ZMML Zentrum für Multimedia in der Lehre

How to organise computer based examinations in mass education?

Experiences and guidelines



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Nasjonal konferanse for automatiserte tester 29.-30.mai i Trondheim

Background at the University of Bremen

- 12 faculties with 23.000 students and appr. 70.000 exams/semester, actually 5000 exams/semester in business science only
- Increasing number of exams due to the shift to BA/MA-studies
- Introduction of aptitude and placement tests
- But: Decreasing manpower within the faculties

Pressure to rationalize examination procedures





The eExamination Project

Aim:

Creation of a campus-wide eLearning service for computer based assessment

Actions:

Investigation and evaluation of technical, organisational and didactical implications of computer based examinations

Current status:

Pilot phase finished, now transfer of experiences from business science to other faculties



eExaminations at the University of Bremen (December 2004 – April 2006)

- 14 examinations
 (11 in business science, 3 in educational science)
- 5669 registered students
 (Ø 405 candidates per exam, range 47 962)
- Mean capacity was only 20 PCs / room (range 10-54)

Ø 24 repetitions/exam (range 5-64), up to:
 7 rooms in parallel and 6 time slots/day
 very high investment in organisation



Example of an e-examination schedule

| day | Slot | BIBA1 | BIBA2 | MZH1 | MZH2 | MZH3 | MIWI | GW2 |
|----------|-------------|-------|-------|------|------|------|------|-----|
| 16.02.05 | 08:00-10:00 | ٠ | ٠ | ٠ | • | • | | |
| | 10:30-12:30 | • | • | • | • | • | | |
| | 13:00-15:00 | ٠ | ٠ | ٠ | ٠ | ٠ | | |
| | 15:30-17:30 | • | • | • | • | • | | |
| | | | | | | | | |
| 18.02.05 | 09:00-10:30 | • | • | • | • | • | • | • |
| | 11:00-12:30 | ٠ | • | • | ٠ | ٠ | • | • |
| | 13:00-14:30 | • | • | • | • | • | • | • |
| | 15:00-16:30 | • | • | • | • | • | • | |
| | 17:00-18:30 | • | • | • | • | • | • | |
| | 18:00-19:30 | | | | • | • | | |
| | | | | | | | | |
| 21.02.05 | 08:00-10:00 | | • | | ٠ | | • | • |
| | 10:30-12:30 | | • | | • | | • | • |
| | 13:00-15:00 | | • | • | | | • | • |
| | 15:30-17:30 | | • | • | | | • | • |
| | 18:00-20:00 | | • | • | | | • | • |

| day | Slot | BIBA1 | BIBA2 | MZH1 | MZH2 | 8HZM | IMIM | GW2 |
|----------|-------------|-------|--------------|------|------|------|------|-----|
| 22.02.05 | 08:00-10:00 | | • | | • | | • | • |
| | 10:30-12:30 | | • | | • | | ٠ | • |
| | 13:00-15:00 | | • | • | | | • | • |
| | 15:30-17:30 | | • | • | | | • | • |
| | | | | | | | | |
| 23.02.05 | 08:00-10:00 | | • | | • | | | |
| | 10:30-12:30 | | • | | • | | | |
| | 13:00-15:00 | | • | • | | | | |
| | 15:30-17:30 | | • | ٠ | | | | |
| | | | | | | | | |
| 24.02.05 | 15:00-16:30 | | • | | | | | |

2 courses 1500 candidates 100 repetitions





Why e-Examinations? Advantages for students

enhanced management of studies due to instant feedback on examination result

higher grade of objectivity

elaborated feedback

transparency and effective preparation for exams





Why e-Examinations? Advantages for the university

- Rationalization of selection of students and of placement tests
- Reduced costs
- Support of the administration by an effective and integrated management of examinations



Pro argument: More efficient administration Integration of e-examinations







Why e-Examinations? Advantages for teachers

- reduced work load
- elaborated feedback on teaching success
- e-assessments (self-assessments, mock exams, final exams) as part of the didactical concept in eLearning
- enhanced audit quality management
- re-usability of question catalogues
- collaborative production of catalogues



Pro argument: Reduced expenditure of human labour Comparison of work load (1)

| | Exam parameters | Written | eExam 1 | eExam 2 |
|---|--------------------------------------|---------|---------|---------|
| | Number of questions / catalogue | 60 | 240 | 240 |
| | Production time/question (h) | 0,5 | 1 | 1 |
| | Development of catalogue (h) | 30 | 240 | 240 |
| | Reuses of catalogue | 1 | 3 | 3 |
| 1 | Mean Development time/season (h) | 30 | 80 | 80 |
| 2 | Preparation of exam (h) | 8 | 32 | 32 |
| | Registrations | 400 | 400 | 400 |
| | Places/room | 200 | 20 | 120 |
| | Duration of single exam (h) | 2,0 | 2,0 | 2,0 |
| | Repetitions needed | 2 | 20 | 4 |
| | Observers/exam | 2 | 2 | 2 |
| | Working hours of observers (h) | 8 | 80 | 16 |
| | IT-staff needed during exam | 0 | 1 | 1 |
| | Working hours of IT-staff (h) | 0 | 40 | 8 |
| 3 | Working hours for exam | 8 | 120 | 24 |
| | Time need for scoring (min/question) | 0,5 | 0 | 0 |
| 4 | Time need for scoring (h/exam) | 200 | 0 | 0 |
| | Mean time consumption (h) | 246 | 232 | 136 |
| | Mean time consumption in Days | 31 | 29 | 17 |



Excel-Experiment



Pro argument: Reduced expenditure of human labour Comparison of work load (2)



























Support material provided by the ZMML

- Excel-sheet for costbenefit analysis
- Templates (question types, excel-sheets, ...)
- Protocols and troubleshooting-list
- Contingency-plans
- Checklists for all stakeholders

Checklist for supervisors

- 1. Start
- Login with user
- Check function of mouse, keyboard and screeen
- Deactivate image icons, virus scan and screen saver
- Distribute exam paper and manual
- 2. Instruction
- Exam regulation:
- Explain login procedure
- Interpretation Technical hints
- 3. End
- Log out
- Activate alarm control
- ⊻



Organisation of e-exams: Work packages





Example WP3: Question catalogues

🗌 eLearning-service 📕 eExam Commissioner 📃 Editor 📰 Author







Example WP4: Preparation of exam





Controlling of eExaminations

| GANTT Project | | | Oktober 2005 | | | N | November 2005 | | | | Dezember 2005 | | | Januar 2006 | | | | | Februar 2006 | | | März 2008 | | | | | | |
|--|----------|----------|--------------|----------|--------|----------|---------------|-----------|------|----|---------------|------|-------|-------------|----|----|--------|--------|--------------|----------------|-------|-----------|----------------|------|--------|--------|-------|-----|
| Vorgang | Anfang | Ende | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 4 | 19 | 50 | 51 | 52 | 1 | 2 | з | 4 | 5 | 6 | | 7 | 8 | 9 | 10 | |
| AP1: Raumbuchung + Aufsichtsplanung | 18.10.05 | 25.01.06 | [99 | Tag(e)] | | <u> </u> | | | | | | | | | | | | | | Á. | | | | | | | | |
| AP2: Anmeldung | 15.12.05 | 24.02.06 | | | | | | | | | | [71] | Tag(e | | | | | | | | | | | | _ | | | |
| AP3: Katalogerstellung und Qualitätskontrolle | 26.10.05 | 17.02.06 | | [114 | Tag(e |)] 💻 | | | | | | | | | | | | | | | | | | _ | | | | |
| Beratung der Autoren / Schulung der Editoren | 26.10.05 | 27.10.05 | | | | + | | | | | | | | | | | | | | | | | | | | | | |
| Festlegung und Kontrolle der Deadlines | 26.10.05 | 17.02.06 | | [114 | Tag(e | 01 🗖 | | | | | | | | | | | | | | | | | | | EKB | | | |
| Erstellung/Bereitstellung von Templates für Fragenvorlagen | 27.10.05 | 04.11.05 | | [8 | 8 Tagi | (e)] | | h ED | | | | | | | | | | | | | | | | | | | | |
| Erstellung von Fragenvorlagen | 04.11.05 | 03.01.06 | | | | 60 Tag | g(e)] | | | | | | | | | | AU | | | | | | | | | | | |
| Umsetzung der Vorlagen im TM-Editor | 14.11.05 | 13.01.06 | | | | | [6 | iO Tag(e) |)] 📃 | | | | | | | | | 1 | ED | | | | | | | | | |
| Überprüfung Fragen/Bewertung im TM-Editor | 13.01.06 | 24.01.06 | | | | | | | | | | | | | | [| 11 Tag | (e)] [| | հ Բ | D,AU | | | | | | | |
| Upload der vorläufigen Katalogversion | 24.01.06 | 25.01.06 | | | | | | | | | | | | | | | | | | 4 | | | | | | | | |
| Überprüfung Fragen/Bewertung/Raster im LTC | 25.01.06 | 29.01.06 | | | | | | | | | | | | | | | | [| 4 Tag(e | 1 | hε | D,AU | | | | | | |
| Revision des Fragenkataloges | 29.01.06 | 01.02.06 | | | | | | | | | | | | | | | | | [ЗТ | a g(e)) | i È. | ED | | | | | | |
| Upload der entgültigen Katalogversion | 01.02.06 | 02.02.06 | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| Endabnahme der Prüfung | 02.02.06 | 03.02.06 | | | | | | | | | | | | | | | | | | | | Ī | | | | | | |
| Funktionstests in den Prüfungsräumen | 14.02.06 | 16.02.06 | | | | | | | | | | | | | | | | | | | | [2 Ta | g(e)] | | ED,PC- | Pool A | dmin, | EKB |
| AP4: Prüfungsvorbereitung | | | [12 | O Tag(e) |] | | | | | | | | | | | | | | | | | | | - | | | | |
| Vorgang : AP4: Prüfungsvorbereitung | 19.10.05 | 20.10.05 | | | • | | | | | | | | | | | | | | | | | | | | | | | |
| Vereinbarung von Terminen für Funktionstests | 22.10.05 | 23.10.05 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Abgleich der IP-Angaben mit den PC-Pool Admins | 23.01.06 | 27.01.06 | | | | | | | | | | | | | | | | [4 | Tag(e)] | | PC- | Pool A | .dmin | ЕКВ, | | | | |
| Eingabe der Prüfungs- und Raumdaten in das LTC | 27.01.06 | 28.01.06 | | | | | | | | | | | | | | | | | | | • | | | | | | | |
| Organisation und Durchführung des Vorbereitungstreffens | 30.01.06 | 03.02.06 | | | | | | | | | | | | | | | | | [4 | Tag(e) |)] 📃 | ED | ,екр | ,AU | | | | |
| Upload der finalen TN-Liste in das LTC | 11.02.06 | 12.02.06 | | | | | | | | | | | | | | | | | | | | | - \ | | | | | |
| Abschließende Kontrolle aller Daten im LTC | 12.02.06 | 13.02.06 | | | | | | | | | | | | | | | | | | | | | • | 1 | | | | |
| Finaler Zugangstest mit Studierendendaten | 13.02.06 | 14.02.06 | | | | | | | | | | | | | | | | | | | | | | ł | | | | |
| Ausdruck der Unterschriftenlisten | 22.01.06 | 23.01.06 | | | | | | | | | | | | | | | | | | | | | 1 | | | | | |
| Übermittlung der Klausurmaterialien | 07.02.06 | 08.02.06 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Übermittlung der Hinweiszettel | 07.02.06 | 08.02.06 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zusammenstellen der Klausurpakete | 08.02.06 | 14.02.06 | | | | | | | | | | | | | | | | | | | [6 Ta | g(e)] | | FB | -V | | | |
| Abholung der Klausurpakete durch AF | 15.02.06 | 16.02.06 | | | | | | | | | | | | | | | | | | | | | | | | | | |



Take-home Messages

- Reduction of work load becomes true with
 - high number of candidates/exam (> 300)
 - sufficient number of PCs/room (> 50)
 - (otherwise) long duration for correction (≥ 30sec/question)
 - short exams (\leq 2h) with many questions (> 50)
- Go for a professional operated testcenter!
 - Dramatical reduction of working hours for supervision
 - Higher security and safety, autonomous LAN
 - Easier and faster workflows for subscription, scheduling and technical preparation
 - Fascilitation of innovative examination procedures





Thanks for your attention!

www.zmml.uni-bremen.de/tagung

Congress: Computergestützte Prüfungen: Praxisbeispiele und Konzepte (Computer based examinations: Examples and Strategies) 21.11.2005, ZMML - University of Bremen

