ENHANCING FEEDBACK THROUGH ELECTRONIC EXAMINING

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Abstract

Electronic exams taken in specifically equipped electronic exam rooms are growing in popularity in Finnish Higher Education. The systems used for the purpose are provided with the essay question type which requires manual grading, and on the other hand provides the teacher with the opportunity to give students individual, written feedback. When log data from the system used at the University of Helsinki was analysed, the results indicate that teachers do provide their students with individual comments on their submissions. On the other hand, some of the comments could not be defined as feedback in the pedagogical sense. Interviewed teachers perceived that the electronic examining process in whole provided added values for themselves and their students as the eased and flowing process, and as the increased opportunity to give and receive feedback for the exam response.

Keywords: electronic examining, exam room, essay, assessment, teacher perspective, feedback.

1   THE CONTEXT

The context of this study is electronic examining in electronic exam rooms. In this section, the context is described.

1.1   Exams in constructively aligned teaching

In a constructively aligned teaching process, the learning goals should be designed first, after which all the assessment and learning methods should be selected in such a way that they support students in reaching the designed goals [1][2][3]. An exam situation can be defined as "an on purpose created problem situation included in education" of which the student has to manage with her knowledge [4]. As part of course assessment methods, exams should support reaching the selected learning goals and be learning situations, instead of testing knowledge [3]. Therefore, feedback should be provided on exams. The feedback provided by the teacher for the exam response should be related to the individual response as well as the task at hand, and reflect on the performance in relation to the learning context [3]. Ideally, the exam response could be a start for a short, reflective discussion between the teacher and the student, and the student could also respond to the received feedback.

In the traditional pen and paper exam process, there are two challenges relative to constructive alignment. Firstly, producing the exam response is typically not aligned with the modern learning activities during the course. Nowadays the learning activities are at least partly online, and students are more used to writing on computer than by hand. The writing process with computer allows editing and restructuring with copy-paste, while on paper the student must make a more thorough plan of her answer before writing it down. In this respect, all the course activities aim at other goals than are needed in the exam situation. Secondly, the paper exam process does not include systematic ways for the teacher to give constructive feedback on the student's response. Students should be active and contact the teacher by email or in person, which often makes the threshold too high for the student. Therefore, feedback on exams is often insufficient [3].

1.2   Electronic examining

Electronic examining refers to an exam situation where the student produces her answer with a computer, and most typically also online via a network connection. When investigating on different electronic exam situations via temporal and spatial dimensions, there are four main types of electronic exams [6]: When the time and place of the exam situation are defined by the organization, the electronic exams are either called computer classroom exams or Bring your own device (BYOD) exams. If the time is restricted but not the place, the exams are online exams. When the exam room is always the same but the students can select when to take the exam, the exams are called electronic exam room exams. Finally, if the time and place are both free within a time period, then you can call the exams online exam

periods – or not exams at all, but instead online assignments. The electronic exam types are illustrated in Table 1.

Table 1. Electronic exams in time and space [6].

		Is the physical space restricted?	
		Yes	No
Is the exam time restricted?	Yes	• Exams in computer classrooms • Bring Your Own Device exams	• Online exams
	No	• Electronic exam room exams	• Online assignments

All types of electronic exams can be provided with automatically assessed question types, such as multiple-choice questions, or manually assessed essay questions. In Finland, most universities provide a variety of opportunities for electronic exams. In the overall scope of electronic exams, essay questions with unstructured problems are widely used.

The restriction of the physical space refers to the need of invigilation. The computer classroom exams and BYOD-exams are traditionally invigilated, while in electronic exam room exams video monitoring is used. The requirement for invigilation comes from the need to identify the student, or from the need to provide closed-book exams, where no material is allowed. If there is no need for invigilation, the exam is an open-book exam, and online exams are used. If the exam is a closed-book exam, the electronic exam room exam can be used. Additionally, online assignments with as well automatically as manually assessed question types are widely used. This study is focused on exams taken in electronic exam rooms.

The challenges of pen and paper exams in constructive alignment can be solved with electronic exams. The student writes the response on computer, and is thereby able to edit and restructure the response [6]. The students perceive even that they can produce better exam responses when they are allowed to use the computer. Additionally, the systems used for electronic examining support the teacher in producing and submitting systematic feedback to the students.

1.3   The system used for the electronic exam room examining process

The concept of providing electronic exams in electronic exam rooms requires two systems:

1. the examining system
2. the exam video monitoring system

The examining system is a system designed and implemented specifically for the purpose. Web-based learning environments such as Moodle, though widely used in Finland, do not provide all features needed for the process.

Firstly, the administrator provides the framework for electronic exams, i.e. all the classrooms and computers with their individual IP addresses are added in the system. In addition, the opening hours for each room are included. Secondly, the teacher creates the exam with all the basic information, such as exam name, duration in hours, and the exam period in calendar days. Finally, all the questions are included in the exam's question bank with defined rules for question draw. The system provides only the essay question type with manual grading.

After the preparations, the system is ready for the students to book times for their exams. The booking calendars is also provided in the system. The teacher receives an automatic email message each time a student books a time. In this way, the teacher can be aware of students' examining schedules and can plan her own part of the process, i.e. be prepared for assessment.

The students are able to take the exam only during the booked time at the specific computer. If the student logs in at wrong computer, the system provides instructions for changing to the right computer. When the student enters the exam room, the video monitoring turns automatically on, and the building janitors are able to see the live stream. The exam situation is also recorded so that the teacher is able to watch the exam situation afterwards, if there is a reason to suspect cheating or other issues.

When the student has submitted the response, the teacher receives an automatic email message. The user interfaces for the assessment part is very simple and easy-to-use, as is the whole system. All questions and responses are printed in one view. The teacher can grade each question on scales with whole numbers. The whole exam is graded on the European 0-5 scale or the Passed / Failed scale. In

addition, the assessment may include optional written feedback written in a text area. The quality and quantity of this written feedback is in the focus of this study. Finally, when the teacher is ready with the assessment, she saves it, after which the student receives an automatic email message with the grade and feedback.

2 GOALS AND METHODS OF THE STUDY

University of Helsinki is a multidisciplinary university with nearly 40.000 students. It has been providing the concept of electronic exam rooms in small scale for over ten years. The currently used system for electronic exam room exams has been used since 2007. The concept has been used in individual faculties for years, and additional faculties have taken the concept into use within the previous academic year. Especially, disciplines with courses consisting of only book exams are interested in the concept. Typically, closed-book exams are provided, but also exams with law books allowed are included.

The concept of electronic exam room examining provides pedagogical added values for students [6] followed by the flexibility in time, and the opportunity to write the answer on a computer. This study, however, focuses on the pedagogical aspect of providing students with feedback on the exam response. In traditional pen and paper exams in Finnish Higher Education, the student writes the answer, returns the paper and receives the grade typically without meeting the teacher at all, and without receiving feedback except the grade in the Student Information System (SIS). One of the pedagogical goals in increasing electronic examining at the University of Helsinki is to increase providing feedback on exams.

The overall research question for the study is: How does the electronic exam process (in the electronic exam room case) enhance providing feedback on the submissions? The question was split to sub-questions:

1. How typical is it for teachers to write feedback, and how long feedback do teachers write?
2. What types of contents do teachers include in the written feedback?
3. Are there and what are the perceived pedagogical added values of the electronic exam room examining process compared with the traditional pen and paper exam?

To find out answers to the research questions, system log data was used, focusing on the given feedback. Additionally, two teachers who have provided their exams in the electronic exam room have been interviewed to find out how the process has affected the examining process in whole and the interaction between the student and the teacher. The interviews were transcribed verbatim.

The system log data used for research questions 1-2 comes from the time period 2007-2015. Interviews were used for research questions 2-3. The overall numbers illustrating electronic exam usage are listed in Table 2.

Table 2. Basic figures illustrating the electronic exam room usage 2007-2015.

Illustrating figure	Number
Number of graded exams between January 2007 and March 2015	3335
Number of teachers	106
Number of graded exams per teacher	1-322
Median of graded exams per teacher	11
Average of graded exams per teacher	32

The collected data was analyzed using Microsoft Excel. The log data was analyzed using descriptive statistics [7], and the feedback texts were categorized into elements and categories of feedback, and the numbers of instances were counted [8]. The author made the categorization independently. Quotes presented in the Results section were translated from Finnish to English.

3 RESULTS

In this section, the results are presented in subsections numbered by research questions.

3.1 Written feedback in numbers

When investigating on the time period from January 2007 to March 2015, there were in total 3335 taken exams in the electronic exam system, for which teachers provided 1670 times feedback. This makes the overall feedback percentage 50%. The lengths of the provided feedbacks varied noticeably, from a

couple of words to nearly two pages of text. Typically the feedback texts were short; ¾ of the provided feedbacks were shorter than 266 characters. To compare with, this paragraph of text is over 500 characters, i.e. twice as long. The basic figures illustrating provided feedback are listed in Table 3.

Table 3. Basic figures illustrating provided feedback during 2007-2015.

Illustrating figure	Number
Number of taken exams	3335
Number of provided written feedback	1670
Provided written feedback percentage	50,1% of all taken exams
The variety of length of the feedback	5 – 6603 characters
1st quartile of length of the feedback	75 characters
Median of length of the feedback	132 characters
3rd quartile of length of the feedback	266 characters
Number of given feedbacks with over 1500 char.	30

Most of the feedback texts were written in Finnish, and only few in Swedish and English. To note is, that average word length in Finnish is longer, with ca 8 characters, than in Swedish and English with ca 5-6 characters. As listed in Table 3, half of the written feedback texts were between 75 and 266 characters. Though most teachers wrote short texts, some teachers provided their students with thorough feedback with at least 1500 characters. These feedbacks were investigated on separately in the qualitative analysis to find out possible reasons for the need of long feedback.

3.2   Quality of the feedback

Three main elements were recognized in the written feedback texts:

> D: descriptive comments on the student's response

> I: instructions on the required contents

> M: meta-information

Element 1: descriptive comments on the student's response included as well positive as critical phrases, either referring to answers in common, such as "excellent/good/short-spoken/weak answers" and "I enjoyed reading your answers", to the whole, such as "good work!" or to specific questions, such as "your discussion on the question on XX was short-spoken".

Element 2: instructions and suggestions on the required contents included model answers, corrections on misconceptions, and phrases which combined this element with element 1, such as "Otherwise good answers, but misunderstanding on XX, see book chapter 1-2".

The Element 3: meta-information, included phrases which did not refer to the response, but instead to the course context. Teachers shared the course grade scale, informed about the grade being submitted to the study register and provided recommendations for future courses or studies. As the system included only one text field for all information, this type of use can be considered intuitive, though "creative misuse", but on the other hand this show the lack of another, more meaningful system for these needs. Additionally, Element 3 included email-type phrases such as "Hi"s and "Dear"s in the beginning, and "Regards", "Have a nice summer/spring/autumn" and "Happy holidays" at the end of the message.

All elements appeared in the feedback texts as well individually as combined. When investigating the possible combinations of the presented elements, the following groups of categories could be identified:

- Group 1: not feedback
  - M: Only meta-information; contents that actually could not be considered as feedback.
- Group 2: Main type of feedback
  - D+M: Description on the student's answer typically wrapped in an email-like frame, which made the feedback clearly more personal and friendly. Feedback typically for very good responses. Also meta-information such as information on how the course grading process will continue, and suggestions for the future.
- Group 3: secondary types of feedback
  - D+I: Thorough feedback for teachers who have taken the effort and time. Reflective, personal feedback which includes what would have made the response even better or correct answers and corrections of mistakes and misconceptions, also minor details.

- o D: very short-spoken feedback, typically about good performances; such as "Nice work!", but also for weaker performances, such as "quite weak".
- o D+I+M: Close to D+I but with email-like framing. Including all three elements in the feedback requires a number of characters, but to note is that not even this category requires long texts.
- Group 4: non-typical types of feedback
  - o I: only the model answer.
  - o I+M: weakly formulated feedback with only what should have been included in the response, and meta-information. No explicit references to the student's response though the text implicates so.

The identified and above described categories are presented in numbers in Table 4.

Table 4. Identified element categories in numbers, N=1670.

Category	Frequency (sum 100%)	Average length	Min length	Max length	Median length
M	43%	126	5	722	89
D+M	23%	150	11	326	133
D+I	12%	700	62	6603	420
D	9%	70	5	437	56
D+I+M	9%	631	97	3882	456
I	3%	536	48	3148	293
I+M	1%	438	61	1136	333

When comparing the elements of feedback and the presented categories with the lengths of the feedback, the following results could be found:

- the shortest feedbacks were descriptive
- the 30 longest feedbacks, including over 1500 characters, included at least instructions – long instructions – on the correct answer; mostly also descriptive comments on the student's response, but rarely meta-information
- based on the results, no such rule as "the longer the feedback, the more elements are included" exists – feedback with all three elements were typically well-focused and meaningful in length, compared to the longest feedbacks.

When the interviewed teachers explained how they assess exam responses, they expressed the quality of responses through levels.

> *"The starting point is that whether the student has read, i.e. whether she knows the stuff, and the next one is that does she understand, and what does she understand about it, and as third one, that can she in some way integrate those things in her own things, for example examples that are not from the books or lectures, or in some other ways integrate the theories to what she knows from before. And in addition I've seen that in very good responses that they can apply, integrate, connect, oppose and give reasons."*

> *"Well, firstly the classic that if the response is short, that's the first sign that maybe the preparation for the exam has not succeeded as it should have. And then how the student moves in her response from private to general and from general to private, so how she masters […] the whole and with relevant examples concretizes the issue."*

The observations were concretized as written feedback, where short and somewhat personal was perceived as suitable.

> *"I have written a couple of sentences about what the response was like […] of course not terribly detailed descriptions, that's not kind of the idea there, but in general how it went. […]. I aim at reasonably personal [feedback] but it goes so that there are the same certain kinds of elements I pay attention to."*

In addition to what is written, teachers think about why they write the feedback: the electronic exam is seen as a situation to learn and support learning, instead of being a test of what has been learned.

"It's a very good thing that the student receives an automatic email about the feedback; then I also want to write feedback, and then the exam is more of a teaching situation much more than when the student reads the course grade from the notice board."

"You can give some personal feedback to the student. It belongs to a kind of good teaching, that you have that much time in the middle of all haste. I understand that it depends on the workload that sometimes you just can't manage with more than give the grade, but still you have the opportunity. So the feedback is definitely a good thing. It doesn't have to be long, even short feedback will do."

Here, the teachers want to take the effort to provide feedback. In contrast, in pen and paper exams, teachers themselves write few comments and few students want to know how the exam went.

"Sometimes I have made notes [in the papers] but quite seldom. […] A student comes [to receive feedback] maybe two times per academic year."

When the students have received the electronic feedback, they may even respond to it.

"I have received more feedback from this process and assessment, more individual […] and it's been perceived as good in the sense that when I've put out myself for them in writing and giving individualized feedback […] some students have thanked me, and said, that they receive exam feedback too infrequently"

"But it hasn't been a debate, I haven't reached that, only some students have responded that ok, then I understood this right."

As a whole, the electronic exam process provides the opportunity to give feedback for the teacher and to receive feedback and continue the discussion for the student. In the traditional pen and paper exam process, receiving feedback is occasional in numbers and laborious as a process.

3.3 Teachers' perceptions on added values of electronic exam room examining

When discussing the examining process with the interviewed teachers, they compared their experiences from the traditional paper examining process to the electronic exam room examining process. The electronic process was perceived as overall better than the old paper process.

"The electronic system has changed the process in a certain way; the process has kind of met the student and the teacher, so that the process is flowing; students can register and book suitable times quite freely, so there is a kind of flexibility that certainly serves the whole university."

The new process include improvements for the teachers themselves as well as for their students.

"The electronic form has made life easier for both sides", "And then I thought that the students can take the exam whenever between 8 am and 8 pm without any rush, that's pretty much nicer for them."

The concrete issues that have made the change for the teachers, include three aspects in the eased assessment process. First, the responses are easy to receive.

"No problems with disappeared exam responses. […] Once I had the paper responses with me in the plane and hoped that the suitcase would not end up in wrong country or disappear totally"

In other words, the teacher can trust in that the responses are in safety in the system. There they can be found whenever and wherever needed.

Secondly, the responses, and the literature, can be accessed and assessed practically anywhere.

"My smart phone is fairly good so I can use the exam system in practice anywhere. I can see the responses and read and assess them wherever I want […], at the airport for example; anywhere with Internet access. I just go there and read the

responses. I have almost all exam literature as pdf files so I can browse and check details so I don't have to memorize. It's just so much faster, easier and more flexible. […] On travel, at home, in the office – quite often in the office, because it of course is a place where I can concentrate and have them done."

And, thirdly, the process of producing the responses on computer promises the teacher that the student's handwriting is always readable;

"[The response] has become easier to assess. No problems with illegible handwriting.", "I truly have had terrible problems with reading their scrawl, and when that was over I understood how much I benefit from that students write their responses on computer."

For the students with terrible handwriting or other challenges in producing decent written responses, the electronic response is certainly readable, which in turn increases their possibility to pass the exam.

"Once I had a student with dyslexia which could be seen in the handwriting. She then had to read the response to me. I recorded it with my mobile phone and listened to it at home." "I had to agree with one student that it's either a Fail or an oral exam. These kinds of situations can't happen in electronic examining."

So the electronic process supports as well the student as the teacher.

Additionally, the electronic responses are perceived to be faster to assess than pen and paper exam responses.

"Yes it goes faster, as a result from the fact that it's so easy to read. Of course it takes a while for me to write the feedback, which makes it slower, but overall it's clearly faster."

In addition to being faster, the feedback process is perceived as easier.

"And it's easier [in the electronic system], of course I didn't in provide this kind of feedback the old system, that's so difficult."

But overall, in spite of perceptions on personal ease in the process, the pedagogical point was emphasized.

"the personal feedback, so that it individualizes, that's where it sort of sums up", "Teachers should be encouraged to giving instant feedback; that certainly adds to the effect of learning, when students receive comments immediately."

When summarizing the reported findings, based on the interviews, the teachers perceived two types of added values of electronic examining: technical and pedagogical.

1. The technical process was perceived as more fluent and effortless for the teachers and their students
   o The responses are easier for students to produce. Students with illegible handwriting can produce readable responses, and students with special needs, e.g. dyslexia, can benefit from electronic exams.
   o The electronic exam responses are saved by the system
     ▪ The responses cannot be lost as paper exam responses can
     ▪ The responses can be accessed whenever and wherever the teacher wants
   o the responses are easier and faster for the teacher to assess than handwritten paper exam responses, though the written feedback is an additional step in the process compared to paper exams
2. The pedagogical process is enhanced by the opportunity and ease of providing feedback
   o Teachers appreciate the opportunity and ease to provide feedback, even personal feedback, for each student, and even continue the discussion with students.
   o The teachers have received feedback from their students who have appreciated the feedback

Overall, the interviewed teachers would not change back to the traditional paper exam.

"I wouldn't happily go back" – "No, why would I? I don't have any motivation for the old one. The electronic matriculation examination comes in a couple of years, and if I think of myself, it's the spirit of this time."

4   CONCLUSIONS

Based on the results presented in the previous section, the following conclusions can be drawn.

When using the electronic exam system, teachers clearly take advantage of the provided opportunity to give written comments to students, i.e. using electronic examining does enhance the pedagogical process in giving feedback. But the opportunity is not benefited from as widely as could be, as half of the submitted exam responses lacked written comments. Additionally, as the results in subsection 3.2 point out, all given comments cannot be counted as feedback but instead meta-information about the exam context. Further, as the system only provides a text field instead of providing guidance to the teacher in the feedback process, the quality of given feedback is very heterogeneous.

The written comments consisted of three elements: information about the required contents, descriptive comments about the quality of the student's response, and meta-information. Even if the feedback included all three elements, the length of the text could be reasonable short. Based on this study, there is no need to write multiple paragraphs of text for each student; an adequate length for encouraging, reflective and, if needed, also critical feedback (in Finnish) fits in the frame of 100 to 300 characters. If the feedback does not include all three elements, and as short feedback is better than no feedback, an encouraging comment, e.g. "Nicely done!" can be recommended, instead of providing a paragraph of meta-information.

The electronic examining process as a whole has provided perceived added values for the teachers, as well as their students. Student experiences have been reported in a previous study [6]. Added value provided by the opportunity to write the exam on computer, which students expresses in the previous study, has now been expressed by the teacher as well. The teacher perspective to the responses being written on computer refers to better handwriting which makes assessment easier, when teachers do not have to guess what the student has written, and thereby faster. The saved time can be used for providing feedback. Additionally, the administrative process required for examining has become more effortless with the electronic system, as well for teachers as their students. From teacher perspective the ease includes safety and accessibility of the responses. The system saves the submitted responses and keeps them on behalf of the teacher. Additionally, the responses are accessible immediately after the submission, regardless where the teacher is located.

The opportunity to write feedback in the system in a straightforward way that automatically submitted the feedback to the individual student was perceived by the interviewed teachers as enhancing the pedagogical feedback process. The results indicate that the technical context for the pedagogical process is available and makes it possible for the teachers to concentrate on the assessment and feedback. Also the opportunity for providing individual, reflective and pedagogically meaningful feedback exists. It is up to teachers whether to take advantage of it or not.

As the system lacks the feature for the student to respond or even accept the received feedback, it has been up to the active students to reply and provide counter-feedback, and possibly continue the discussion. Therefore, the results of this study have initiated the need for further investigations on how the electronic exam system could even better support the teacher and the student in the feedback process and develop it towards activating new learning, instead of being an end of a process.

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