Student's reflections as a tool for self-regulated learning in a formative assessment practice

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ABSTRACT: A framework of formative assessment applied in the compulsory activities in a preparatory physics course for engineering education is presented. These activities are based on seven principles of good feedback and student's reflections on the achieved learning outcome are used as a learning tool. Our goal is to focus on the student's learning rather than their performance.

The intension is to help the students to become self-regulated learners and to support them in the process of becoming deep learners. In this paper we discuss some of the typical reflections written by the students and reflect upon to what degree we have achieved our goal. Our observations indicate that some students are on their way to become self-regulated learners, while the rest need more awareness on how to change and improve their learning strategies.

1 INTRODUCTION

A good correlation between the intended learning outcomes, the teaching and learning activities and the assessment tasks is the intension in constructive alignment (Biggs, 1999). One way for teachers to work on a better alignment is to organize teaching and learning activities that facilitate for the students actively to construct their own knowledge and skills. To teach the students how to learn is essential. One way to achieve this and thereby foster self-regulation is by implementing the seven principles of good feedback in a formative assessment practice (Nicol and Macfarlane-Dick, 2006). Nicol and Macfarlane-Dick present the seven principles as:

Good feedback practise:

1. Helps clarify what good performance is (goals, criteria, expected standards).
2. Facilitates the development of self-assessment (reflection) in learning.
3. Delivers high quality information to students about their learning.
4. Encourages teacher and peer dialogue around learning.
5. Encourages positive motivational beliefs and self-esteem.
6. Provides opportunities to close the gap between current and desired performance.
7. Provides information to teachers that can be used to help shape the teaching.

A previous study of achievement-goal patterns of students following a course where this practice was implemented, and where feedback was used as a learning tool in formative assessment showed goal stability regarding mastery-approach (Hansen and Ringdal, 2018).

One of the strategies for obtaining deep learning is to use reflection as a tool to turn experience into learning (Gibbs, 1992). To be able to use reflection as a learning tool this has to be done in a systematic way. By going back to the work by John Dewey, Rodgers offers a definition of four criteria that characterize what reflective thinking consist of (Rodgers, 2002). These four criteria include the following:

1. Reflection is a meaning-making process that moves a learner from one experience into the next with deeper understanding of its relationships with and connections to other experiences and ideas. It is the thread that makes continuity of learning possible, and ensures the progress of the individual and, ultimately, society.
2. Reflection is a systematic, rigorous, disciplined way of thinking, with its roots in scientific inquiry.
3. Reflection needs to happen in community, in interaction with others.
4. Reflection requires attitudes that value the personal and intellectual growth of oneself and others.

In order to implement effective models of reflection for students, the teachers need to obtain a deeper understanding and to apply reflective processes themselves (Rogers, 2001) and when practicing reflection, possible outcomes are (Boud *et al.*, 1985):

1. New perspectives on experience.
2. Change in behaviour.
3. Readiness for application.
4. Commitment to action.

In this paper, we present a framework of formative assessment where we are using the seven principles for good feedback. Typical reflections written by the students are presented and discussed.

2 BACKGROUND

2.1 The preparatory physics course for prospective engineering students

The learning outcomes for the preparatory course for prospective engineering students states the importance of student's ability to reflect upon his or her academic qualifications, and use it actively when making decisions. Further, the students should be able to communicate with others about scientific issues using terms and concepts from the syllabus. Collaboration with fellow students is emphasized and in the continuing bachelor studies that lay ahead, reflection in teams is one of the skills that are highlighted (UHR, 2014).

2.2 The framework of formative assessment used in this course

This course has a national given written exam of five hours, which qualifies for engineering study programs. We as teachers have no influence on the form. Therefore, the framework of formative assessment we have applied treats the compulsory activities, which the students have to pass before the final exam.

The formative assessment includes written reflection as a learning tool, where our intension is that student's reflections will foster a deep approach to learning (Gibbs, 1992). During the compulsory activities, the seven principles of good feedback practice are applied to enhance the student activity (Nicol and Macfarlane-Dick, 2006). Traditionally the students have met compulsory activities that have been handed in and been given written feedback and handed back to the students after a week or more. When the students then got feedback they no longer had their experience fresh in mind.

To close the gap between the student experience obtained by solving exercises and the feedback from the teacher, the compulsory activities are structured as two-hour sessions; in the first hour they work on the assignment individually, after a pause they are summoned for a teacher explanation. Here, two different procedures have been applied: Either the teacher explains the tasks, focusing on student participation and thereby creating an opportunity for the students to learn from their misconceptions, or the students discuss in groups and learn from each other before the teacher explanation is given. In the second model, a student response system is used in order to give the teacher an immediate overview of the students understanding. In both models, the students are asked to reflect upon to what degree they have obtained the learning outcomes (Hansen and Ringdal, 2018).

2.3 Collecting student reflections

Student's reflections are collected during the academic year 2018/19, i. e., data is still being collected. The reflections are handwritten on paper and translated into English. The data presented in this paper originates from four compulsory activities during the autumn semester. In total 64 students have accepted to join this research project.

3 RESULTS AND DISCUSSION

Presented here are the students' overall reflections, written at the end of the tasks. Reflections regarding details concerning the calculations in each question are to a large extend not included here.

3.1 Model 1, Reflections written after teacher explanation

Evaluating their own performance, almost all students tend to give themselves a "summative" evaluation, where they use categories from "very good" to "not so good". This type of short evaluation may also be expressed as:

> *"Physics are going well so far. It has not been very challenging."*
> *"It went well, but I was a bit sloppy."*

Some of the students end their reflection at this point, while for the rest of the students we observe outcomes as proposed by Boud (Boud *et al.*, 1985). New perspectives on experience are expressed as:

> *"This exercise went well; the questions were good because they helped me clarify several of my misunderstandings."*

Further, we observe references to topics the student needs to improve:

> *"I should have had better control on transforming between areas given in m/km/cm, it felt a bit embarrassing."*

Awareness of objectives to study further are frequently addressed. However, when it comes to commitment to action and a change in behaviour, many students will make suggestions on how to improve:

> *"I need more practice in this. I have not been working very hard, so no surprise there. I will work harder from now on."*
> *"I need to work more on chapter 1 (motion), because I have not been able to learn it yet."*
> *"More work is needed, even during Christmas. Must work more on previous exams."*
> *"I need to allocate more time than I have done so far when I see the results. I need to use 1.5 hours each day and at least 3 hours in weekends to regain the level I should have."*

Even though the students do propose actions, this is restricted to how much time spend, or specific topics, and they are not proposing actual strategies on how to achieve a better understanding. It seems to us that they are unaware of how to change their behaviour to improve the efficiency in their studies.

3.2 Model 2, Reflections written after group discussion and teacher explanation

The students' reflections are categorised in three levels regarding their understanding of the collaboration process itself. At the lower level there are only comments on the quality of the process, generally evaluated as positive:

> *"Group discussion was good."*

On the next level the students also include a description of the process:

> *"The group communicated well and agreed quickly on answers… ."*
> *"The group work went well. I understood most of the problems and explained my thoughts to the others."*
> *"Problem 3 was difficult, but sharing our thoughts helped us solve it."*
> *"Group discussion was great, and I persuaded the group a couple of times, ending up with correct answers!"*

Finally, some students attempt to include an explanation for why the process succeeded in improving skills and understanding:

> *"I think group discussions works very well. All members contributed, and we discussed strategies, which I find very useful"*
> *"I find group work based on each other's reflections to be a good tool for learning. I can see my own mistakes easier, and that gives me better and broader understanding."*

These comments outline that reflection needs to happen in community, and in interaction with others as characterised by Rodgers (Rodgers, 2002).

4 REFLECTION

Our experience is that the students need to learn how to reflect. To help the students getting started in their process, we have given them guided questions. For some students, this has been helpful, while for others, this results in simply answering the questions, with as short sentences as possible, without doing any further reflections. The students, which have difficulties in further reflections, also lack commitment to action.

In our continuing studies, we want to focus on how to get the students to "commit to action", taken into account that the students must know how to act in order to improve. We need to improve the learning activities and the feedback to obtain more self-regulation among the students. To achieve this, it is important that we as teachers use reflection as a tool to gain deeper understanding in the process ourselves, as suggested by Rogers (Rogers, 2001).

5 CONCLUSION

The compulsory activities are arranged for the students systematically to reflect on their experience, and thereby come to an understanding of what action the students need to take in order to increase the learning outcome. As discussed in this paper, some of the students develop self-regulated behaviour, while the majority still do not know how to act to improve their learning process.

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