How feedback on a digital platform supports students learning

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ABSTRACT

Students generally think they have too little feedback. This article reports on research done to evaluate how students experience the quality of feedback on a digital platform and with use of rubrics; compared to written feedback or no feedback at all. Not surprisingly, students in this research (like in other research) prefer the type that gives them most feedback. However, they prefer even more feedback that seems personal. Giving students' feedback by indicating the quality of their solution on a detailed scale is not values as much as individual feedback that is shorter. Feedback given on a digital platform has some advances which the students think is important, such as availability, easy to find and read etc. It has also been important to investigate what happens to the quality of the feedback when given on a digital platform compared to the more traditional feedback on hand written assignments.

This article is a further work on an earlier article (Lauritsen; Bennedsen; 2015) dealing with using rubrics in the same course which is the focus in this article.

In the article is also discussed if the way we give feedback is the right way. Feedback is often given as a transmission process were teachers "transmit" feedback messages about what is right and wrong in the assignments, about its strength and weaknesses, and how students use the information to make improvements in next assignment. The students have to decode and translate the messages into action. Here some mistakes might appear.

When solving problems, cases, such as those in focus in this article, the students use rubrics to get an idea on the expectations the teacher has, and use the rubrics especially to read and use the given feedback. The feedback given in the rubric is used to make improvements.

1   INTRODUCTION

Active learning has been on the agenda for many years (see e.g. (Cross, 1987)). In the 1980s, several reports were made in the US with the hope that universities could create teaching that actively engaged students in their process of learning (Study Group on the Conditions of Excellence in American Higher Education, 1984). As they write in the report from 1984:

Much is known about the conditions under which student learning and growth can be maximize…We content that the quality of undergraduate education could be significantly improved if America's colleges and universities would apply existing knowledge about three critical conditions of excellence - (1= student involvement, (2) high expectations, and (3) assessment and feedback (p.17)

Three conditions must be fulfilled at the same time, to ensure students learning.

-    They have to work
-    They have to be engaged
-    They have to work in their comfort zone

This has been unfolded by the Danish professor Steen Larsen (Ultimate formula to effective learning processes) (Larsen; 1998).

The first condition, "they have to work", means they have to work with something meaningfully, it is not enough that the students are active (as sometimes are the condition in active learning), they actually have to work with activities in a particular order and a meaningfully context.

The second condition, "they have to be engaged", means that you have to be emotionally involved, engaged, to learn in the optimal way.

The third condition, "to work in their comfort zone", is also what Vygotsky (Vygotsky, 1962) formulated as in the "zone of proximal development".

How does feedback fit into to this formula? Well in all three conditions, we could say. The students must have some feedback on their work process to ensure they work with the most important and correct objects and in the right way. The feedback interacts with motivation and beliefs and in that way it also engages the students. Last it requires dialogue and feedback to ensure the students do work in their comfort zone.

This article focuses on feedback given on a digital platform. It has been important to investigate if it is available, useful, on time, supports the learning process and encourage the students to work with the intended objects according to the learning objectives.

Several studies have shown that feedback is very important for the student when (s)he is learning (see e.g. (Higgins, Hartley, & Skelton, 2002; Huba & Freed, 2000)). Willis and Webb (2010) defines feedback as follows: "*Feedback is a term commonly used to describe the range of processes in higher education whereby a student or group of students receives information about how well they understand concepts and are progressing with their studies.*" (p. 1). In studies at our university, feedback is the component that scores lowest; students do not think they get enough feedback and they need the feedback to progress through their studies. The low score on the amount and quality of feedback is also seen in other evaluations (e.g. (The National Student Survey, 2015)).

The Feedback and Assessment Benchmarking Tool (National Union of Students, 2014) developed by NUS (National Union of Students) describe ten principles of effective feedback and assessment. Some of these includes assessment criteria (the criteria should be clear, easy accessible by students and linked to learning outcomes), submission process (submission should be easy and electronically if possible) and feedback timeliness (the students should be able to act upon the feedback).

Solving a real case, where the students should find their own way and ask the right questions, they need feedback more than if a "normal" assignment where given. In a case they need to know if they have found a reasonable way to the solution. In a "normal" assignment where a model for solving has been given, the students might be satisfied with a teacher made solution and then be able to self-assess their assignment.

In this article the use of rubrics in connecting to solving assignments, cases, is described. The rubrics is seen both when the students actively solve cases and when the students receive feedback on these using the learning management system, Blackboard Learn (Blackboard, 2015). The general course design is described as well as the role of the case. The main focus of the article is an evaluation and comparison of the different feedback methods.

2   FEEDBACK AND RUBRICS AND THEIR USAGE

In the course used for this research, the students have to hand in four cases as a part of the learning process. The cases are mandatory and the students get marks for these and they count for 20% of the course grade. Because of the importance of feedback in the students learning process it is essential also to specify clearly the criteria used as a basis for the assessment and also to give the feedback according to these.

So we are dealing with to perspectives; the criteria in the rubrics and the feedback.

2.1 Criteria and rubrics

To clarify and specify the criteria, the teacher has in the course used the rubrics that are available in Blackboard Learn (Blackboard, 2015).

Using rubrics provides more advantages for both the students and the teacher. As described by the Eberly Centre (Teaching Excellence & Educational Innovation) at Carnegie Mellon University:

Grading according to an explicit and descriptive set of criteria that is designed to reflect the weighted importance of the objectives of the assignment helps ensure that the instructor's grading standards don't change over time. …. Furthermore, rubrics can reduce the time spent grading by reducing uncertainty and by allowing instructors to refer to the rubric description associated with a score rather than having to write long comments. (Carnegie Mellon University, 2015)

The students are using the rubrics both when solving the case and when reading the feedback. As one student said: *"We read the criteria before, to see what the teacher expected, I mean the things we could not read from the assignment text…afterwards we mostly used the feedback and not that much the grading given".*

It makes it clear for the students how it is possible to improve themselves and it specifies clearly what are the requirements and acceptable performance standards of the cases.

The use of rubrics in this course also gave the teacher a clearer picture of the student´s challenges and strengths. It is also possible for the teacher to get statistics of the class grades.

When rubrics are given to students with the assignment description, they can help students monitor and assess their progress as they work toward clearly indicated goals. When assignments are scored and returned with the rubric, students can more easily recognize the strengths and weaknesses of their work and direct their efforts accordingly. (Carnegie Mellon University, 2015).

In the course the students had to hand in four assignments (cases). In all four cases rubrics were used. The rubrics were designed as shown in Figure 1.

Rubric

Name	Case C: Criteria for the assessment
Description	This rubric shows which criteria are the basis of the assessment in case C
Rubric Detail	

Levels of Achievement

Criteria	insufficient	sufficient	acceptable	excellent
Layout and communication	**0 Points** There is no structure, layout, explanatory text, etc.	**1 Points** There is an attempt of a structure, but it is not consistent. There are a few explanatory texts.	**2 Points** There is a structure, but there are few crack. There are explanatory texts for most calculations, graphs, illustrations, etc.	**3 Points** There is a consistent structure. There are explanatory texts to all important calculations, illustrations and graphs
Use of concepts and theory	**0 Points** Concepts and theory appears not/are used entirely inconsistent	**1 Points** Course key concepts and theory used almost correct	**2 Points** Course key concepts and theory used properly. You have addressed the right formulas and use the right terms	**3 Points** Course key concepts and theory used properly. All concepts and theory are explained/reference to the description and any assumptions supported
Creation of model and strategi for the solution	**0 Points** No strategy, or calculation is described	**1 Points** Have used a strategy but it is not made explicit and the calculation model is not quite correct	**2 Points** You have used a clear and detailed strategy for the overall elements in the calculation model and the model works	**3 Points** You have used a reasoned approach to the relevente points in the calculation model and it is a very fine working model
Creation of energy balances and relevant equations for the heat transfer and the temperature diagram	**0 Points** There is not set up the correct equations or they are not correct	**1 Points** There is established the necessary equations but they are not all correct	**2 Points** The necessary equations are established and they are almost all correct	**3 Points** There is established the necessary equations and they are all correct and substantiated
Professional insights, understanding of function and relationships	**0 Points** There appears no understanding of function and professional insight. Text and calculations are filled with misconceptions	**1 Points** There appears limited understanding of the function and professional insight. Text and calculations contain some misunderstandings	**2 Points** There demonstrated great understanding of the function and professional insight. Text and calculations include some misunderstandings	**3 Points** There demonstrated excellent understanding of the function and professional insight. Text and calculations contain no significant misconceptions
Use of software tools, EES, MathCad, mm.	**0 Points** No tools are used or they are incorrectly used	**1 Points** There is only a limited use of tools they are some places used incorrectly	**2 Points** There are sufficiently widely used tools they are largely used properly	**3 Points** There are sufficiently widely used tools are used correctly and the application is well chosen

Figure 1: Rubric for the case C

2.2 Feedback

There is no doubt that feedback is very important to the students learning, there are a lots of research showing this, as written in the introduction.

Therefore it is important to find a form of feedback that is useful to the students. It has to be:

- accessible and easy to find
- understandable and precise
- clearly related to the criteria
- on time
- etc.

Race (2004) describes and discusses many different forms of feedback: oral<>written, individual<>group, hand written<>electronically.

When it was decided in the course to use the Blackboard Learn facility to give feedback, written, individual and electronically, it was based on the following:

- **Written;** because it makes it easy for students to save the feedback and use it for solving the next case and also to use it in other contexts,
- **Individual;** because it was important to the teacher to give precise feedback on the errors and good things that they did in the assignment. The feedback and comments were somewhat different for the hand ins. General feedbacks to all students do not have these advantages.
- **Electronically;** it was obvious, because of the Blackboard Learn platform was where the communication took place

The feedback is given in two ways in the assignments, directly in the hand-in (pdf-file) and in feedback boxes in the rubrics on the Black Board learning management platform. The feedback is given in text only, because it has not been possible to give formula and sketches.

3   CONTEXT

The course used for this research is a forth semester course on Thermodynamics at Mechanical Engineering at Aarhus University, School of Engineering. It is a mandatory course for mechanical engineering students (they need to take four mandatory courses during their fourth semester as well as a semester project). The author of this article is teaching the course, and has done so for many years. Below called, "the teacher".

As a part of the course the students shall complete four cases. The cases are graded by the teacher. The cases are an important part of the learning process in the course; it is where the students have to do calculations on realistic problems and here they are forced to read the learning material more in depth. In the evaluation of the course almost all students state that this is where they learn mostly - and also state this is hard work. Due to the importance of these cases, a lot of effort to give the students proper feedback.

The four cases in the course are somewhat different in form and content. It is debatable whether the four issues in their form actually meet the definition of a case.

Lau *(Lau, Woon M. L. 2007) write: .."in Case Based Learning (CBL) the problem space is defined by the case. Typically, the presentation of the problem comes first in the CBL instructional sequence, which is a reversal of the traditional use of problems in science teaching. The introduction of a case (Lau, 2007) problem early in the instructional sequence encourages learners to use the case to generate a set of questions that they then try to answer. This makes them more motivated in subsequent lectures, labs, and discussion because they have a problem of their own to work on. In short, students are asked to learn new materials mainly by themselves, and also to pose intelligent questions, develop accountable approaches to investigate these questions, and present their methodology and conclusions to the class".*

A case has to be a real problem which is presented by a realistic (or real) story. With this story as base, a question (or a series of) is formed for the students to answer. These questions should help the student create a number of hypotheses and questions to validate the hypothesis, thereby fostering new knowledge.

The first case in the course is in that sense not a real case. It is more a design assignment and some disciplinary questions connected to this. In this case the students have to make a poster. On the poster they have to describe an energy system by function and energy balance.

The last three cases are formulated as cases, that is, they have real stories as a basis. But in the text very specific questions are formulated, that in some way guides the student through the problem solving. The student does not really have to generate their own hypothesis and questions. The cases are chosen from the course content to cover different topics.

The feedback is given on the Blackboard Learn platform (Blackboard, 2015). In this paper it has been described, elaborated and evaluated on the feedback given.

Feedback is given in two ways, se figure 2.

- **In the boxes in the rubrics**
  Here more general comments to form and method e.g., are given. Here only text is possible.
- **Comments in the pdf-file**
  Specific corrections into the substance are given. The facility in Black Board does not support tools to make sketches and formulas in a proper way, so the comments are only in text form.
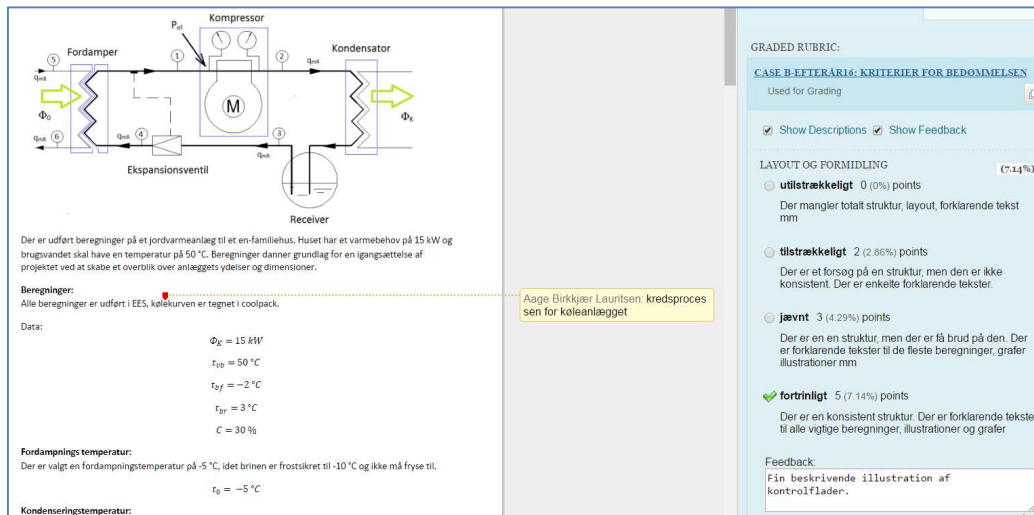
Figure 2: Feedback in Blackboard. Left; comments in the pdf-file. Right; feedback in rubric boxes

4 RESEARCH DESIGN

The research is done in a real setting - a real course with real students. An alternative to this could have been to ask students for their view on the feedback given. The rationale for choosing a real course is that it gives a much more realistic view on how feedback on the digital platform is perceived. One downside of this design is that students might have difficulty in just focusing on the feedback – it is of course seen as a part of the learning design. It is found that the research design is good but one need to take the concerns into account when analyzing the results.

> *The research question in focus here is* **"How do students perceive the feedback given to their case work - both the feedback in the pdf-file and in the rubrics? And how do they perceive feedback on the digital platform compared with feedback in traditional form?"**

In order to evaluate how the feedback is perceived, it has been decided to interview a group of students and beside this to look into the evaluation form from the course. The students participating in the interviews were chosen by random (out of a total population of 42 students for the course). They were not given any credit for participating in the interview. It is important to notice that the interviewer is also the teacher. It of course lowers the potential impact of the work.

4.1 Research method

Here has been used primarily a qualitative philosophy well aware of the strength in using also a quantitative method. To compensate for this the course evaluation has been taken into account.

4.2 Course evaluation

In the course evaluation which took place in the end of the course statements, feedback on cases have been picked up and some useful comments and interesting points have been found.

The evaluation was designed as a form handed out in class with two boxes. In one box the students have to write down three good things about the course and in the other box three things that can be improved. In this design the students get to find precisely the things they feel is good or has

to be improved, and not the teachers formulation of the things he want to focus on as it is on some questionnaire.

4.3 Interviews

Prior to the interviews an interview guide has been prepared as a framework for the interviews. The interview guide consists of keywords, which are prepared in preparation for the interview. The guide worked well, and the order was almost followed.

The interview began with a brief introduction to the purpose of the interview. As a starting point questions about the age and prior knowledge about the field as well as if the cases were done alone or in collaboration with a fellow student has been given. After that the interview got into asking about the feedback given:

- Quality of the feedback given, was it useful and relevant
- How did they use the feedback
- Where the feedback understandable
- Where the feedback timely
- Did you get enough feedback
- Balance between positive and negative feedback
- Problems finding the feedback
- Differences in feedback given in the pdf-file and in rubric boxes
- Usage of rubrics for feedback from the teacher
- The learning management system
- The structure of the course (including the cases)
- General comments

The interviews were recorded on audio files.

4.3.1 Participants

42 students participated in the course. Out of these were four female. The interviewed students were all male. Eight students were interviewed. The interviews were done in the week after the examination. The students were random chosen from the course participants. The students were from 22 to 28 in age, all of them in their second year of their bachelor study.

4.4 Analysis of the data

The qualitative data were analyzed by the author. The author listened to the interviews and noted relevant views on the general topics.

There has been no transcription of the interviews in their entirety, but condensed view of relevance to my perspective in the study. Specifically keywords from the interview guide have been used to first organize and then condense the eight interviews. By selecting this method awareness has been given to some errors that may affect the conclusions, especially because the teacher and the interviewer are the same person in the course. Also some mistakes could appear because of translation to English and some meaning might get lost. This was considered acceptable as what was wanted to retrieve from the interviews are general views and status more than it is facts. Further-

more, a mix method approach has been used and can compare the findings in the interview with what has been found in the course evaluation form.

5   FINDINGS

The students have not been exposed to rubrics in this form in earlier courses, they found it very useful that the expectations were precisely described and that the rubric expressed the expectations very clearly. When in the interviews was asked about how they normally find the information, most of the students said that the types of assignments they normally have, typically calculations - apply the theory to a problem and calculate something. For this type of assignments, they know what they are expected to do. They found the criteria understandable and precise, and this compared to the given feedback was important and useful.

Some students though said, they were able to read from the case text what they were supposed to do, and did not use the criteria that much before solving the case just afterwards when feedback was given.

5.1   Feedback

As described before, is have been evaluated how feedback is perceived by the students.

When giving feedback the rubric was used to structure the feedback. But did the students read the feedback and did they use it for improvement?

From the interviews it was clear that the students read the feedback and that it was very useful. One student put it this way:

..this getting feedback is really what you learn from… …what I could have done different, and so…

All students stated that feedback on the digital platform was a good way to give the feedback. They did especially think the feedback given in the hand-in file were useful. As some students said:

…it showed me specific what I had done wrong and mistakes I have done…

…one has it all at your fingertips and can use it later... …it is easy…

...we have not received feedback on a digital platform before… …I think it is very good…

The comments given in the boxes in the rubrics, some could not use in connection to the specific case, because it was comments to method and strategy. Some students stated this was more useful in connection to the generally understanding in the course and solving the next cases.

Another student put it this way:

...boxes with general comments might have been more comprehensive and detailed because I can use it further on … references to where I could read more about it and some examples...

The students indicate that they receive much more feedback and with a higher quality in this course than other courses. In many courses they did not get any feedback at all.

…in fact, it is in this course we have had most feedback on work we have done… and it is important it comes from you and not from other students…

From what has been found from the interviews, a comparison of feedback on a digital platform and the traditional way has been made. It is shown in following table, table 1.

Table 1: Positive and negative opinions about digital feedback

Positve on digital feedback	
Students	Easy to find feedback
	Feedback is saved for later use
	Feedback is saved same place as hand-in and assignment
	Feedback was easy to read because of digital text
	Saves paper, energy and time for printing
Teachers	Easy and timesaving giving feedback too many students. Copy paste of same feedback to more students.
	Timesaving not having to print all hand-ins and copying
	Saved for later use and easy to find when dialog with the students.
Negative on digital feedback	
Students	Only text comments and corrections, sketches and formulas that explains how to improve is wanted
	Did not have that much dialog with the teacher about the hand-in feedback, because the communication was only on the Black Board platform
Teachers	Did not have that much dialog with the students about the hand-in feedback, because the communication was only on the Black Board platform.
	It mostly becomes "find the errors" and not that much explanations to help the students to improve and learn by this

...if you make a pdf with feedback it tends one does not do it just as well as if it's done by hand where you are able to striking out and making a little drawing and so… one student stated.

6   DISCUSSION

Students favor detailed criteria. It is clear from this research that the feedback they liked the best were the personal feedback given precisely into where in the assignments they have made errors or misunderstandings. That means that the feedback given into the pdf-files handed in was the most useful. The more general comments made in the boxes in the rubrics where used for the more principle issues on the methods and strategies when solving the next case.

But is it the right way we are giving feedback like in this context? Does it support the learning process in the way we want? It seems we are taking the student by the hand and lead them to the "right way", this transmission way, were teachers "transmit" feedback messages about what is right and wrong in the assignments, about its strength and weakness, and how students use the in-

formation to make improvements in next assignment. The students have to decode and translate the messages into action.

If we want to support the learning process, we might use more of the guiding version of feedback, like. *Here in this section of the calculation you have used… read more about this in…*

Then the assignment could take another round and have new feedback. Use of peer-assessment or self-assessment could be other way to improve and the feedback would be different. In "Seven principles of good practice" (Nicol; Macfarlane-Dick; 2006), good suggestions on how to improve the feedback process in my course is given, it might be a way to go.

All in all some more interaction and dialog could support the learning process better.

7   CONCLUSION

As concluded by many others: Feedback is useful and appreciated by the students. In this course the students found the amount of feedback to be higher than they normally experience in their study. One student put it this way:

There is much feedback in this course compared to others. Normally we do not get feedback, that we do not like and normally we do not have so many mandatory assignments, which was good.

The students like to have a detailed description of their assignment. However, personal feedback was preferred even more. When the students were asked about their view on the feedback given by indicating the quality of their solution on a detailed scale, they preferred the individually written one. All of the interviewed students said that the setup with cases, rubrics and feedback on Black Board was very good and helpful. Here some citations:

…it is a good way to do it, this, solving cases, you just stop and think about what you have learned and what the teacher went through in class…

…in fact, I think this hole set up is very fine, this that it is online and we can hand in this way that we could see what was expected and afterwards have feedback and see if we did do it ok…

The students like to have feedback on a digital platform. It is easier to find, it is saved for later use, and it saves paper, energy and time to print. It also mostly is easier to read because of digital text instead of handwritten comments. You have hand-in, assignment and feedback saved in the same place.

What the students think could be useful and what are not available until yet, were sketches and formulas that explained their mistakes and how to improve in the best way. Also some of the students thought that the traditional hand written included more dialog with the teacher, which is good.

Final comment from a student:

…its very fine with this feedback on a digital platform, but it cannot stand alone ... there must be dialogue with a teacher…

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