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# Fostering self-regulated learning by increasing student agency in assessment – student perceptions

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*This study investigated students' perceptions of different assessment methods in an undergraduate mathematics course. Each student could choose from two summative methods, exam and self-assessment, for their course grade. Embracing this form of agency, most the students chose self-assessment. A content-based analysis of the reasons students gave for their choice produced a variety of expressions of self-regulation. Many students recognised the value of self-assessment for their continuous learning and were motivated by it. Others acted from affective reasons, enjoying or agonising about one or the other method. Still others aimed to control their behaviour by challenging themselves or managing their workload. Choices were also made from purely practical reasons. The results give teachers valuable information on what students consider important in assessment. They also point to the usefulness of the study design for studying student agency and self-regulation.*

*Keywords: Undergraduate mathematics, self-regulation, agency in assessment, students' perceptions, self-assessment.*

## Introduction

There is a growing consensus among pedagogical researchers and policy-makers that university students should be involved in assessment processes as agents, not just passive assessees (e.g., Falchikov, 2004). This would improve students' engagement with the learning goals and assessment criteria, as well as their self-regulation skills, including monitoring and reflecting on their own learning (e.g., Adie et al., 2018). In this study, we enhanced student agency in assessment by giving them the possibility to choose between a traditional and a novel, student-centred assessment method for their course grade. By analysing the reasons students give for their choice, we aim to obtain in-depth information about students' self-regulation, as well as their perceptions of novel summative assessment methods in mathematics.

Student agency is usually restricted to formative assessment, which takes place during learning and usually does not involve high-stakes grading. Students may, for example, be involved in self-assessment or peer review processes. On the other hand, Nieminen and Tuohilampi (2020) suggest that student agency in summative assessment may in some contexts offer benefits that are not accessible through formative assessment. They reason that some students may not see the benefit of formative assessment to themselves but consider it instead to be conducted for someone else. However, involving students in summative assessment presents many challenges, for example regarding validity and fairness. Also, summative assessment has traditionally been in control of the teachers, and students may end up resisting any change that they consider a risk for their grades.

Hence, it is important to study students' reasoning around assessment choices in order to find ways to promote student agency also in summative assessment.

Assessment in mathematics is very traditional through all levels of education. In the UK, the most common assessment method in university mathematics is the closed book exam, and there has been no significant change in this in the last 10 years (Iannone & Simpson, 2021). Also, in schools assessment in mathematics is often traditional. In Finnish schools, the most common assessment method in mathematics is the exam, and alternative assessment methods are not used as frequently as in other subjects (Atjonen et al., 2019).

This study is the first step in a larger project concerning self-regulation and student agency in assessment. We let students in an undergraduate mathematics course choose the summative assessment method from two options: exam and self-assessment. The students made the choice in the beginning of the course but were able to change their choice before the assessment took place. The pedagogical motivation for this setting was to enhance students' agency by giving them power over their own assessment. We also presumed that students' perceptions of the assessment methods would be more authentic if they had to commit themselves to a particular method (as opposed to asking them about assessment that they were not engaged in). Our research questions are the following:

Research question 1: How do mathematics students perceive a novel summative assessment method compared to a traditional one?

Research question 2: What characteristics of self-regulation are expressed in the justifications students give for their choice of assessment method?

## **Self-regulation and student agency in assessment**

Self-regulation refers to monitoring, controlling, directing and evaluating one's own thoughts and behaviour in order to achieve desired outcomes (e.g., Zimmerman & Schunk, 2001). Self-regulation of learning is considered an important skill in higher education and life-long learning (e.g., Zimmerman, 1990; Heikkilä & Lonka, 2006). Pintrich (2000) introduced a model of self-regulation that identifies four areas of regulation: cognition/metacognition, motivation/affect, behaviour, and context. For example, regulation of motivation may include assessing the value of a task and one's capacity of succeeding, and regulation of context may include changing the task or leaving it.

In order to cultivate self-regulation skills, students must achieve *agency*, in other words they must be able to make decisions and act autonomically towards a desired goal. One way of increasing student agency is to involve students in assessment. Assessment has traditionally been in control of the teachers, but recently, student agency in assessment – in particular, formative assessment – has been emphasised in international policy (Adie et al., 2018). Adie et al. (2018) proposed a definition of student agency in assessment based on Emirbayer and Mische (1998): agentic students (1) make choices and take action in assessment (2) within the boundaries of different contexts, environments and timeframes (3) thereby reproducing or transforming traditional assessment structures.

Self-assessment is a typical way of transferring control to students. Panadero et al. (2018) note that self-assessment has long been studied as a link between formative assessment and self-regulated learning. They point out that although self-assessment is theorised to support self-regulation,

empirical evidence is mixed. On the other hand, Nieminen and Tuohilampi (2020) compared student perceptions of their agency in formative and summative self-assessment contexts. They observed that only those students who were randomly selected to perform summative self-assessment for their course grades, perceived the self-assessment useful for their future studies or working life. Compared to students assessed with an exam, they also expressed a feeling of ‘studying for themselves’.

## **Students’ perceptions of assessment**

It is essential to understand students’ perceptions of assessment in order to enact the positive impact of assessment on learning (Conlon, 2006; Guo & Yan, 2019). Past studies have shown that students tend to have mixed perceptions of assessment, and the purposes of assessment (formative vs. summative) might greatly influence their perceptions (Brown & Harris, 2016; McMillan, 2016). With regard to self-assessment, there is no consensus among students either. Some believe self-assessment to be useful, while others doubt its effectiveness in improving their learning (Hung, 2019; Lew et al., 2010). The learning environment can have a significant influence on students’ perceptions of assessment (Gijbels et al., 2008) and self-assessment (Hill, 2016). Hill (2016) found that students seldom conducted self-assessment without explicit encouragement. However, once given the opportunity to practice, their attitude towards self-assessment became more positive and they were willing to continue to carry out self-assessment in their future learning.

Undergraduate mathematics students’ perceptions of assessment have been found to be different from other fields. In their review, Struyven et al. (2005) found that higher education students find alternative assessment methods to be fairer and to lead to deeper learning than traditional methods. However, the review does not include any studies on mathematics students. Indeed, Iannone and Simpson (2015) found that in the UK, mathematics students prefer traditional assessment methods such as closed book exams. Iannone and Simpson (2017) have also compared mathematics and education students’ perceptions of assessment in two universities in the UK. Students in both groups preferred assessment methods that, in their view, discriminated with respect to academic ability. However, their perceptions concerning discrimination differed. Education students preferred projects and dissertations, and mathematics students preferred closed book exams. It can be concluded that disciplinary factors need to be considered when studying students’ perceptions of assessment.

## **Context and method**

The context of this study was an undergraduate mathematics course taught at a research-intensive Finnish university. The topic of the course was linear algebra, and it was one of the first mathematics courses students take. The course lasted for 7 weeks and was worth 5 credits (ECTS). Typical major subjects among the students who took the course were mathematics (including teacher education), computer science, economics and statistics.

The course was taught using an inquiry-based teaching method (see Rämö et al., 2020). During the course, all students took part in formative self-assessment exercises which followed the DISA self-assessment model (Häsä et al., 2019). In the exercises, the students assessed their competencies using a detailed rubric written by the teacher and received automated feedback on their assessments.

For the summative assessment that took place at the end of the course, students could choose from two options: exam and self-assessment. In the former case, the grade was determined by the exam

together with bonus points received from weekly tasks. In the latter case, the students self-graded their course according to the DISA model. In this model, a student's self-assessment is checked against the tasks they had completed during the course. The teacher can step in if the self-assessment is not in line with the student's weekly performance.

In the beginning of the course, students were explained the teaching arrangements of the course. As self-assessment was assumed to be a new assessment method to many students, and all students had to complete formative self-assessment exercises during the course, the teacher explained what the benefits of self-assessment are considered to be. After this, the students had to choose the summative assessment method, but they were told that they could change the assessment method before the end of the course if they wanted to. The students were asked to give a reason for their choice.

The participants in this study are 333 students who participated in the linear algebra course and gave consent to use their answers in the study. The data consists of two datasets. Firstly, it contains the reasons students gave for their choice of assessment method in the second week of the course ("On what basis did you make your choice?"). Secondly, it contains reasons students gave for changing their choice in the last week of the course ("Justify carefully why you wish to change your choice."). Students' answers were gathered via the Moodle platform that was used for teaching the course. In the beginning of the course, 83% ( $n=275$ ) of the students chose self-assessment and 17% ( $n=58$ ) examination. There were 18 participants who changed their choice: 14 from examination to self-assessment and 4 from self-assessment to examination.

The data was analysed using abductive content analysis, in which identified categories are related to theoretical concepts but not directly based on them (Timmermans & Tavory, 2012), and it was coded with an Atlas-ti programme for qualitative data analysis. The justifications varied in length from a few words to several sentences and each justification could include several reasons for the choice. For the students' choices in the beginning of the course, altogether 16 codes were identified, forming five main categories: self-assessment enhancing learning; examination preventing learning; external reasons for self-assessment; negative aspects of self-assessment and examination enhancing learning.

## Results

The most common reason to choose self-assessment was that **self-assessment enhances learning**. Half of the justifications endorsing self-assessment were related to this category. Participants for instance argued that *they learned more by self-assessment*:

I feel that I invest in the tasks more when I know that the self-assessment is based on them. And when I do tasks with thought, I learn the course content better.

They also stated that *self-assessment was a more efficient and beneficial way of learning*:

In my view, self-assessment supports deeper learning to a greater extent, because often when you study for an exam, learning may remain superficial.

I choose self-assessment, because I believe that it challenges me to study things properly during the course but also gives me information on how I have understood things and what is my level of mastery.

Self-assessment was *seen to balance the workload during the course*:

Moreover, you can do the final assessment a bit earlier which makes it possible to focus earlier on other final assessments and Christmas holidays.

In addition, self-assessment was reflected to *be a more holistic and a long-term way of learning compared with examinations*:

I want to learn to better interpret my learning in practice and I believe I'll get a more realistic outline of what I learned in the course by means of a long-term follow-up process than through an exam at the end of the course.

Some participants also mentioned that self-assessment caused less stress than examination: "Self-assessment is less stressful."

More than one quarter of the participants endorsing self-assessment as a first choice, considered that **examination prevented their learning**, not just because it can be stressful, but because it focused on only the limited aspects of what have been learned:

In self-assessment I must really evaluate the work I've done, whereas the exam seems to be just one performance in which you can succeed (pass) even when you don't completely comprehend things.

Approximately 23% of the justifications for choosing self-assessment were related to **external reasons**, mostly referring to timing issues, and not taking a stand on effects on learning: "It is better for my timetable."

Participants endorsing examination for the first choice reasoned most often that **examination enhances their learning** by challenging and motivating them to learn.

I choose the exam because I regard it as a more challenging alternative to myself.

I feel the exam is a motivating and pleasant way of assessing mastery.

Examination was also considered to accomplish long-lasting learning outcomes and to be a good way to validate what one has learned.

The exam creates extra motivation to permanently learn the content. It is also, in my opinion, a good way to validate one's level of mastery.

**Negative aspects of self-assessment** were also reasons to choose examination as the assessment method. Some participants had had negative experiences of self-assessment before and found it laborious and difficult: "Self-assessment is repulsive and difficult" or they were reluctant to try new experiences: "I'm not open to new experiences."

Those students who changed their initial choice from examination to self-assessment ( $n=14$ ) did it often based on practical reasons, such as a more flexible timetable. Some students changed their mind because during the course they found that self-assessment was beneficial for them or they wanted to try something new. Those four students who changed their choice from self-assessment to examination argued for instance that they felt they could perform better in the examination than by doing self-assessment.

## Discussion

In our study, most students chose self-assessment instead of exam. This is in line with several previous studies in which students have been found to prefer novel assessment methods over traditional ones (Struyven et al., 2005). However, it contradicts previous studies in which mathematics students in the UK have been found to prefer exams (Iannone & Simpson, 2015, 2017). The cultural context of these studies may explain the different results to some extent. In Finland, assessment is not high-stakes: exams can be retaken easily and single course grades do not affect students' studies or future careers. In the UK, assessment is often high-stakes, and this may lead students to view alternative assessment as risky. Finally, in the case of our study, the teacher informed the students about the benefits of self-assessment, which may have affected students' choices.

In previous studies, mathematics undergraduate students have been found to prefer assessment methods that they perceive to discriminate according to academic ability (Iannone & Simpson, 2017). We found similar perceptions in our study when students described how a certain assessment method enhances or prevents learning. What is notable is that some students linked the discriminating ability with exams but others with self-assessment.

Our study design allowed students to achieve agency in assessment in several ways. Practising self-assessment in a formative setting is itself a typical way to include students in assessment (Panadero et al., 2018). Also, some students opted for summative self-assessment, which has been reported to enhance future-driven agency and ownership of learning more than formative self-assessment (Nieminen & Tuohilampi, 2020). Thirdly, students were given power to choose the assessment method themselves.

Students' reasons for choosing the assessment method give information on how they regulate their learning in Pintrich's model for self-regulation (2000). Students who chose the exam expressed regulation of affect or behaviour: they enjoyed exams or found self-assessment disagreeable, or they felt that exam would challenge them to study harder. Students who chose self-assessment expressed similar regulation: self-assessment was more flexible in terms of scheduling (behaviour) or less stressful (affect). However, they also mentioned aspects of motivation and cognition, stating that they would learn more or in a more holistic way, and even metacognition, claiming that self-assessment would enable them to monitor and learn about their own learning.

From the teacher's point of view, it is valuable to understand not only what kind of assessment students prefer, but also what they would consider important given the chance to choose a method themselves. This knowledge will help in designing new, student-centred assessment structures. Allowing students to make the choice also revealed detailed information about what they focus on when regulating their own learning in an authentic situation. However, since it was the teacher of the course who collected the students' choices and justifications, some students may have embellished their reasoning, even though they knew that their answers would not affect their grades. This must be taken into account when drawing conclusions from the results.

The current study design offers several possibilities for future research concerning student agency in assessment. We will continue by analysing students' justifications further and by linking them to quantitative data on self-regulation and approaches to learning. As another direction that could be

based on a similar design, we recommend studying the effects of increased agency in assessment on students' academic achievement or well-being.

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