efficiency of teaching	23	32	14	3.584	0.167
Electronic examination is practical, safe and reliable.	29	38	18	1.422	0.491
Electronic examination is quick and comfortable	48	68	32	4.267	0.119
Electronic examination enables constructing questions that would not be possible using a traditional form of testing	8	29	15	9.661	0.008
Assessment in electronic examination is fair, accurate and eliminates the possibility of a human error	31	52	16	2.516	0.284
Electronic examination requires of a student additional intellectual effort	29	21	6	13.283	0.001
Students are used to using computers on every day basis, thus taking part in electronic examination will not be a problem for them	35	57	24	4.924	0.085
Electronic examination should be closely connected with e- classes	28	31	11	3.765	0.152
Electronic examination are just a passing fad in testing students knowledge	18	26	6	6.366	0.042
The results of tests should be provided immediately after the exam	44	53	13	5.889	0.053
The results of tests should be announced at a later date, after a complete analysis of all the students' results	15	30	15	0.970	0.616
I think the results of e-tests may be worse	28	30	3	6.531	0.038
I don't accept e-exams in any form	15	35	8	1.550	0.461
Answers to the questions should be provided immediately after each question with no possibility to return to this question, which would positively influence the quality of teaching	7	14	9	5.355	0.069

"Group 1 – group of students who took part in e-exams through the platform (n = 59)
Group 2 - group of students who did not take part in e-exams (n = 89)
Group 3 – group of teachers at MUW (n = 35)
* non-parametric Kruskal-Wallis ANOVA test of ranks

Table 7. Opinions of students and teachers at MUW concerning the disadvantages of e-exams

Question	Agree/ Strongly agree			H	P-value*
	Group 1	Group 2	Group 3		
Applying new technologies in testing students' knowledge	26	37	8	7.069	0.029
Possibility of technical problems in the system while examining students	49	73	24	7.834	0.020
No previous experience of students in participating in e-exams	36	55	13	3.469	0.176
Participating in e-exams increases exam stress	38	31	6	17.689	<0.001
Problems with concentration during reading a text off the computer screen	37	48	9	6.604	0.037
Noise resulting from using the computer keyboard	20	33	7	1.586	0.452
No possibility of taking notes during the exam	26	48	17	2.360	0.307

Randomly selected test questions	28	44	7	11.634	0.003
Using multi-media materials (photos, films, audio materials) in test questions.	21	31	6	9.798	0.008
No possibility to discuss questions after the exam due to their random selection	38	57	18	2.944	0.230
Lower chances of cheating and copying answers during the exam	28	22	18	10.483	0.005

Group 1 – group of students who took part in e-exams through the platform (n = 59)
Group 2 - group of students who did not take part in e-exams (n = 89)
Group 3 – group of teachers at MUW (n = 35)
* non-parametric Kruskal-Wallis ANOVA test of ranks

Table 8. Opinions of students and teachers at MUW concerning advantages of e-exams

Question	Agree/ Strongly agree			H	P-value*
	Grupa 1	Grupa 2	Grupa 3		
Electronic exams make the exams practical	27	35	14	2.256	0.324
Electronic exams are more fair	18	28	14	3.494	0.174
Electronic exams test students' knowledge better than their traditional counterparts	13	22	6	3.642	0.162
Electronic exams assess not only subject knowledge but also computer skills	26	29	11	3.189	0.203
Organising an e-exam increases the chances for a better result	6	27	7	6.891	0.032
There is immediate information on passing or failing a given subject	47	63	25	1.682	0.431
Randlomly selected questions	20	28	27	16.762	<0.001
There is a possibility to change the answer to the question during the exam	52	65	22	4.707	0.095
Using multi-media materials (photos, films, audio materials) in the exam questions	31	52	31	9.367	0.009
Lowers the possibilities of cheating and copying answers during the exam	37	30	23	17.097	<0.001
Shorter exam time	37	44	20	0.545	0.762
Possibility of choosing the date of an exam	40	64	28	0.473	0.789

Group 1 – group of students who took part in e-exams through the platform (n = 59)
Group 2 - group of students who did not take part in e-exams (n = 89)
Group 3 – group of teachers at MUW (n = 35)
* non-parametric Kruskal-Wallis ANOVA test of ranks

Discussion

In the accessible scientific literature (PubMed, Scopus, Embase, ProQuest, key words: *computer based assessment, e-assessment, students of medicine and health sciences, final examinations,* years: 2000-2015, articles in English) several publications concerning opinions of students about participating in computer-assisted exam were found. Such studies were carried out in New Zealand (in 2006, Faculty of Medicine, University of Otago), Great Britain (in 2007, University of Bradford), Saudi Arabia (in 2009, College of Medicine, King Abdulaziz University), Germany (in 2011, Medical Clinic University of Heidelberg), or Pakistan (in 2013, Dow University of Health Sciences International Medical College, Karachi) [10-14].In Polish literature, this subject has not yet been explored except for this publication [15-17]. However, neither in world nor Polish literature has any publication been found that would compare the opinions and attitudes of students and academic teachers towards computer-assisted examining. Which is why this issue is a novelty in Polish scientific literature. In the studied group of students, participation in the electronic exam did not have any significant influence on their opinions and attitudes towards such form of examining. The students presented similar opinions on the subjects, whether they took part in a computer-assisted exam or not. However, the group of students who have already taken part in EE, did confirm that such an exam requires some additional intellectual effort from them, increases exam stress and lowers the chances of cheating and copying their answers during the exam. Moreover, in the opinion of students who have already taken part in EE, the results of such exams that take place through an electronic exam platform may be worse. In the opinion of the authors, slight differences between the compared groups of students show that their idea of EE, usually based on cliché, is compliant with the opinions based on

actual participation of students in EE. Thus, the students' knowledge on organisation and course of EE is vast and this group needs no additional organisational preparation prior to exam proceedings. This is also confirmed by the results of a survey where students claim that they need no special preparation for such a form of examination. That is why, in the Authors' opinion, further part of the study should focus solely on the analysis of how to approach an electronic exam platform and not on the attitudes towards computer-assisted examining.

Opinions of students and academic teachers differed significantly in case of 5 general statements concerning EE. One of the areas of such differences were their opinions on the results of electronic exams. Students were more frequent to claim that the results of EE should be available immediately after the exam and that they might be worse than in case of traditional, pen-and-paper form of the exam.

In the available literature on EE, one of the advantages most frequently emphasised by the students is the immediate result presented to the students. From the standpoint of academic teachers, the issue of assessing a student's performance may be seen slightly differently. So far, the exams at MUW were based on evaluating all students after the exam, the final grades were presented after a detailed analysis of the results of the whole group of students and the threshold was established by the person responsible for the didactics, depending on the general result of the exam and the analysis of such parametres as simplicity and the discriminating power of the whole exam as well as its individual questions. In practice, it often meant that the results of exams were set "to the benefit" of the students, e.g. by lowering the threshold. Immediate information concerning the result of the test requires of the teacher to set the threshold *a priori*, regardless of the students' results and that may result in lowering the overall results. That is why teachers often declare that grades should be presented to the students after the exam has been completed by all of them, which allows the teachers to evaluate the whole group participating in the exam in a given academic year. Students who declare their will to obtain the results immediately after the exam has been taken by them, may often be unaware of the fact that their results may be worse and that such a situation may be to their disadvantage. This is the reason why, in the Authors' opinion, in case of introducing electronic exams at universities, the issue of final grades in the exams should be an individual decision of each academic teacher who would decide to carry out their exam in electronic form. Moreover, the decision concerning setting the threshold in advance requires the necessity of having a pool of good quality exam questions – evaluated and standardised – which is a condition necessary to carry out an electronic exam.

Limitations of The Presented Results of Study

A significant limitation of the presented results of study is a low number of returned surveys in all analysed group of students and academic teachers. In the Authors' opinion, electronic form of the survey could have contributed to the fact of such a low number of returned surveys, however, due to the fact that it concerned electronic examination, the Authors decided to apply this particular form of a questionnaire and in the future studies, the survey will also be carried out in an electronic form. However, the time of carrying out the research will be modified in the future editions and it will be performed immediately after the exam that will take place on an electronic platform. Also promoting activities encouraging academic teachers to complete the survey will be intensified.The presented studies are of pioneering character, however, it is worth noting that the limitation of this study is the fact that independent groups of students not taking part in EE were compared. In consecutive studies, opinions of the same group of students will be analysed before and after electronic exams, which may significantly influence the change of opinion on EE, however, this thesis requires verification in future studies.

Further Directions of Studies

Further surveys on the opinions of students concerning electronic exams will be carried out systematically in all groups of students who will participate in this form of exams. Moreover, initially, these studies will be carried out both before and after taking the exam in its electronic form. Such organisation of the study will allow to obtain reliable feedback from a greater number of students. Additionally, a comparative analysis of the results of the survey before and after the exams may influence the improvement of exam organisation and increasing the quality of electronic testing at MUW.

Conclusions

Due to the fact that students had correct conception of organization of e-exams and positive attitudes towards EE, there is no need of organising special preparation for students regarding computer-aided examinations.

It seems to be essential to develop procedures of grading computer-aided exams even before the introduction of this form of examination. Moreover, it also seems necessary to conduct training for university teachers on possibilities that are provided by the ASK Systems e-exam platform with reference to test exam structuring and phrasing test questions, with particular focus on multimedia elements. Owing to a not numerous and non-representative study group, the present study results may be only of a pilot nature and the study needs to be continued in consecutive years.

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