EFFECTIVE ONLINE TESTING
Nurturing the Digital Natives

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Abstract: This paper aims to take a glance at a flexible solution for online-testing at the Alpen-Adria-Universität Klagenfurt (AAUK). We will present a recently implemented software that allows students to conduct their exams online and directly on their own devices, while at the same time preventing them accessing locally stored files or non-specified internet pages. A survey among the participating students showed that the general attitude of students is very positive. Especially among lecturers the demand for the secure exam environment (SEE) on their courses has increased tremendously. For the future we plan to further develop the secure exam environment and we intend to use larger lecture halls i.e. for synchronous online testing of approximately 250 students.

1 INTRODUCTION

The various problems connected with the testing of knowledge are known: standardized tests run the risk of only testing "superficial" knowledge, whereas free-text or face-to-face tests are criticised for not being objective enough (whether or not the teacher is aware of this fact). In order to provide an efficient and transparent process, more and more online tests are applied in a multi-faceted way at the University of Klagenfurt (AAUK). Currently, fully standardised tests, mixed test forms with standardised and free-text questions, solely free-test questions as well as tests incorporating specific software tools e.g. spread sheet programs and online tests for writing literary essays, are in use.

In general, other advantages are connected with online-exams: they are much more efficient to carry out, create automated feedback to standardized questions and facilitate the readability of free-text answers. Also the reusability of questions gives back time resources that can be used for areas of teaching requiring face-to-face contact. Furthermore, Austrian students usually do not make use of their right to inspect the results of their exams by personally contacting the lecturer and therefore they do not receive potentially valuable feedback. However, if the feedback is available online, our experience shows that nearly all students use the possibility to inspect their exam online (see Frankl, Scharter and Zebedin 2011a).

Using up-to-date teaching methods is an essential concern of our university and contemporary teaching requires also up-to-date testing and examining methods. Therefore, the e-learning department of the AAUK developed the "secure exam environment" (SEE) in cooperation with the System Security Group of the AAUK.

2 LARGE SCALE ONLINE TESTING

One possibility for conducting online exams is in computer rooms. However, they are in most cases much too small. Where there are large enough computer rooms, these are usually very costly and therefore not economically viable. Additionally, maintenance of these rooms is necessary, single computers cannot work and it is also very laborious to install the specially required software tools. Hence, the SEE is based on the usage of existing students' resources. An evident advantage is the flexibility of the SEE, as it can be used on a grand scale. Another advantage for the students is that they can use their own devices, which they are used to, which is probably a benefit especially in an exam

situation where they may be stressed and nervous.

Certainly, when using the technical resources of the students, loan devices are offered in case of technical problems or for those students who do not own a mobile device.

Nevertheless, despite the obvious advantages there is one major pitfall with using student's devices, namely that students have access to their local files, to the internet and therefore also to communication tools. Thus, we developed the "Secure Exam Environment" (SEE).

3 THE SECURE EXAM ENVIRONMENT (SEE)

Without a doubt, online applications and exams both come with massive security issues (see Weippl 2005, Bartram and Hambleton 2008, and Scheuermann and Björnsson 2009, pp. 84). However, the secure exam environment can hinder the issue of cheating.

3.1 Security

Since KNOPPIX is said to be the Linux-distribution with the broadest hardware support, a knoppix boot system (www.knopper.net/knoppix/index-en.html) was developed to meet the requirement that there would be no access to students' own files and data as well as to Internet addresses and links. The students boot the SEE from a flash drive or a DVD. Corresponding firewall rules restrict the access to external (online) resources. The only internet resource that can be accessed from the SEE is the server of the e-learning-platform Moodle (http://moodle.com). As Moodle also provides chatting capabilities and (in most cases) course related material, we integrated the Safe Exam Browser (SEB – see www.safeexambrowser.org/ news_en.html for details), an open source project supported by the University Giessen and the ETH Zurich, into Moodle-core 1.9.4. The SEB restricts the access to the exam page only. Since the SEB is only available for Windows XP, Windows 7 and MAC OS X, we have to run a minimized WindowsXP that provides exactly the necessary programs in a virtual machine (www.virtualbox.org) on the KNOPPIX system (see Fig. 1 for a sketch of the system). (see Frankl, Scharter and Zebedin 2011a and b).

After booting from USB or DVD, KNOPPIX automatically starts the WindowsXP-Virtual Machine, then Windows XP automatically starts the
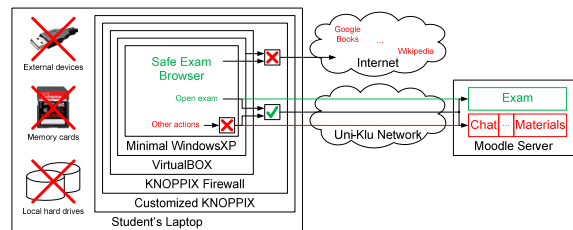

Figure 1: The operating principle of SEE (see Frankl, Schartner and Zebedin 2011a).

SEB that automatically connects to the homepage of Moodle. The students login into Moodle and select the appropriate course and access the exam.

In order to make it work, the respective browser security settings have to be chosen when setting up the Moodle test. To guarantee that only students who are present in person can access the online-exam, the network address of the lecture hall has to be entered in the designated field in the quiz security settings.

3.2 Safety and Privacy

Electronic exam environments massively depend on the availability of (information) technology. During an online exam our system relies on the online connection between the SEB and the Moodle Server.

In order to provide the maximum availability of the network connection we only use cat5-wired LAN at this time. However, LAN also doesn't guarantee a 100 % stable connection.

Hardware failures of laptops are not such a problem, since students can continue the exam on one of our loan-devices.

The answers provided by the students and the grades achieved relate specifically to individual students and hence according to the Austrian Data protection act (see Republic of Austria 2009) their privacy has to be protected. We use encrypted and authenticated transmission lines between the SEB and the Moodle server (HTTPS), and the Moodle server uses login/password-authentication for the students and the lecturers and grants access to authorized persons only. Hence, we can guarantee the privacy of exam data (see Frankl, Scharter and Zebedin 2011a and b)

3.3 Organisational Aspects

During our first testruns we encountered network timeout errors. After debugging we discovered a misconfiguration in the DHCP settings assigned to the lecture hall used for exams. The DHCP lifetime was set to 120 minutes, which led to network

timeouts and connection losses between the SEB and the moodle server. Such organisational aspects have to be mentioned.

Furthermore, the lecturers are supported by e-tutors of the e-learning department of the university to properly set up their online-exams. **Moreover** the students have to be informed in due time before the exam about the action chain for the online-exam. The e-learning department of the AAUK offers checklists for students and lecturers.

The implementation and execution of online exams requires a certain amount of time. Therefore, an efficient and well-planned organisation is vital.

4 STUDENTS' FEEDBACK

By the end of February 2012, we had conducted 40 online exams with the SEE. The online tests were a mix of pure single or multiple choice questions, other standardised question types, free-text answers, or – in one case - even group work using explicitly allowed materials.

The courses come from the area of business administration, information science, mathematics, geography, media and communication science, English and American studies, German language and literature studies as well as from educational studies.

Students, who used the SEE for their final exams, were asked to give feedback after the online-exam in their respective Moodle course.

In total 965 students participated in the online-exams. 274 students (28,4 %) submitted their feedback.

The students were asked for their assessment of the online exam and given the following options for their answers: very negative / negative / positive / very positive. 26 % of the students evaluated online exams in general as "very positive", 56.8 % as "positive, 15 % as "negative" and 2.2 % of the students considered as "very negative" (see Fig. 2).
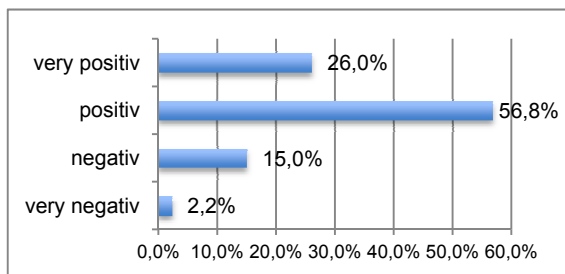

Figure 2: Students' attitude about online exams.

Students were also asked about advantages and disadvantages of online exams and provided a variety of wide ranging answers to these open questions. Fig. 3 shows the main advantages from the students' point of view.
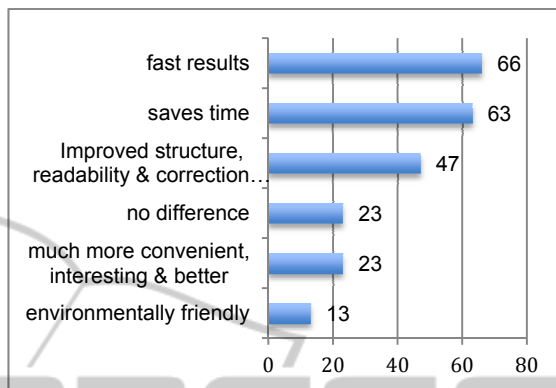

Figure 3: Advantages of online exams from the students' point of view.

The most frequently mentioned disadvantages - from a student perspective – are summarised in Fig. 4.
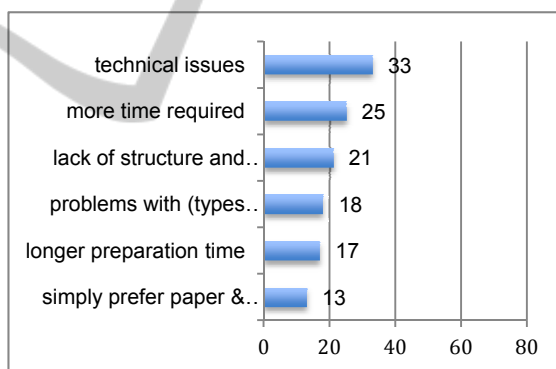

Figure 4: Disadvantages of online exams from the students' point of view.

5 ON-GOING PROBLEMS AND FUTURE WORK

The demand from lecturers to use this method of online-examination is extremely high. Due to the various requirements of the lecturers, the present Moodle-question types and multiple-choice evaluation options do not exactly meet all the needs of our lecturers. There is room for improvement to enlarge the testing-possibilities.

Additionally, it has to be highlighted that the requirements for the SEE are an electrical socket and

network access at each and every seat in the lecture hall. At the moment, there are only a limited number of lecture halls that offer these prerequisites. Hence restructuring work will take place in order to install the necessary technical equipment in the larger lecture halls (for synchronous online testing of approximately 250 students). Furthermore, the SEE will be adapted to the new performance requirements. In addition, a flexible registration system will be developed. Students will not in the future be dependent anymore on a fixed exam date, but can conduct their exam within a stipulated testing period. The online exam will then be generated out of a large enough question pool in real-time for each and every student.

6 OUTLOOK

In many disciplines traditional methods for performance assessment are, in terms of didactics completely inappropriate. However, the classical testing is in many cases much better than its reputation. Sometimes it is necessary to study hard facts and to test these. In these situations classical knowledge appraisals are appropriate. However, some guidelines on creating useful and high quality multiple-choice questions were developed by August Fenk from the AAUK and is available for lecturers.

If classical exam methods are managed and supported electronically, time is saved for those areas of teaching that require face-to-face contact, a lot of time and that currently students miss out on, such as in-depth discussions, reflections, oral exams, or if applicable, extra coaching in these areas.

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