Reflection on Computer Aided Exams

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Abstract—**The purpose of this paper is to discuss and compare the conventional and "electronic" examination methods used in engineering education, with special focus on the students' view and feedback. Conclusions from a survey are provided and some specific recommendations offered.**

Keywords-computer aided exams; engineering education; Moodle; students' perspective

I. INTRODUCTION

Traditional approach to examinations in engineering subjects usually relies on "pen and paper" – several questions of theoretical or computational nature that are answered by the students in written form and then evaluated and graded by the examiner, for whom it is a demanding and time-consuming activity that can easily become a routine one. On the other hand, it gives the students a chance to demonstrate their good preparation even if the results of the written part are not satisfactory. The written and oral parts may be accompanied by practical tests.

The "modern" alternative is online testing with the help of various software tools and learning management systems (LMS), such as, for example, Moodle. [1] They usually offer several types of questions, including single-choice, multiple-choice, fill-in-the-blank, matching, drag-and-drop, etc. The preparation of these tests should be very careful – the questions (and the answers) must not be ambiguous; the offered answers must be diverse, but not obvious; the questions must be relevant to the topic. When the set of questions for a particular subject is prepared, the work is seemingly done, but it is actually necessary to check it before every exams period, since every year the content of lectures and exercises may vary (due to the development of technology, available time, teachers coming and leaving, and so on).

Online testing can substantially speed the examination procedure up and relieve the teachers in their duties. Unfortunately, certain level of simplification is necessary in the online tests, and therefore they cannot reflect the full range of students' skills and knowledge truly. Also, there is a higher risk of cheating, even in a controlled environment. If there are any doubts, verification (oral part) is still desirable. The real problem is that the simple types of tests (single-choice or multiple-choice questions) allow the students just to memorize the correct answers, but they do not force them to think about the principles and realize the relationships between basic facts.

II. METHODOLOGY

Below we will have a look on the students' opinions about online testing, which is winning more and more popularity every year, and on the summary of classification results in several sample subjects that are taught at the Department of Telecommunication Engineering. The data summarizing the marks in several recent semesters are provided by the study information system of the Faculty of Electrical Engineering. The students' feedback is taken from the online voluntary survey performed regularly after every exams period.

III. FEEDBACK AND RESULTS

A. A1M32TSY – Telecommunication Systems

This subject has been introduced recently, in connection with the redesigned study system at the faculty. The form of teaching is traditional, i.e. standard lectures supplemented with laboratory exercises. The exam consists in a single-choice test in Moodle (physical presence in a controlled environment is required) with automatic evaluation – but corrections are possible if some question is disputable or if a student wants a better mark and convinces the examiner that he/she deserves it.

- "With respect to the strictly given system of evaluation applied to the Moodle tests (checkbox questions), I cannot, in this particular case, say anything about the examiner's personality. I have very positive feelings about this style of examination. There are clearly given rules and the results are available immediately. It would be desirable to introduce it in many similar subjects, mainly when the examiners refuse to respect the classification scale."

- "The format of the exam is relatively good (test with checkbox questions). This is definitely a suitable choice with fast evaluation, students needn't wait uselessly. I do support keeping of this format in the future. It cannot be true, by any means, that students could just check their tips without proper preparation and obtain a good mark. For the coming year I recommend to increase the number of possible answers, not just ABCD."

- "The system of evaluation – regardless of some minor mistakes in organization – definitely belongs to the better ones."
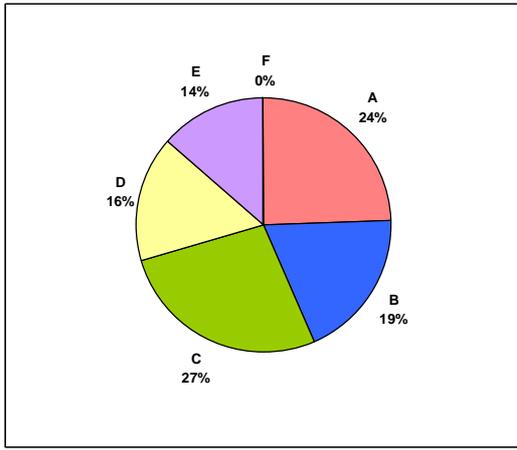
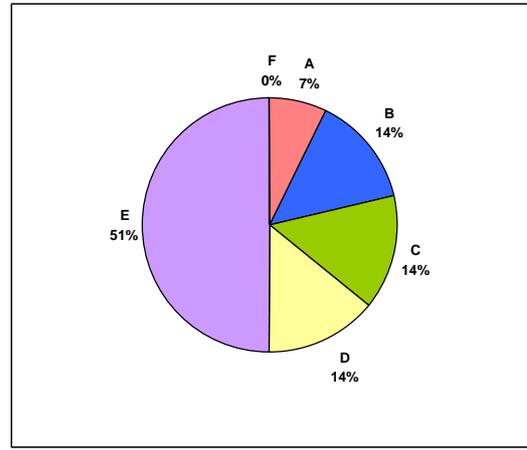Figure 1.   Results of A1M32TSY exams (winter semester 2010/2011)

B.   Y32PKS – Means of Data Communication

This subject is included just for reference. It has similar content as A1M32TSY, but the exam consists in a written test (three questions), and the respective students' answers are evaluated in their presence.
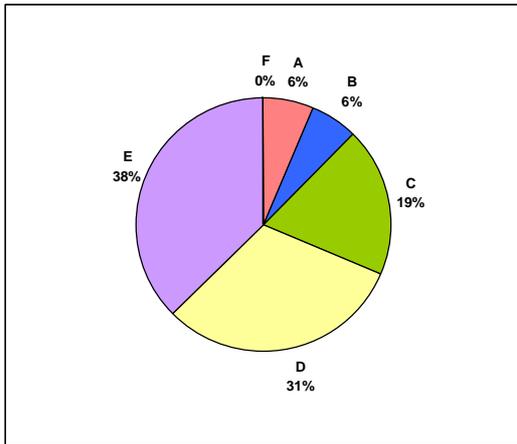

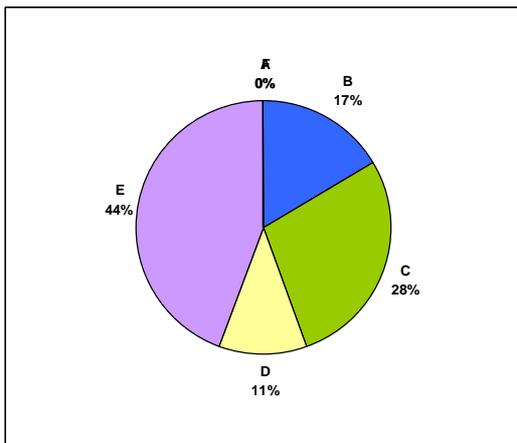Figure 2.   Results of Y32PKS exams (winter semester 2010/2011)

Figure 3.   Results of Y32PKS exams (winter semester 2009/2010)

Figure 4.   Results of Y32PKS exams (winter semester 2008/2009)

C.   X32ODV – Intellectual Property Protection

The subject deals wit IP property issues. It was the first purely e-learning-based (tutored) subject offered by our department – students are provided texts and videos online, and also the exam is done online, in the given time windows.

Most students (more than 90% of all respondents) appreciate the distance (e-learning, homeworking) form that offers them splendid time flexibility.

- "I always knew what was awaiting me. I knew when the new topic was about to be published and I had a whole week to study it. This is what I would welcome also in other subjects. No stress with deadlines, but meeting the given requirements."

- "Some testing questions should be elaborated – e.g. there was a question, which was actually missing, and only the offered answers were displayed."

- "When there is a discussion forum, it should be regularly checked by someone, in order to avoid such situations as missing question in the test. If the test was a normal one, the devil take it, but when such question appears in a graded test, it's really a matter of consequence…"

- "Occasional mistakes in the tests."

- "This subject was really ridiculous. Trash Moodle and teach it normally. Also, the questions in test should be thoroughly remade."

- "Hold e.g. one introductory lecture and keep the rest in the e-learning form."

- "For me, the exam was really an exam, I did not have the responses from my fellow students available, but the system can be probably misused. If it can be – in the future – arranged somehow that the students would have to pass the exam for themselves, without any chance to have the responses of their colleagues displayed in another window, it will be a fantastic way of studying."
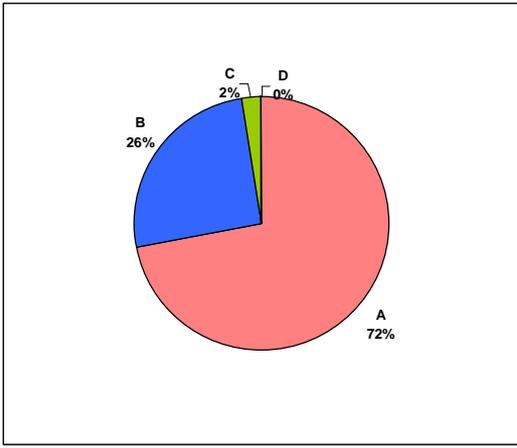
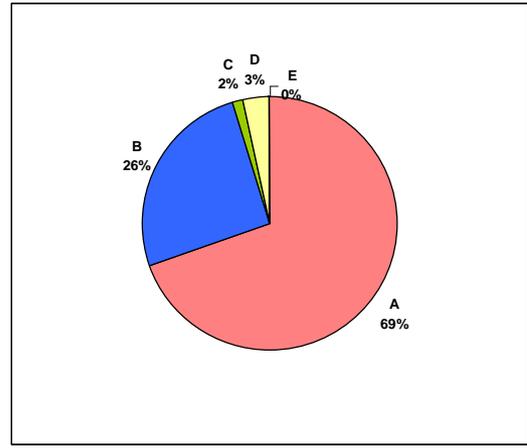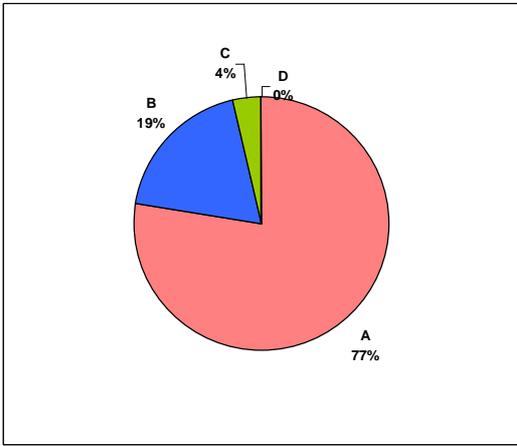Figure 5.   Results of X32ODV exams (winter semester 2010/2011)

Figure 6.   Results of X32ODV exams (summer semester 2009/2010)

It might be interesting what difference we can see in the following two graphs comparing the results achieved one year ago by students of the full-time (regular) form and of the distance one. It is also interesting that the latter is very similar to the results of full-time students who have passed the exam in the current academic year.
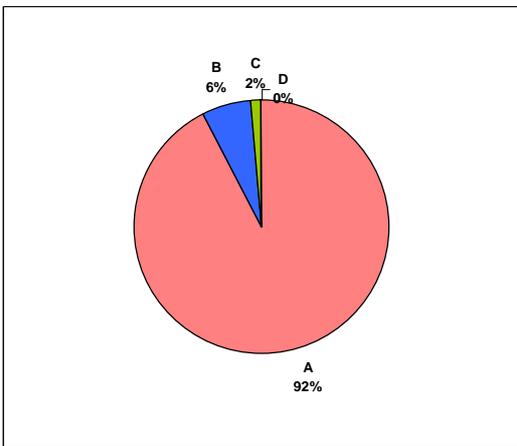

Figure 7.   Results of X32ODV exams (winter semester 2009/2010, regular)

Figure 8.   Results of X32ODV exams (winter semester 2009/2010, distance)

D.   X37ZKT – Fundamentals of Communication Technology

This subject represents the "old-fashioned" group. It is provided by two departments, and the exams are performed in the traditional form of a written test consisting of six questions and subsequent discussion with both examiners.
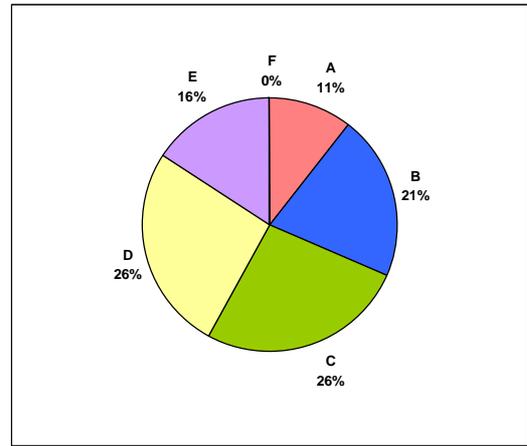

Figure 9.   Results of X37ZKT exams (winter semester 2010/2011)
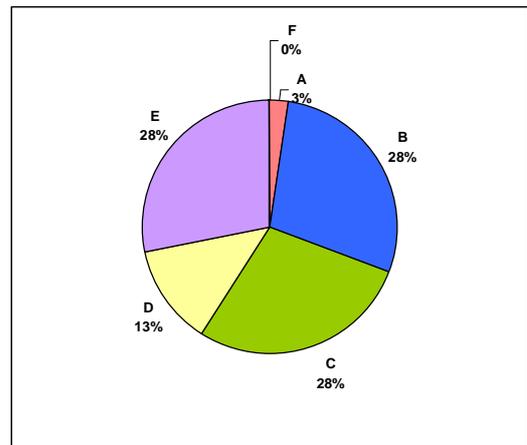

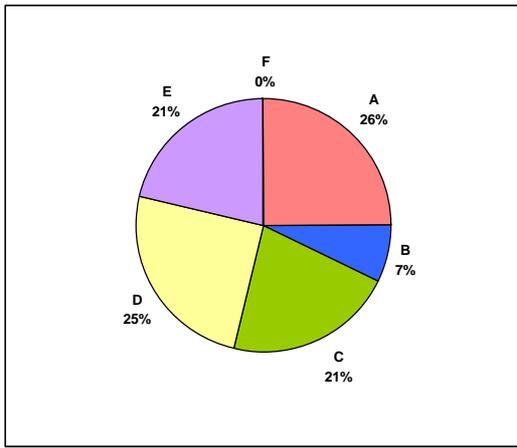Figure 10. Results of X37ZKT exams (winter semester 2009/2010)

Figure 11. Results of X37ZKT exams (winter semester 2008/2009)

It is interesting that the sum of percentages representing the marks "A" to "C" has been almost identical during the recent three academic years. This could be interpreted positively, i.e. that the overall acceptable level of knowledge is remaining constant, but also in much more pessimistic way, i.e. that the requirements have been lowered.

E. A0M32PRD – Data Communication Means

Exams have the form of online test in Moodle (physical presence of students in the computer laboratory is required). This is an example of reaction to the selection of testing questions, which should be paid adequate attention during the process of their preparation.

- "I think that the testing questions were somewhat… I wonder whether asking for the year when the Viterbi algorithm was invented is something really necessary. Okay, it can be mentioned in the lectures, but I guess that it does not make sense in the test – and there was a bunch of such questions."

IV. CONCLUSIONS

As we can observe from the statistics and from the feedback, the online form of examination is quite popular with students, and also the ratio of good marks is higher than in the case of comparable subjects. It is just necessary to pay enough attention to the preparation of questions (and the offered answers) for the online tests; any mistake introduces unnecessary problems, and the students' criticism is usually trenchant and without mercy.

The results in the online subject are almost extremely good, which brings us to a logical question what the reason can be. The level of the subject is definitely not too low. Perhaps the results reflect the fact that the content is not purely technical one (it touches legal and legislation issues), and therefore it is easier to learn. We can also think about the style of the final test and the difficulty of the questions. However, we have to admit that the temptation to cheat may be simply too strong when the credits are cheap and good marks right at hand. Even in the controlled environment of a computer laboratory it might be possible to look for information on the web (sometimes it is complicated to set the proper policies restricting the access to other servers than those hosting the LMS; on the other hand, it is quite easy to limit the range of allowed IP addresses for client computers only to the laboratory, which means that it is virtually impossible to let someone outside the room to act for the examined students).

Different subjects feature different structure of results. Major influence may be ascribed to the differences in priorities of students in different study programs and forms (to achieve exceptional marks / just to pass the exams somehow, focusing on the study in the full-time form / preferring the business or occupation in the distance form). As for the specific years, there is, unfortunately, an apparent downward trend

REFERENCES

[1]   Moodle homepage at http://moddle.org