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Pre-service teachers' perception of LGE-tasks through a digital assessment system

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Introduction

This proposal outlines a study of pre-service teachers' (PST) perceptions at their first meeting with learner-generated example-tasks (LGE) provided through a digital assessment system. Perception, in this context, refers to the process of becoming aware of and interpreting information received from the environment through one's senses. In LGE-tasks, the learner is asked to construct their own examples, satisfying some given properties (Watson & Mason, 2005). This process is a natural part of mathematicians' everyday life with developing mathematical concepts and theories, testing new ideas, and verifying assumptions. For PSTs, working with LGE might be a method that engage them in "exploring, enriching, and extending their appreciation of mathematical structures, concepts, and connections among topics" (Watson & Mason, 2005, p. x). Further, mastering this method allows PSTs to implement LGE in their own teaching, providing similar benefits to their students.

Exercises with LGE can take various forms, for example, a series of tasks as 'write down two numbers that differ by 3', 'give another pair', 'give a pair that no one else in the student group will suggest', 'describe the class of these numbers' (Watson & Mason, 2005). The example with a series of tasks will both enable students' creativity and aim for a general conclusion, where applying algebra might be useful. This proposal builds on such series of tasks.

There are expectations from both the Norwegian school system and the society that future teachers master digital tools. In addition, a computer algebra system is proved to be a powerful tool for assessing LGE-tasks (Sangwin, 2019). We therefore decided to design LGE-inspired tasks in the digital assessment system STACK (System for Teaching and Assessment using a Computer algebra Kernel).

The purpose of this study is to explore how pre-service teachers perceive learner-generated example tasks when engaging in them for the first time.

Methods

The study took place at a university in Norway, involving $N = 21$ pre-service teachers (for grades 1–7) during their second semester of studying mathematics. Data were collected using a series of tasks consisting of learner-generated examples, following the pattern mentioned above (cf. Watson & Mason, 2005), with a total of 7 tasks, presented in Table 1. The first author took fieldnotes during the implementation with focus on utterances from the PSTs, e.g., their immediate responses to the tasks or if someone asked for help during the exercise. Afterwards, three semi-structured individual interviews were conducted, with emphasis on the PSTs' perception of the tasks. Data were analysed by both authors with a focus on the interviewees' perceptions of the tasks.

Table 1: The LGE-inspired tasks given in phase one

1	Give an example of a straight line that goes through the point (3, 2).
2	Give another example of a straight line that goes through the point (3, 2).
3	Give another example of a straight line that goes through the point (3, 2) and is horizontal.
4	Give another example of a straight line that goes through the origin (0, 0) and the point (3, 2).
5	Give another example of a straight line that goes through the point (3, 2) and has negative rate of increase.
6	Give another example of a straight line that goes through (3, 2) and you think nobody else in your class will give.
7	What is different/similar for all straight lines you have given. Can you generalise? Explain.

Findings and discussion

Introducing a new method to the PSTs resulted in frustration and descending motivation for doing mathematics. One challenge was that the LGE-tasks lacked information usually found in standard tasks, which made it difficult for the students to identify what was asked from them. Many of the students commented that they did not have any strategies when they faced new challenges in mathematics, leading to that they either did nothing at all or just made some random attempts. They also expressed they were used to getting the one right answer after completing a task, which led to insecurity since no detailed feedback was provided after they had answered these tasks. However, one student, who understood the tasks, experienced joy of creating own examples and saw this as an opportunity to challenge himself. That students' first perception of LGE-tasks varied was also found by Breen et al. (2016), who reported that integrating LGE-tasks to students' mathematical repertoire is challenging. To be successful, it is essential to prepare the students for the method and that they practice LGE regularly. However, we believe that working with LGE-tasks at an appropriate level, so they are perceived as challenging yet manageable, can enhance students' learning. Hence, for future studies, we find it relevant to explore how LGE-tasks and the feedback provided can be designed to optimise students' learning, and, in the case of PSTs also investigate how this method may impact their future teaching in mathematics.

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