MASTER'S THESIS

Course code: MAT5006 Name: Ylva Høgset

Students' appraisal of mathematics tasks

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1 Introduction

What I want to explore in my master's thesis is what kinds of tasks students tend to like, and what kinds of tasks they tend to dislike. I also want to investigate whether the students' opinion on the task is related to their thoughts about whether or not they can solve it. In addition, I also like to know whether teachers have an idea about what kinds of tasks the students like or dislike. Acquiring knowledge about what tasks students like and why they like or dislike them opens opportunities for teachers to adopt their teaching to the students' interest. In this way, the teachers can also make their teaching more in line with the needs of the students which is an important requirement of the Norwegian law of education (Opplæringslova, 1998, §1-3).

1.2 Background for choice of research questions

The reason why I am interested in this topic and why I want to investigate it goes back to an earlier experience. When I was in the third year of university and was writing my FoU paper, I investigated how a type of problem-solving task can be helpful for students who are good at mathematics. Some peers of mine investigated problem solving at the same time and in the same grade, and we found that the students in the class got particularly tired of the type of tasks in which students needed to gather data by themselves. This experience made we aware that some tasks are disliked by students. Then I was wondering whether this applies to all types of tasks and there are maybe tasks that the student like more. I think students' appraisal of tasks is a relevant topic to investigate. It is important to know this because the nature of the tasks the students work on is something that can affect motivation. Motivation is considered to play a crucial role in the learning of mathematics. It can have a lot of influence on students' performance. If they are not motivated, their learning will be of a lower quality than if they are motivated (Imsen, 2014, p. 313).

1.3 Research questions and approach to answer these questions

In this master's thesis study, I investigated the following research questions:

1. What types of tasks do students tend to like or dislike, and why they feel so?
2. Are students' perception of whether or not they can solve a task related to whether they like the task?"
3. How well do teachers know what types of tasks their students like or dislike?

To answer these questions, I gathered data from 67 eight-grade students from four schools and their teachers by means of two online questionnaires. In the student questionnaire the students were asked for a number of different kind of tasks whether they like or dislike them, and why they like or dislike them, and whether they think they can solve them. In the teacher questionnaire the teachers were asked what they think their students have answered to these questions.

1.4 Terms used in this thesis

In this section I explain the specific terms I used to indicate the different kind of mathematics tasks used in this study, including "context tasks", "bare number tasks", "straightforward tasks", "puzzle-like tasks", and "estimation tasks". Furthermore, I clarify what in this thesis is meant by "appraisal" and "solvability" of the tasks. More explications of the meaning of the used terms are provided in the theory section and the method section.

According to Gravemeijer and Doorman (1999, p. 111), context problems are defined as "problems of which the problem situation is experientially real to the student." Based on this definition, *context tasks* are in this thesis defined as tasks that have a context that places them in a realistic or realistic like scenario through the text that is included as a part of the task.

Bare number tasks are in this thesis defined as tasks that do not have any context which place them in a realistic or realistic-like scenario. The tasks only consist of number and operation symbols with sometimes a short text that tells the students that they have to calculate.

Straightforward tasks are defined here as tasks where it is clear what calculation has to be carried out.

Puzzle-like tasks are defined as tasks in which it is not explained at forehand how the tasks can be solved. The students have to make a model of the problem situation and have to think by themselves which problem-solving heuristics can be applied. Often students have to try several ways before they see a solution.

According to Seigler and Booth (2005, p. 298) a definition of estimation is "a process of translating between alternative quantitative representations, at least one of which is inexact." Based on this definition, *estimation tasks* are defined in this paper as tasks in which you have to find an approximate answer by using some rough information.

Appraisal is defined as the degree the students like or dislike a task as indicated by the score that they give to a task ranging from 5 (I strongly like this task) to 1 (I strongly dislike this task).

Solvability is defined as the degree the students think they can or cannot solve a task as indicated by the score they give to a task ranging from 5 (I am very sure that I can solve this task) to 1 (I am very sure I cannot solve this task.)

1.5 Structure of the thesis

After this introduction, in Section 2 I get into the theory that underlies this thesis. In this section I discuss relevant theory about attitudes to mathematics, motivation, math anxiety, the influence of types of tasks and task characteristics and teachers' approach to teaching mathematics and the use of different type of tasks. I conclude this theory section with some scientific theoretical considerations. In Section 3, I address the method I used for my study, being an online questionnaire for students and teachers. Here I explain why I have chosen this methodological approach and I describe how I set up the study and which instruments I used for it. In addition, I also add some thoughts about aspects of the quality of the study, such as validity, reliability, generalizability, and research ethics. In Section 4, I report about the results. Then in Section 5, I discuss the results and what they could mean. Section 6 contains a concluding summary of the thesis. Finally, the thesis is completed with the reference list.

2 Theory

2.1 Attitudes to mathematics

Math is often brought up when talking about bad experiences at school (Heggem, 2020). Attitudes towards mathematics consists of how one responds emotionally to mathematics, one's conceptions about mathematics, and a behavioral tendency towards mathematics (Nicolaidou and Philippou, 2003, p. 1). Many students start out with positive attitudes about math, but they often get less positive as the students get older and are very negative by high school (Nicolaidou and Philippou, 2003, p. 2). Younger students tend to report higher enjoyment and motivation to learning mathematics than older students (Russo & Minas, 2020, p. 222). This indicates that something could be causing students to lose interest in and change their attitudes and responses to mathematics as they grow older.

It is common to have different attitudes to different parts of mathematics, an example being that many people prefer whole numbers to fractions (Sidney, Thompson, Fitzsimmons, & Taber, 2021, p. 1). It is common for students to have an easier time working with whole numbers than with fractions or decimals because of natural number bias (González-Forte, Fernández, Van Hoof, & Van Dooren, 2019, p. 549).

The attitudes students have towards mathematics can be a result of repeated emotional reactions to mathematics, and something that can influence the initiation of emotions is the believes that the student has (Hannula, 2020, p. 32).

2.2 Motivation

The main reason to give the students tasks that they like is to make them more motivated to work with these tasks and learn mathematics. Motivation can be seen as the inclination to do some things and to avoid doing other things (Hannula, 2006, p. 165). Many theories about motivation focuses on appraisal of the behavior that the person is motivated to do, where the appraisal is a combination of the value of the behavior and outcomes, and what is expected to be the likelihood of the outcomes of the behaviors (Vu et al., 2021, p. 41 Figure 1 shows the cycle of motivation and achievement (ibid.)

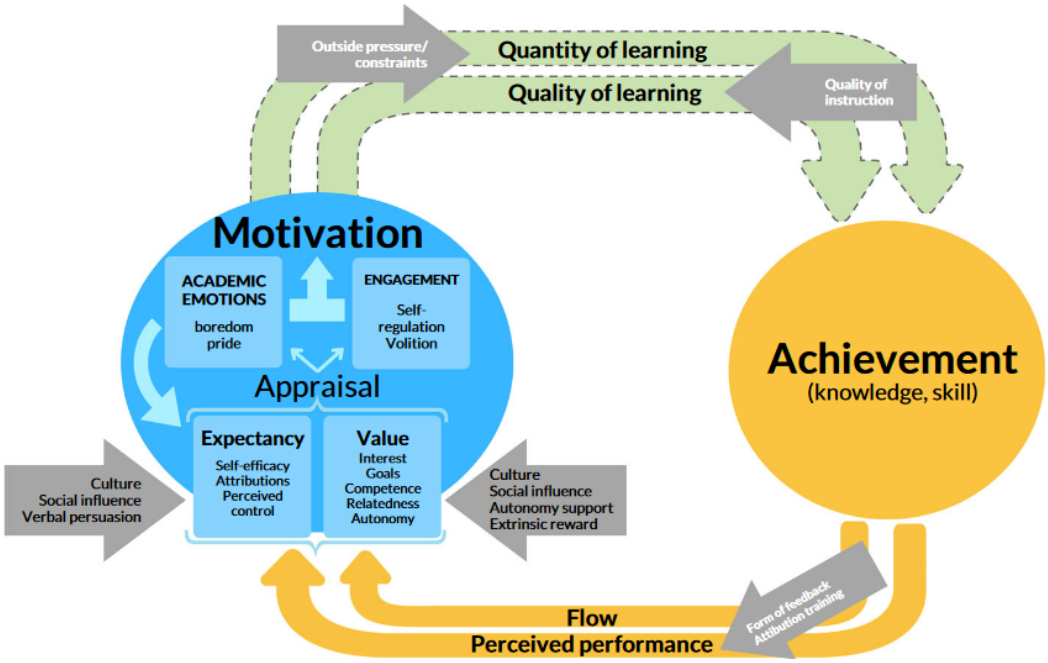


Figure 1. Motivation and achievement cycle (taken from Vu et al. (2021, p. 41).

When it comes to believes about solving a task, it can be beliefs about how important the task is (cognition), persistence (behavior) or it can be anger or sadness if they fail at solving it (emotion) (Hannula, 2006, p. 166- 167).

Motivation when manifested as emotion can come in the form of positive emotions or as negative emotions (Hannula, 2006, p. 167). The negative emotions are usually associated with doing poorly or failing, while the positive emotions are more associated with doing well and succeeding. Doing well in school can increase confidence, and being engaged with the work can increase how satisfied they are with their work (Evang, 2020, p. 284). This can further improve their motivation, and make them overall more positive to mathematics. If students are positive and engaged with mathematics, they have more motivation to try more challenging tasks, accept new ideas and to learn, even from their mistakes (Colgan, 2014). Mathematics skills is an important factor for indicating how well people do as adults, so a good mathematics education is important for helping the students master their own lives (Evang, 2020, p. 285).

Motivation is important for learning mathematics, and the purpose of having tasks that students like is that they will be more motivated to do the tasks and learn what you are trying to teach them. If someone has negative attitudes towards mathematics, it can negatively influence their motivation as well as their ability to learn and do mathematics (Colgan, 2014). It is therefore important to make sure the students have a positive relationship with mathematics, but this is often not the case. When people talk about bad experiences they had in school, mathematics is often brought up (Heggem, 2020). This shows that mathematics is an unpopular subject that not a lot of students are very motivated to work with. This can cause people to be inclined to avoid mathematics when they are able.

2.3 Math anxiety

Many people are struggling with math anxiety, and this affects their performance in and motivation for learning math. It makes it more difficult to solve the tasks and makes the students less motivated to try to learn. Math anxiety can be defined as a feeling of fear, tension or apprehension towards activities that are related to math (Li, Cho, Cosso, & Maeda, 2021, p. 1017). The appraisals, achievements, and emotions of students are linked by some reciprocal effects that happen over time, and the effects involve cycles of negative effects of appraisal, emotions and performance, and cycles of positive effect (Forsblom, Pekrun, Loderer, & Peixoto, 2022, p. 363). Negative emotions that have an effect on math

achievement are anger and hopelessness, where hopelessness seems to play a particular part and was found to play a part both on tests and in the classroom (Peixoto, Sanches, Mata, & Monteiro, 2017, p. 2).

A way to look at the how math anxiety affects motivation is with control-value theory. This theory proposes that the positive and negative emotions an individual experiences in achievement situations are resulted from their interpretations and appraisals of the achievement activities and their outcomes (Li, Cho, Cosso, & Maeda, 2021, p. 1019). Control-value theory includes competency believes of students, and students who perceive themselves to be competent tend to have less math anxiety. (Li, Cho, Cosso, & Maeda, 2021, p. 1019). Another theory about anxiety is expectancy-value theory. Assuming that anxiety is related to threat and expectations, it would depend on the expectations that one has of future events, and on the value placed in the events (Perkun, 1992, p. 23).

2.4 Influence of type of tasks

There are many different types of tasks, and students may work differently depending on the task. Which tasks teachers choose to give the students has ha major part in determining the quality and nature of their learning (Clarke & Roche, 2018, p. 95). To know what types of tasks students generally prefer, it is important to know what defines different types of tasks. The types of tasks I describe in this thesis are context tasks, problem solving tasks, and estimation tasks.

2.4.1 Context tasks

A context task is a task that gives a context for the students with the purpose of helping them to understand and find an answer to the task. The context is meant to be something the students can relate to, which can be helpful since many students dislike mathematics and see it as irrelevant (Clarke & Roche, 2018, p. 96). Context tasks are meant to help them see how mathematics can be relevant to them. These tasks are used because of an emphasis on the usefulness of what the students are supposed to learn, and because they are meant to motivate them (Gravemeijer & Doorman, 1999, p. 111). Despite the intent of using these types of problems, students can still have some problems solving context tasks. These problems are usually difficulties with understanding what the problem is about, seeing what is relevant and what is irrelevant information, and identifying what mathematical procedures can be used to solve the task (Wijaya, Van den Heuvel-Panhuizen, & Doorman, 2015, p. 42).

According to realistic mathematics education, giving students contextualized tasks can provide learning and help the students make use of their own previous knowledge and experience to understand the tasks better (Clarke & Roche, 2018, p. 96). What experiences each student has is a factor that determines if the context is relevant or not (Widjaja, 2013, p. 152). Problems of a very personal nature can make the students more engaged, shift believes about mathematics, and enhance their opportunities for learning (Clarke & Roche, 2018, p. 96-97).

2.4.2 Problem solving tasks

When learning mathematics, students should feel that the subject is relevant, and that they should explore and use problem-solving (Norwegian Ministry of Education, 2021). For students to be interested in solving a problem, it is important that the tasks are meaningful to them (Dindyal et al., 2010, p. 749). It is preferable that students are able to transfer what they learned in the problem solving prosses to other situations, whether they be within or outside mathematics (Dindyal, et al., 2010, p. 752). This goes back to realistic mathematics education, which was mentioned in the section about context tasks.

One way to think about problem solving is that there are five steps to it: reading and thinking, exploring and planning, choosing a strategy, finding an answer, and reviewing and discussing (Rahmah, Mardiyana, & Saputro, 2021, p. 2). There are different thinking styles that can affect which problem-solving strategy students are more likely to use (Rahmah, Mardiyana & Saputro, 2021, p. 5). This is different from the approach used with more straight forward tasks, where it is often clear how you are supposed to solve it.

Most primary school students are positive to learning mathematics through challenging problem-solving tasks, and about half of them find it fun or enjoyable to learn mathematics in this way (Russo & Minas, 2020, p. 222). Most of the students who were ambivalent to this sort of task reported the tasks to be challenging or hard, but most of the students who reported that the tasks were hard had a positive attitude to them (Russo & Minas, 2020, p. 222).

2.4.3 Estimation tasks

Estimation is an activity that is pervasive in the lives of both adults and children and is an important skill in everyday life (Andrews, Xenofontos, & Sayers, 2021, p. 1). Despite this, there is little estimation taught in schools, and many teachers do not have a good conception of the topic and how to teach it (Andrews, Xenofontos, & Sayers, 2021, p. 1-2). People who

are good at estimating numerical quantities with the use of the approximate number system tend to perform better in math, and being good at this may in some cases be a protective factor that can help negate some of the negative effects of math anxiety (Braham, & Libertus, 2018, p. 11).

There are different types of estimation that is used in everyday life and can be taught through tasks and activities in school. Computational estimation is when you simplify a problem by using procedures and rules to get an approximate answer through mental calculation (Sunde, Petersson, Nosrati, Rosenqvist, & Andrews, 2021, p. 2). This is useful for when you do not need a precise answer, as it takes less time and effort. Measurement estimation is measurement without measurement tools, and can be used when precise measurement or calculation is defined as unnecessary or impossible within the context (Sunde, Petersson, Nosrati, Rosenqvist, & Andrews, 2021, p. 2). Number line estimation is the ability to estimate where on a number line a number falls, and it usually gets easier with age (Sunde, Petersson, Nosrati, Rosenqvist, & Andrews, 2021, p. 3). Quantity estimation is the ability to produce or discern the quantity of something without counting it (Sunde, Petersson, Nosrati, Rosenqvist, & Andrews, 2021, p. 3). In the Norwegian curriculum there is very little allusion to the role of estimation in mathematics in any of these forms, and in the Danish and Swedish curriculum there is only mention of some of the types of estimation (Sunde, Petersson, Nosrati, Rosenqvist, & Andrews, 2021, p. 11). It is therefore probably safe to assume that Scandinavian students, especially Norwegian students, do not have much experience working with these sorts of tasks in school.

2.5 Influence of tasks characteristics

2.5.1 Difficulty level of tasks

A lot of students find it fun to work on challenging problem-solving tasks, but a study found that it is more common among students in years 3 and 4 to have a positive attitude compared to students in year 5 and 6 (Rosso & Minas, 2020, p. 220). The cognitive demand of instructional tasks has been found to be important for enhancing the positive relationships students have with mathematics, as well as improving their learning of mathematical skills and knowledge (Ni, Zhou, Cai, Li, Li, & Sun, 2018, p. 13).

2.5.2 Type of numbers involved

Many students rely on their knowledge of whole numbers when working with other types of numbers, and this is called whole number bias (Sidney, Thompson, Fitzsimmons, & Taber,

2021, p. 3). This can result in errors such as believing 1/7 is greater than 1/4 because 7 has a higher value than 4. Whole number bias can also be called natural number bias, and this along with students often struggling with the magnitudes if fractions are big parts of why students struggle with fractions (Reinhold, Obersteiner, Hoch, Hofer, & Reiss, 2020, p. 1). Many students have similar difficulties related to whole number bias when it comes to decimal numbers, where they would for example believe 0.476 is greater than 0.9 because having more digits means a larger number (Roell, Viarouge, Houdé, & Borst, 2019, p. 240). Some students seem to separate math into different groups depending on number types, and have difficulty seeing the similarities and connections between these groups, but this tends to happen less when they get further into their education (Sidney, Thompson, Fitzsimmons, & Taber, 2021, p. 4-5).

2.6 Teachers' approach to teaching mathematics

There are different opinions on how mathematics should be taught. These disagreements are in some cases referred to as math wars, and people can get really passionate about these debates. In the United States there was a lot of math war debate in the 1990, but had the seeds of the disagreements started in the 1980 (Klein, 2007, p. 22). This is not the only time or place were math wars have taken place. In the Netherlands there was also a math war in which people criticized using meaningful contexts from daily life to teach mathematics, and instead propagated the return to the traditional way of teaching (Van den Heuvel-Panhuizen, 2010). Another example of these math wars was in Canada after the release of the 2012 PISA results (McFeetors & McGarvey, 2018, p. 21). What a teacher believes about how mathematics should be taught can affect what tasks they give to students and what they believe their students think about the tasks they have been given.

There are different ideologies when it comes to mathematics education. An ideology can be described as a value-rich overall world view or philosophy, or a broad inter-locking system of believes and ideas (Wright, 2012, p. 7). One way to classify the ideologies teachers can have about mathematics education is to group them into old humanists, technological pragmatists, industrial trainers, progressive educators, and public educators, but individual educators are not fully or exclusively within any one of these categories (ibid). The old humanist ideology is no longer that common among educators, and is based on a desire to maintain the rigorous and abstract nature of mathematics (ibid). The technological pragmatist ideology is based on the utilitarian idea that you should promote skills that can be useful in the workplace and is

therefore necessary for economic growth (ibid). The industrial trainer ideology based in the idea of treating schools and education like businesses, for example with marketisation and selection in schools (ibid). The progressive educator ideology sees the nurturing of the individual and acquisition of concepts and skills that are appropriate to the learner as the primary purpose of mathematical education (ibid). The public education ideology is focused on equality and justice, and using mathematics education to promote democratic citizenship and equality (ibid).

As a whole, many teachers seem reluctant to give their students tasks that are more challenging and uses multiple strategies (Wilkie, 2016, p. 2061). Teachers have expressed a concern that the more high-achieving students would get bored learning more strategies, and the students who were less capable would become confused (Wilkie, 2016, p. 2077). Despite these concerns, students who were given a number of challenging tasks throughout the year responded in a mostly positive way (Wilkie, 2016, p. 2077). When developing problem solving proficiency teachers often favor tasks with lower cognitive demand, even though student learning is greater with more cognitively demanding tasks (McCormick, 2016, p. 455). This shows that teachers can have a tendency to avoid some more difficult tasks that can be helpful for the students to go through, and may not know enough about the preferences of their students.

2.7 Scientific theoretical considerations

My study can be situated within the hermeneutics and constructivist approach to scientific research. The hermeneutics theory emphasizes the subjective interpretation of meaningful phenomena, in which our background and experience shape our ability to interpret the phenomena that a person with other experiences is describing (Gilje & Grimen, 1993, p. 142-143). I kept this in mind when I was analyzing the data collected in my research project. Different students may have different reasons for the responses I received from them based on their different experiences and backgrounds with mathematics. The teachers may have taught different students in a different way, and this may likely affect how the students think about mathematics tasks.

The constructivist theory states that reality is constructed by humans through their experiences and social relations (Høgheim, 2020, p. 22). According to this theory there is no objective reality, but rather multiple created realities that are different for each person (Høgheim, 2020, p. 22). A criterion for truth related to constructivism is consensus theory,

which states that a perception is correct if it is agreed on universally or by a specific group of people, meaning there must be some sort of social agreement (Høgheim, 2020, p. 22). I choose to use this theory because what each students' opinion is on the tasks is a part of their reality. By trying to interpret the realities of multiple students, my intention is to try to find a trend of what is generally true for most of the students.

These two theories can be combined by looking at the different experiences and backgrounds that play a large part in hermeneutics as the reasons for the different realities that each person has according to consensus theory as used in constructivism. This is what I kept in mind when analyzing the data collected in this study.

3 Method

In this part of the thesis, I describe the methodology of my research project. Here I describe how I set up the study, the sample that was involved in my study, and the instruments I used for it. In addition, I also add some thoughts about aspects of the quality of the study, such as validity, reliability, generalizability. At the end of this section, I discuss the research ethics of my study and the chosen methodology.

3.1 Set up of the study

To answer the three research questions, I carried out a survey among students and teachers to figure out the students' appraisal of mathematics tasks and their teachers' knowledge about this. I chose this method because to find the opinions and thoughts of the participants it would be easier to ask them instead of observing their behavior. Moreover, since I like to have a lot of participants it would take a lot of time to do individual interviews. To collect the data, I developed two online questionnaires, one for the students and one for the teachers. The questions in the questionnaire are partly closed and partly open questions.

Using a questionnaire where the participants have to choose an answer from a list of option has the benefit of making it easier for them to answer (Johannessen, Tufte & Christoffersen, 2021, p. 292). This may make it more likely that the students will finish answering the questionnaire. There is also a downside, because this structure makes it so that you will not get any information beyond the exact things you ask for (Johannessen, Tufte & Christoffersen, 2021, p. 292). A questionnaire can be considered to be a type of interview. A standardized interview with fixed options has a lot of structure, and it is easy to compare answers, but is little nuance and deeper understanding to find with this method alone

(Bjørndal, 2017, p. 109-110). This is why I have the second question for each task be more open. This allows for the participants to explain with their own words, but it can be a bit difficult to interpret these answers if some of the participants are not used to expressing themselves in writing (Johannessen, Tufte & Christoffersen, 2021, p. 292).

3.2 Sample

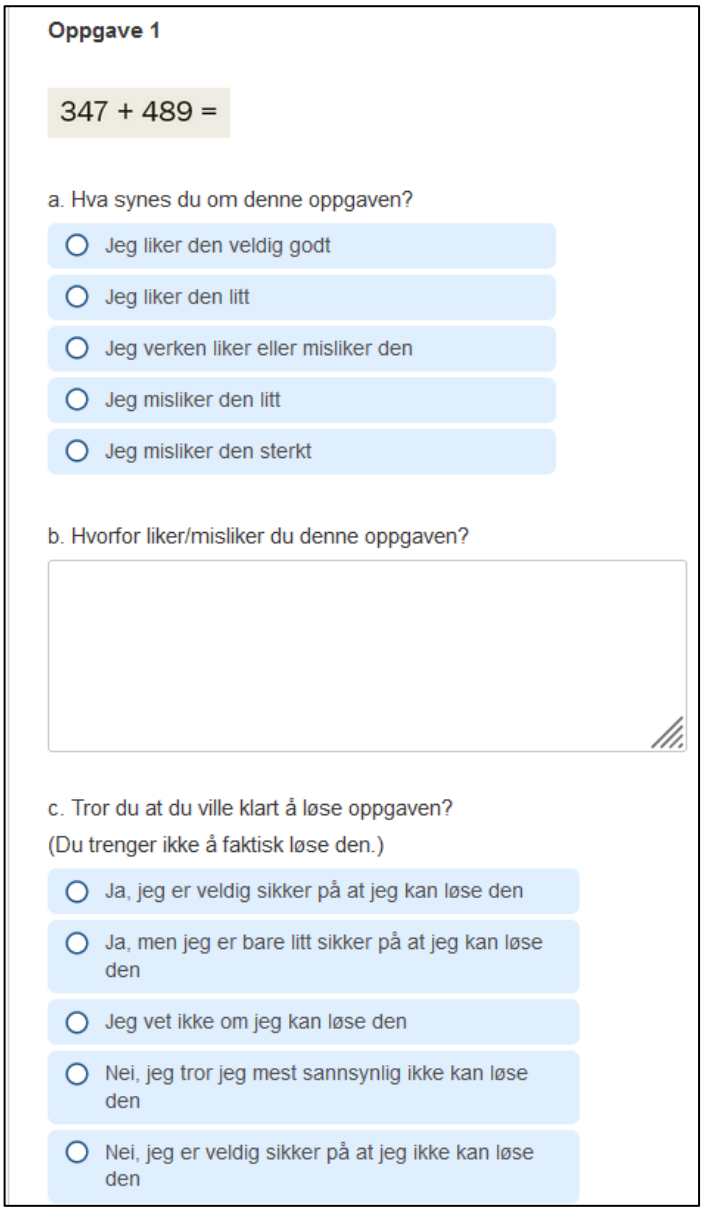
I found the participants by sending an e-mail to about twenty schools in Northern Norway with information about the project and asking whether there were 8th grade math teachers who would like to participate. The group of schools which were contacted included both large and small schools. In the end two large and two small schools in the Nordland region were willing to participate. One school was specifically for grades 8 to 10, while the other three schools had students in grade 1 to 10. The participants involved in my study were 67 eight-grade students and their math teachers. The four schools have all checked whether the students and their parents have given their consent to participate in the study.

3.3 Material

The instrument I used for this study is an online questionnaire because then I could get all the responses into one place immediately instead of having to enter them all into my computer by hand as I would have to do if I had used a paper questionnaire. It would also be easier to read the responses if they were typed out than if they were written by hand, and it would be easier to gather data from schools that are further away than if I had to gather or be sent the answered questionnaires. The online tool I used for the questionnaire is implemented in nettskjema.no. I chose this environment because it allows you to make sure that no personal or traceable information of participants is collected. The participants were given a link to the questionnaire, and they only had to click on the link to start with the questionnaire. There were no requirements for logging in and no personal information was asked to the participants. The questionnaire was completely anonymous.

The developed questionnaire consisted of twenty-four math tasks. In the questionnaire for the students, they were asked for each task whether they like or dislike this task.-The students could choose between five options ranging from liking it very well to strongly disliking it, with the middle option being not liking or disliking it. They were also be asked why they feel that way about the task. In the third and last question they were asked for each task was if they think they can solve the task. They had five options to choose from, ranging in certainty

from being very certain they can solve it to being very certain they cannot solve it, with the middle option being unsure. Together with this last question the students were explicitly told that answering this question did not mean that they actually had to solve the task. Figure 2a (English translation in Figure 2b) shows for one task what the students saw on the screen when they worked on the questionnaire.



a. What do you think of this task?

- I like it very much
- I like it a little
- I neither like nor dislike it
- I dislike it a little
- I strongly dislike it

b. Why do you like or dislike this task?

c. Do you think that you would be able to solve this task? (You do not need to solve it.)

- Yes, I am very sure that I can solve it
- Yes, but I am only a bit sure about it
- I do not know whether I can solve it
- No, I think it is most likely that I cannot solve it
- No, I am quite sure that I cannot solve it

Figure 2a. Screen view from the student questionnaire. Figure 2b. English translation

Each task together with the three questions were presented on one page, which made that the students still could see the task when they answered the questions. At the start of the questionnaire one page was included with information about the questionnaire, and at the end there was a page with a ‘thank you’ for answering the questionnaire.

The teachers were given a questionnaire with the same tasks and the same questions as the students. However, they did not have to give their personal opinion about these questions. Instead, they were asked to tell what they think most of their students will answer to these questions, and why they think they would answer in such a way. Regarding the last question the teachers were asked whether they have an idea of how many students will think they can solve the task, and if so, what percentage they think will be able to do this. They were also informed that the students were not meant to solve the task before answering this last question. Figure 3a (English translation in Figure 3b) shows for one task what the teachers saw on the screen when they worked on the questionnaire.

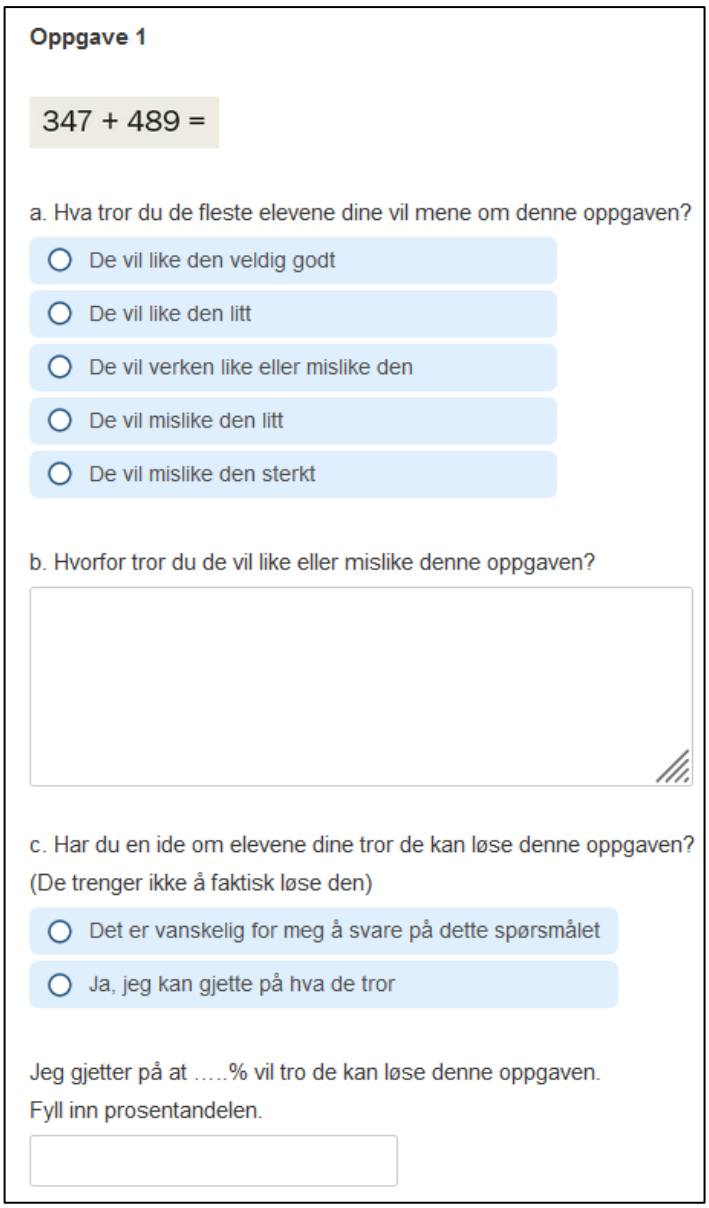


Figure 3a. Screen view from the teacher questionnaire

a. What do you think most of your students will think of this task?

- ❍ They will like it very much
- ❍ They will like it a little
- ❍ They will neither like nor dislike it
- ❍ They will dislike it a little
- ❍ They will strongly dislike it

b. Why do you think they will like or dislike this task?

c. Do you have an idea whether your students think they can solve this task? (They do not need to solve this task!)

- ❍ This question is difficult for me to answer
- ❍ Yes, I can make a guess about it.

My guess is that …..% will think that they can solve this task.
Fill in the percentage.

Figure 3b. English translation

Both questionnaires were open for answering from the 25th of November 2021 to the 15th of January 2022. All the student responses were gathered in early January 2022, while the teacher responses were more spread out.

Before putting the final version of the questionnaire for the students online I first did a tryout in order to investigate whether the tasks and the questions were clearly formulated and whether the number of tasks was feasible. For doing this tryout I asked an 8th grader from another school to answer the questions and give some feedback. It turned out that the questions and tasks were clear for the student and that they did not need much time to finish the questionnaire. This assured me that there were no major problems with the wording of the questionnaire, or that there were so many tasks that most of the students would tire of answering long before finishing the questionnaire.

The math tasks included in the questionnaire were originally taken from two math textbooks for 8th grade, and some of them were altered or replaced by other self-made tasks. Both textbooks were published recently, and therefore followed the new curriculum for mathematics education in Norway. The tasks that were chosen from the textbooks were marked by the textbook authors as being of medium difficulty, and it was attempted to have the altered or self-made tasks at about the same difficulty as the ones from the textbooks. This was done to limit the effect the difficulty level of the tasks would have on the students' appraisal of the tasks. Furthermore, the tasks were chosen from the earlier chapters of the textbooks so that it would be likely that the students would have already learned about the tasks like these before they had to answer the questionnaire. Many of the topics in these chapters were also topics that the students would be familiar with from earlier grades. In this way it can be avoided that unfamiliarity with the topics addressed in the questionnaire would influence the answers of the students.

Table 1 shows an overview of the different task types included in the questionnaire. The tasks are classified based on how the problem is presented (as a bare number problem or as a context problem), the nature of the problem requiring a particular way of mathematical processing (straightforward calculating, puzzling, or estimating), the operation involved (+, -, x, :) and the number type involved (whole numbers, fractions, decimals, percentages). For every subcategory of the task types is indicated how many of these were in the questionnaire. Moreover, of each subcategory a sample task is given. For the complete questionnaires with the tasks see Appendix 1 and Appendix 2.

Table 1. Type and number of tasks included in the questionnaire and sample tasks

Task type	Subcategory	Number of tasks	Sample task from the questionnaire
1. Presentation of the problem	Bare number problem	10	14 x 78 =
	Context problem	14	There are 12 bottles that has 1/2 litres each. How many litres does each person get if there are eight people sharing?
2. Nature of the problem	Straightforward problem	14	You are selling buns for 15kr, and jam is 5kr extra. You buy ingredients for 132kr, and sell 84 buns. Every 4th bun had jam on it. How much money did you earn?
	Puzzle-like problem	7	The difference between two double-digit numbers is 50. How many such pairs of double-digit numbers are there
	Estimation problem	3	Make an estimation of the hours you sleep in one year. Explain how you came to your answer.
3. Operation involved	+	2	347 + 489 =
	-	3	912 – 677 =
	x	2	$\frac{22}{15} \text{x} \frac{45}{44} \text{x} \frac{18}{10} =$
	:	1	592 : 37 =
	mixed	16	2/9 of the people on a restaurant are adults. If there are 95 more children than adults, how many children are there in the restaurant?
4. Number type involved	Whole numbers	16	100 marbles in row. Lisa starts on the left takes every time 7 marbles and Tim starts on the right and takes every time 3 marbles. They stop when no marbles are left. How many marbles will each get?
	Fractions	4	$\frac{13}{6} - \frac{7}{15} =$
	Decimals	2	Rocco has 1.5 litres of orange soda and 2.25 litres of grape soda in his fridge. Antonio has 1.15 litres of orange soda and 0.62 litres of grape soda. How much more soda does Rocco have than Angelo?
	Percentages	2	What is more 15% of 750 or 35% of 350?

As can be seen in Table 1 the number of tasks is not for every subcategory the same. The number of context problems is fourteen tasks and bare number tasks is ten, which is not too far apart. Regarding the nature of the problems the majority are straightforward problems with fourteen in total. There are half as many puzzle-like problems with a total of seven, and there are three estimation problems. With respect to the operation involved the tasks were mostly with mixed operations and for the number types involved the most part of tasks was with whole numbers. In choosing these numbers of types of tasks we tried more or less to follow the proportion of tasks that students can come across in textbooks. In general, there are only a

few estimation problems and in many cases the tasks involve mixture of operations. The reason of having a substantial number of context problem was that I wanted to investigate whether the context situation had an effect on the students' answers, and that would be easier if there were a larger number of context problems to give more variation in the situations of the context.

The tasks were ordered in the questionnaire in such a way that there were not too many of a certain type after each other. This was done so that the order in which the participants would see the tasks would have less of an effect on how they would answer the questions. The first few tasks were among the easier ones. This was done in order not to make the participants lose their motivation in the beginning. The motivation to answer and the mood of the participants can be different at the start, the middle and the end of the questionnaire. Before I made the final version for trying out the questionnaire with one eight-grade student, as mentioned earlier, I made three drafts of the questionnaire to think about what the best order will be. I thought that if there were a lot of similar tasks in a row, then the students would get used to those tasks. This would make that the students would be more familiar with a certain type of task towards the end of the questionnaire. Consequently, this could affect the students' appraisal of the tasks and could affect how they think about the solvability of the tasks. It could also make that the students become a little scared when a new type of task would come up. Also, if the tasks were grouped in types of problems, then this could affect the students' answers and skew the results, especially when the participants were a bit tired of answering towards the end of the questionnaire. Spreading out the types of tasks would help diminish these problems.

3.4 Data analysis

I have analyzed part of the data in a quantitative manner, and part of it in a qualitive manner. For investigating what tasks students like (the first part of Research question 1) and whether students' perception about being able to solve a task is related to liking a task (Research question 2), I have used quantitative analyses. For investigating why the students like or dislike a task (the second part of Research question 1) a qualitative analysis method was used. Because there were only three teachers involved in the study, I only investigated in a qualitative way whether the teachers know how their students think about these tasks (Research question 3). For this I looked at the responses the teachers gave to the three questions in the questionnaire and compared these responses to the responses the students gave. In addition, I also compared the responses of the teachers with each other to see how

much the teachers are in agreement with one another when they are asked about their students' appraisal of tasks.

Regarding the quantitative analysis I used both descriptive statistics and hypothesis testing. For describing the students' appraisals of the tasks, I calculated for each task the average mean and the standard deviation. I used hypothesis testing to investigate whether there is a correlation between how much students like some types of tasks and the degree they think they can solve them.

A hypothesis is a claim that has the property of a guess or an assumption, of which it is not known whether or not the hypothesis is true or not (Gilje & Grimen, 1993, p. 24), and which has to be tested up against a set of data or observations (Gilje & Grimen, 1993, p. 25). There is a null hypothesis and an alternative hypothesis when testing hypotheses, where the null hypothesis is that there is no correlation (in my case between liking a task and thinking they can solve it) and the alternative hypothesis is that there is a correlation (Grønnmo, 2016, p. 346). You cannot prove the alternative hypothesis, but you can work to disprove the null hypothesis.

To analyze the responses the students and teachers gave to the first and the third question of the questionnaire I used SPSS. This means that I transposed the five options that could be chosen in the questionnaire questions (ranging from liking the task very well to strongly disliking the task; and ranging from being very certain they can solve the task to being very certain they cannot solve the task) into numbers (see Johannessen, Tufte & Christoffersen, 2021, p. 304). I did this by giving the options for the responses a value between 1 and 5 where 1 is the most negative option and 5 is the most positive. Then I first investigated how the students are appraising the different types of tasks and whether there are significant differences in the students' appraisal of the types of tasks (see Table 1 with the overview of the task types). To compare students' appraisal for TaskType1 (tasks with bare number problems and tasks with context problems), I started with looking at the descriptive statistics and the frequency distribution. Then I tested whether there is a statistically significant difference between the scores the students gave to both types of tasks. Finally, I also calculated the group mean ranks to identify the direction of the difference. Then I looked at the reasons the students gave for liking or not liking a task. After that, I did the same series of investigations for TaskType2 (tasks with straightforward problems, puzzle-like problems, and estimation problems).

I also investigated whether there is a correlation between how much students like a task and whether they think they can solve it. I first made a bar chart for each of the tasks showing how many students chose each option on question one and three, and I compared the bar charts for these questions. I did a correlation analysis to see whether there is a relation between liking a task and thinking you can solve it. I did this both with the individual tasks and all the tasks combined. I checked the correlation with Pearson's r, which gives a number between -1 and 1, where the values closer to 0 means that there is little or no correlation (Johannessen, Tufte, & Christoffersen, 2021, p. 325). I also tested whether there is a difference between how much students like the different types of tasks. This I did by gathering the data for each type of task into different groups and compared them by hypothesis testing. The null hypothesis would be that there is no difference, and the alternative hypothesis would be that there is a difference.

In my analysis I mostly focused on bare number problems vs. context problems, and straight forward problems vs. puzzle-like problems vs. estimation problems. The reason for this focus was that in the groups of operations and number types there were less than three tasks. Because of this very low number, I think these groups might not be representative for a particular type of tasks. Therefore, it might not be useful to compare these groups.

The answers to the question why the students like or dislike a task was analyzed in a qualitative manner. This question was asked in an open format. The students had to type out the answers themselves and could come up with a variety of reasons for liking or disliking a task which cannot simply be transposed into a fixed number value to be used in a statistical analysis. I used that information to find out more about the results of the quantitative analysis. I have read through the written responses for the tasks and sorted them into categories according to what they gave as the main reason for liking or disliking a task. I did this for all responses in the highest and lowest appraised tasks, and I also sorted the answers by appraisal score. When looking at what students thought about specific types of problems, I focused on the responses mentioning the specific type of problem or something related to it. I sorted the responses into categories based on what was said, and whether it was positive or negative to the type of task. When looking at the correlation between appraisal and solvability, I also looked at the written responses for some of the combinations of appraisal and solvability scores that stood out. This means that I looked at the students who gave for both a score of 1, students who gave a score of 5, and students who scored appraisal with a 1 and solvability with a 5.

Finally, I compared the perception the teachers have of their students' appraisal of the tasks with the scores the students gave themselves to the tasks. Since only a few teachers participated in the study it would not make sense to analyze these scores quantitively, so I looked at their responses in a qualitative manner.

3.5 Quality of the study

3.5.1 Validity

It is important that a questionnaire is made in a way that gives an answer to the research questions, and this can be done by wording the questions and optional answers in as concrete a way as possible (Johannessen, Tufte & Christoffersen, 2021, p. 292). This gives more detailed information, and makes it easier to interpret the information gathered (Johannessen, Tufte & Christoffersen, 2021, p. 292). In the questionnaire the students are asked about their opinion on different types of tasks, and this is directly related to the thesis. The students are asked about if they think they can solve the tasks, and this information can be compared with their opinion on the task to answer the research question about whether there is a connection between students liking a task and thinking they can solve it. The research question about whether teachers have an idea about what type of tasks the students like is answered by asking the teachers what they think the students will think about each task. This can be compared to the answers the students give about their opinion on the tasks to see if there is agreement between the two groups.

3.5.2 Reliability

The participants may want to give answers that they think that I want them to give instead of giving completely honest answers. How they feel about a specific task could also depend on their mood that day, or on how recently they worked with the specific topic that the task represents. When analyzing the data of the questions with optional answers, each option is given a number between 1 and 5. It is not likely that these numbers correspond to exactly how far apart the options are in opinion and certainty.

There could be cases where participants are unsure about which option to pick and their opinion is either somewhere between two options or not included. The questions with options have five options each in both the questionnaire for the students and the one for the teachers. Since there are two positive, two negative and one neutral option for these questions there should be enough options for the participants to find an answer that is at least roughly the same as how they would describe it if they were to use their own words.

When making a questionnaire, it is important to keep in mind the four phases of the cognitive process that the participants answering it go through. 1: that the participants should be able to understand and interpret the questions correctly, 2: that the participant must activate their memory and gather the relevant information, 3: that the participant must consider what information is relevant, and 4: that the participant formulate or mark off a relevant answer (Johannessen, Tufte & Christoffersen, 2021, p. 294). The questions in the questionnaire are worded in a simple way that 8th graders should be able to understand, and the questions for the teachers are worded in a similar manner. The short introduction on the first page also explains the purpose of the questionnaire, so they know what the questions will be about. The relevant information the participants must gather is related to their or their students opinion on different tasks and if they think they can solve it. There is a picture of each task on the same page as the questions related to it, so they have the task in sight while forming their opinion. It is made clear by the information they are given in the beginning and the options they are presented with, what information in relevant. The second question is the only one where the participants have to think about information that is not in an option they can choose, and they must decide for themselves how they will describe their reasoning. When it comes to giving relevant answers, they are given options that are not just either like or dislike, but has degrees of how much they may like or dislike it. They also have different degrees of certainty to choose from when asked if they can solve the task.

3.5.3 Generalizability

It is only possible to get exact information on the population if you have data from the entire population, and you do not know what the distribution is in a sample of the population compared to the entire population (Johannessen, Tufte & Christoffersen, 2021, p. 387). There are only four teachers answering the questionnaire, so there are limits to how much you can generalize their responses. There are also only four schools and four classes of 8th graders participating, and the differences between schools can have an effect on the answers the preferences of the students when it comes to the tasks. There can be many differences between schools that can be affected by for example if the school is old or new, what kind of work environment there is, or the local environment in the area (Imsen, 2016, p. 525- 526).

The small selection of schools is likely to not have a wide selection of different types of schools. This can give a picture that is skewed and does not resemble the average of all schools in the country. One thing to consider is if the sample represents the entire population (Johannessen, Tufte & Christoffersen, 2021, p. 427). All the schools in this study are in

Northern Norway, and there are likely be some differences from how people in other parts of the country would answer. A reason for this could be that northern Norway is less populated than many other parts of Norway, and this can affect the size and population of the schools.

3.6 Research ethics

I chose to make the questionnaire electronic because that way I could ask schools that are further away if they want to participate. It would also be safer considering that we are still in a pandemic, even if it has calmed down a bit from what it has been like earlier. By not traveling to the schools to give them the questionnaires on paper, it is less likely for me, the participants or others we may come in contact with to get infected with covid 19.

When doing research, it is important that the participants give free and informed consent to be a part of the study (Høgheim, 2020, p. 88). I asked schools if they had any teachers that would volunteer to participate, so they got to choose whether on not they did. In the e-mail I sent, there was information about what the study was about, what I wanted them to do if they were to participate, how they would do it, and when the deadline was to finish. I also put a short explanation of the purpose of the study in the beginning of the questionnaires so that both the students and teachers would be reminded if they had forgotten some of it. I know that the teachers got the information that I sent in the e-mail, and I assume that they either gave this text or a shorter summary to the students, or told them about the study in class. I do not know how well the students were informed as it was their teachers who were to convey the information as they saw fit, but I trust them to have done so in a satisfying manner.

Since the questionnaire is anonymous, I did not send an application to NSD. If a questionnaire is anonymous, you are not supposed to send an application to the Norwegian center for scientific data, or NSD (Norsk senter for forskningsdata, n. d.). I checked on the website for nettskjema.no that it was possible to make a questionnaire anonymous enough to not send an application to NSD, and I found that it was. I also made sure that I had followed the requirements listed for it to be anonymous enough. I chose to make it anonymous because I did not see a reason to gather personal information on the students or teachers for this study. If personal information is not necessary, it is best to not collect it so that the privacy of the participants can be upheld as much as possible.

All personal or sensitive information gathered about the participants is to be anonymized (Høgheim, 2020, p. 90). This will not be an issue since there is no personal information

gathered and the questionnaire does not gather data on who gave the answers. There are many students participating, but the number of teachers is rather low. This is not ideal for anonymity, but I do not know any of the teachers participating and will not be able to tell which responses are from which teacher based on their answers. I am the only one who has access to the answers, so no one who knows them would have the opportunity to attempt to do so. I have not informed anyone which schools that are participating other than each school knowing that they themselves will be a part of the study, so anyone reading my master's thesis should not be able to tell who gave the responses that will be analyzed. The number of students participating makes it even less likely for anyone to be able to recognize their responses. As their data will mostly be analyzed quantitively, that part of the results will not give information about who gave what answer. In the results from the qualitative analysis, some written responses are literally included in the thesis but not before I have translated them into English. So, the wording is not exactly the same. This combined with the number of students would make it difficult to connect an answer to a specific student. When I translated the answers from Norwegian, I simplified most of them somewhat with keeping the main point of what they are saying, so the exact translation of the wording of the students is a bit different.

4 Results

In this part of the thesis, I present the findings for the three research questions. I start in Section 4.1 with describing some general findings about the students' appraisal of tasks. Here I give an overview of how every task was scored, discuss which types of tasks were liked the most and the least, and which main reasons were given for that. In Section 4.2 I zoom in on particular types of tasks. I report on the results I found when comparing students' appraisal of tasks with bare number problems and tasks with context problems. In Section 4.3 I report in a similar way as in Section 4.2, but now for tasks with straightforward problems, puzzle-like problems and estimation problems. Then, in Section 4.4 I describe the correlation between the appraisal and the perceived solvability of the tasks. Lastly, in Section 4.5, I present the findings from analyzing the responses of the teachers and compare them to those of the students.

4.1 Students' appraisal of tasks

Out of 1608 possible ratings the students could give, 40 were left blank. This means that based on the 24 tasks there were 1568 ratings in total done by 67 students. Within the

appraisal range of 1 to 5, the mean score of all the tasks was 3.25. So, when taking all the scores together the tasks were scored close to the middle option. This indicates that the students neither were liking or disliking the tasks very much. The found mean standard deviation was 1.25. This value shows how far the students' scores on average deviated from the mean score.

Table 2 shows which of the tasks were liked the most (coloured green) and which were disliked the most (colored orange). The highest appraisal scores were found for the tasks including bare number problems. Of the ten bare number problems five had an average higher than 3.5, while of the fourteen tasks with a context problem there were only two with an average higher than 3.5. These two tasks containing a context problem are both related to playing football.

The highly appraised tasks with a bare number problem included three straightforward calculation problems (347+48, 912-677, and 14x78) and two puzzle-like problems (□3 – 2□ = 25 and 243 + 1□7 + □26 = 82). This may indicate that the challenging nature of a task does not automatically mean that the students do not like a task. About 45% of the students gave these two puzzle-like problems a sore of 4 or 5.

Regarding the five tasks of which more than 25% of the students gave a score of 5 there were three tasks with straightforward bare number problems, one with a bare number puzzle-like problem, and one with a context problem.

Table 2. Mean scores and standard deviations of the students' appraisal of tasks

			Mean score	SD	Absolute and relative frequency				
					Score:1	Score:2	Score:3	Score:4	Score:5
1	+ bare numbers	347 + 489 =	3.7879	1.08861	4 6.1%	3 4.5%	14 21.2%	27 40.9%	**18** **27.3%**
2	- bare number	912 – 677 =	3.5522	1.22206	6 9%	6 9%	17 25.4%	21 31.3%	**17** **25.4%**
3	fractions in context	There are 12 bottles that has 1/2 litres each. How many litres does each person get if there are eight people sharing?	2.9701	1.15431	7 10.4%	18 26.9%	18 26.9%	18 26.9%	6 9%
4	investigation with estimation context	Make an estimation of how many burgers you can buy for a million kroner? Explain how you came to your answer.	3.0625	1.31987	**10** **15.6%**	11 17.2%	20 31.3%	11 17.2%	12 18.8%
5	puzzle-like problem bare numbers	Fill the missing digits in in the boxes • 3 – 2• = 25	3.7164	1.02361	6 9%	4 6%	12 17.9%	26 38.8%	**19** **28.4%**
6	+/x in context	You are selling buns for 15kr, and jam is 5kr extra. You buy ingredients for 132kr, and sell 84 buns. Every 4th bun had jam on it. How much money did you earn?	3.0909	1.19907	**10** **15.2%**	8 12.1%	20 30.3%	22 33.3&	6 9.1%
7	puzzle-like problem in context	In a soccer tournament, teams get: 3 points for a win, 1 point for a tie, 0 points for a loss. Zedland has 11 points. What is the smallest number of games Zedland could have played?	3.5909	1.16325	5 7.6%	5 7.6%	18 27.3%	22 33.3%	16 24.2%
8	fractions bare numbers	$\frac{22}{15} \times \frac{45}{44} \times \frac{18}{10} =$	2.4848	1.09884	**15** **22.7%**	18 27.3%	21 31.8%	10 15.2%	2 3%
9	percentages in context	The shop gives 25% discount. The sale price of the binocular is 960 kr. What was the regular price?	2.9104	1.27602	**13** **19.4%**	11 16.4%	19 28.4%	17 25.4%	7 10.4%
10	puzzle-like problem in context	A family has three children that have a total age of 36. the youngest child is half the age of the middle child, and the oldest child is three times the age of the youngest. How old are the children?	3.3333	1.37375	**10** **15.2%**	8 12.1%	14 21.2%	18 27.3%	16 24.2%
11	percentages bare numbers	What is more 15% of 750 or 35% of 350?	3.2273	1.28656	**10** **15.2%**	8 12.1%	15 22.7%	23 34.8%	10 15.2%
12	decimals in context	The size of a carpet is 8.5 by 10 metres. 1.5 metres from the side is cut all around. What is the area in square metres of the reduced carpet?	3.1563	1.25	8 12.5%	11 17.2%	18 28.1%	17 26.6%	10 15.6%
13	puzzle-like problem in context	There is a row of books of different size on a shelf. There are 20 books to the left of the largest book and 22 books to the right of the smallest book. The largest book and the smallest book are both adjacent to the oldest one. What is the smallest possible number of books on the shelf?	2.9841	1.07	6 9.5%	13 20.6%	25 39.7%	14 22.2%	5 7.9%
14	x bare numbers	14 x 78 =	3.5909	1.30062	6 9.1%	9 13.6%	11 16.7%	20 30.3%	**20** **30.3%**
15	decimals in context	Rocco has 1.5 litres of orange soda and 2.25 litres of grape soda in his fridge. Antonio has 1.15 litres of orange soda and 0.62 litres of grape soda. How much more soda does Rocco have than Angelo?	3.2615	1.22827	8 12.3%	7 10.8%	21 32.3%	18 27.7%	11 16.9%
16	puzzle-like problem bare number	Fill the missing digits in in the boxes. 243 + 1• 7 + • 26 = 82	3.6	1.18322	7 10.8%	3 4.6%	12 18.5%	30 40.2%	13 20%
17	fractions bare numbers	$\frac{13}{6} - \frac{7}{15} =$	3.0154	1.20536	9 13.8%	12 18.5%	20 30.8%	27 26.2%	7 10.8%
18	investigation with estimation context	The traffic jam is 2 kilometres long. About how many cars do you think are in this traffic jam? Explain how you came to your answer.	3.3016	1.19993	7 11.1%	6 9.5%	22 34.9%	17 27%	11 17.5%
19	puzzle-like problem bare numbers	The difference between two double-digit numbers is 50. How many such pairs of double-digit numbers are there	3.0455	1.20807	9 13.6%	11 16.7%	22 33.3%	16 24.2%	8 12.1%
20	+/x in context	A football team is participating in a cup. There are 14 players from this team participating. Registration fee for the team: 1700 kr. Accommodation and food per person: 900 kr. Renting a bus to and from the cup: 4600 kr. How much does it cost for the team to participate in the cup?	3.7846	1.25614	5 7.7%	5 7.7%	14 21.5%	16 24.6%	**25** **38.5%**
21	: bare numbers	592 : 37 =	3.1538	1.26529	9 13.8%	9 13.8%	21 32.3%	15 23.1%	11 16.9%
22	fractions in context	2/9 of the people on a restaurant are adults. If there are 95 more children than adults, how many children are there in the restaurant?	2.8	1.09259	9 13.8%	14 21.5%	28 43.1%	9 13.8%	5 7.7%
23	puzzle-like problem in context	100 marbles in row. Lisa starts on the left takes every time 7 marbles and Tim starts on the right and takes every time 3 marbles. They stop when no marbles are left. How many marbles will each get?	3.1077	1.27626	**11** **16.9%**	7 10.8%	20 30.8%	18 27.7%	9 13.8%
24	investigation with estimation context	Make an estimation of the hours you sleep in one year. Explain how you came to your answer.	3.3492	1.32176	9 14.3%	6 9.5%	16 25.4%	18 28.6%	14 22.2%
		TOTAL	3.2455	1.254559	199 12.7%	213 13.6%	438 27.9%	440 28.1%	278 17.7%

Looking at the reasons the students gave for liking a task, the most common reason that was given for the tasks with the highest appraisal score was that the task is easy or simple. Another reason that was often mentioned for liking a task was that they think they can solve the task. Thinking that they can solve a task is a bit similar to thinking that a task is easy. This means that a task not being too difficult was for many of the students a big reason for why they gave a task a high appraisal score. However, there were also some students who were liking tasks because they seem to be fun or interesting. For the two tasks about football, there were students who said they like the task because it is about football. Seven students did say this about task 7 and two students gave this response for task 20. The two latter students did also say this for task 7.

The lowest scores for appraisal were found for five tasks: three tasks about fractions, one about percentages, and one with a puzzle-like problem. Four of the fourteen tasks with a context problem had a mean score of less than 3.0, while only one task with a bare number problem had a score less than 3.0.

The two tasks of the complete collection with the highest number of students who gave an appraisal score of 1, were Tasks 8 and 9. These tasks were valued as such by 22.7% and 19.4% of the students, respectively. Task 9 is a context task about percentages and Task 8 is a bare number problem about fractions ($\frac{22}{15}$ x $\frac{45}{44}$ x $\frac{18}{10}$ =). This task also had the lowest average of appraisal.

Looking at the tasks for which the students gave the lowest appraisal scores, the reasons for not or less liking were often that the students do not understand the task and find it difficult. Another reason that was mentioned a lot for disliking a task was that the task includes fractions, or percentage. Moreover, there were also students who mentioned that they do not like that some of the tasks have text in them. A few students disliked the tasks because they find them boring.

In general, the question about why the students liked or disliked a task elicited more written responses for the earlier tasks in the questionnaire than for the later tasks. For example, there were five more students who gave a reason for liking the football task in Task 7 than in Task 20.

More about the findings about the appraisal scores and the reasons for liking or disliking the tasks follows in the following sections.

4.2 Tasks with bare number problems versus tasks with context problems

4.2.1 Students' appraisal of tasks with bare number and context problems

The descriptive statistics in Table 3 show that there are hardly differences between the descriptive statistics of the appraisal scores for the two subcategories of TaskType1. The tasks with bare number problems have a mean score of 3,3 and the tasks with context problems have a mean score of 3.2. The median and the mode are 4 for the bare number tasks and 3 for the context tasks. The standard deviations are for both task types around 1,25.

Table 3. Descriptive statistics of students' appraisal of TaskType1: Tasks with bare number problems and tasks with context problems

		Students' appraisal of tasks with bare number problems	Students' appraisal of tasks with context problems
N	Valid	659	909
	Missing	11	29
Mean		3,3187	3,1925
Median		4,0000	3,0000
Mode		4,00	3,00
Std. Deviation		1,26027	1,24848

To know more about how the students rated the tasks, I figured out how often within each subcategory of TaskType1 the different response categories of the rating scale were chosen. Figure 4 and Figure 5 show the frequency distribution in percentages of the appraisal scores respectively given to the tasks with bare number problems and the tasks with context problems. The appraisal score given most often to the bare number tasks is 4. The second most often given score is 3. For the tasks with the context problems the reverse is the case with 3 given the most often and 4 given the second most often. In addition, these figures also show that the tasks with bare number problems have a slightly lower percentage of "strongly disliking the task" and "disliking the task", and a slightly higher percentage of "strongly liking the task" then the tasks with context problems. Taken together, these findings suggest that bare number tasks tend to be liked more than context tasks.

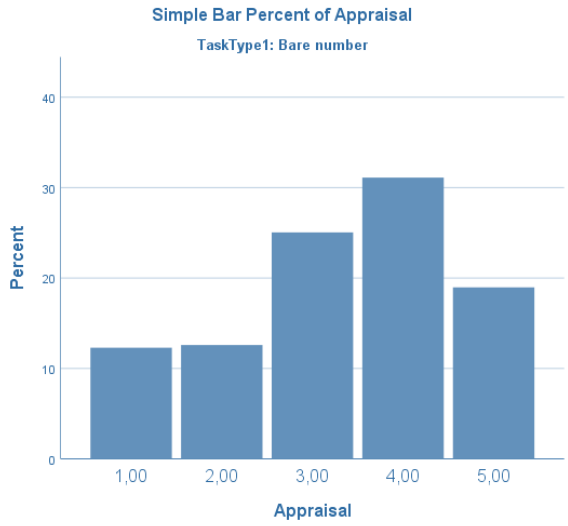


Figure 4. Relative frequency distribution in percentages of the given appraisal scores (n = 659) for tasks with bare number problems

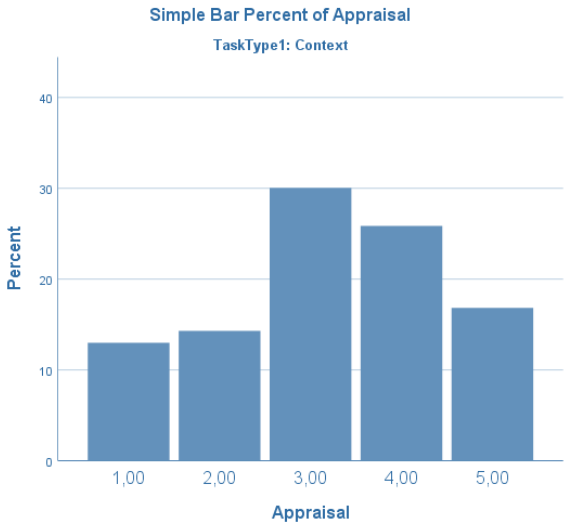


Figure 5. Relative frequency distribution in percentages of the given appraisal scores (n = 909) for tasks with context problems

To further investigate whether there was a significant difference between the students' degree of appraisal of the tasks with bare number problems and the tasks with context problems I applied two non-parametric tests. My null hypothesis was that the distribution of the degree of appraisal is the same across these two subcategories of TaskType1. The alternative hypothesis was that there is a difference between these distributions. I did not do a parametric test because beforehand I tested the data to see whether they had a normal distribution, and this was not the case. To test the null hypothesis, I used the Independent-Samples Mann-Whitney U Test and the Independent-Samples Kolmogorov-Smirnov Test and both tests led to the conclusion that the null hypothesis should be rejected. This means that the data do show a significant difference between the students' appraisal of the tasks with bare number problems and the tasks with context problems (see Table 4).

Table 4. Test of null hypothesis of students' appraisal of TaskType1: Tasks with bare number problems versus tasks with context problems

Null Hypothesis	Test	Asymp. Sig.	Decision
The distribution of students' appraisal of tasks is the same across the subcategories of TaskType1.	Independent-Samples Mann-Whitney U Test	,029	Reject the null hypothesis
	Independent-Samples Kolmogorov-Smirnov Test	,031	Reject the null hypothesis

After knowing that there was a statistical difference, I did some further investigation to see which subcategory within TaskType1 had the highest appraisal score. As is shown in Table 5

it seems that the tasks with bare number problems tend to be liked more than the tasks with the context problems. The group mean ranks of the tasks with bare number problems was higher than those with context problems.

Table 5. Rank orders of the students' appraisal of tasks with bare number and context problems

	Subcategory	N	Mean Rank	Sum of Ranks
Students' appraisal of TaskType1	Bare number	659	813,10	535835,50
	Context	909	763,76	694260,50
	Total	1568		

4.2.2 Students' reasons for liking or disliking bare number and context tasks

When I looked through the responses the students gave to the question why they like or dislike the tasks, I chose to focus on the answers for the tasks with the highest and lowest appraisal scores. In total this included half of the tasks. Out of these tasks, half of them contained a bare number problem and half of them involved a context problem. In the responses to the bare number tasks there was not much that referred to something specifically regarding the bare number nature of the problem involved, but a large part of the responses for context tasks referred to the context or text of the task.

For bare number tasks, a lot of the students said that the reason they liked a problem was because it was easy. For some of the tasks, this type of response was more than half of the reasons given for giving an appraisal rating of 4 of 5 for a task. Also, for context tasks there were students who said they liked a task because it was easy, but that was not as often the case as it was for bare number problems. Even for the highly appraised context tasks, the task being easy was not that often mentioned as a reason for liking the task. This was in contrast with the bare number tasks for which it was a common reason for liking a task.

Another reason for liking a context task was because it was found interesting. This response was more common for context problems than for bare number problems. There were however also more students who said that a context task was confusing than this was said for bare number tasks, even if they gave the context task a high appraisal score. Bare number tasks were called boring more often than context tasks, even with a high appraisal score. For the tasks with a lower appraisal score it was even more clear that the bare number tasks were more often seen as boring and the context tasks were more often seen as confusing. However, both reasons could be found for each task type.

Within the tasks with a context problem one of the tasks about football was particularly highly valued by the students. This task was given an appraisal score of 5 by 38.5% of the students which is the highest percentage of all the tasks in the study. For comparison, the average percentage for appraisal score 5 was 17.7%.

When looking at all the responses, I found that, in total, 33 out of the 67 participating students gave a response that could be related to the context itself in some way. The context topic that was mentioned the most in the responses was football, and another topic from the context of a task that was brought up by multiple students was burgers, being mentioned three times relating to a student's positive opinion of a task.

One of the students gave some interesting answers related to context tasks. This student stated liking four tasks because of the specific context of the task. The things in the tasks that were liked were football, burgers, and discounts. The student also liked that to solve the task it was needed to picture in your head the kids mentioned in a task. However, regarding four other context tasks the student claimed to dislike context tasks as a whole. Another student, who strongly liked a task, said to do this because of liking marbles. This same student also liked the two tasks mentioning football because of liking football, but was disliking another context task because the text was too long.

4.3 Tasks with straightforward versus puzzle-like versus estimation problems

4.3.1 Students' appraisal of tasks with straightforward, puzzle-like and estimation problems

The descriptive statistics in Table 6 show that there are hardly differences between the descriptive statistics of the appraisal scores for the three subcategories of TaskType2. The tasks with straightforward problems and the tasks with estimation problems have both a mean appraisal score of 3,2. The mean score of the tasks with a puzzle-like problem is 3.3, which is a bit higher but is still close to 3,2. The same pattern can be found for the median and the mode. These are 3 for the straightforward problems and the estimation problems, and they are 4 for the puzzle-like problems. The standard deviations for the three task types are all around 1,25.

Table 6. Descriptive statistics of students' appraisal of TaskType2: Tasks with straightforward problems, puzzle-like problems and tasks with estimation problems

		Students' appraisal of tasks with straightforward problems	Students' appraisal of tasks with puzzle-like problems	Students' appraisal of tasks with estimation problem
n	Valid	920	458	190
	Missing	18	11	11
Mean		3,1989	3,3428	3,2368
Median		3,0000	4,0000	3,0000
Mode		3,00	4,00	3,00
Std. Deviation		1,2555	1,23867	1,28141

The distribution of the appraisal scores for these types of tasks can be found in figures below. The diagrams reveal some differences. For the puzzle-like problems (see Figure 7) and the estimation problems (see Figure 8) there are fewer who gave an appraisal score of 2 than 1, while for the straightforward tasks (see Figure 6) it is the reverse. Also, for straightforward tasks all appraisal scores had less than 30% of the students who chose these scores, while for the puzzle-like tasks the score 4, and for the estimation tasks the score 3, had slightly more than 30% of the students who chose these scores.

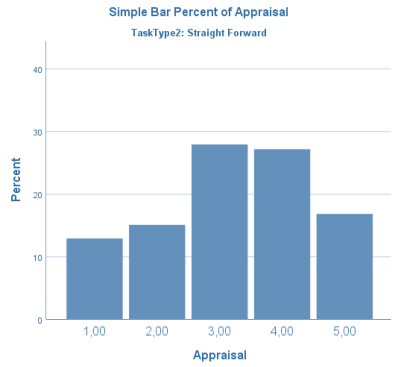


Figure 6. Relative frequency distribution in percentages of the given appraisal scores (n = 920) for tasks straight forward problems

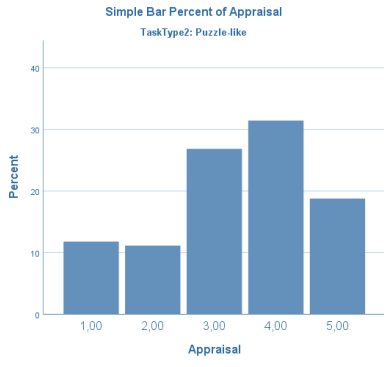


Figure 7. Relative frequency distribution in percentages of the given appraisal scores (n = 458) for tasks with puzzle-like problems

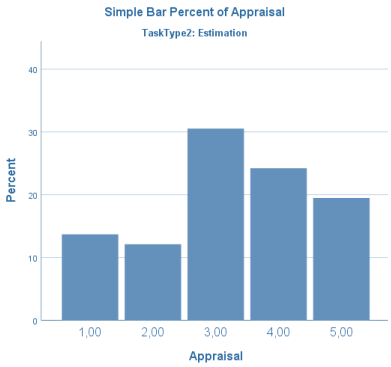


Figure 8. Relative frequency distribution in percentages of the given appraisal scores (n = 190) for tasks with estimation problems

Figure 7 shows that tasks with puzzle-like problems got a slightly lower percentage of students who gave an appraisal score of 1 and 2 than tasks with straightforward and estimation problems. Furthermore, tasks with estimation problems obtained a slightly higher percentage of students who gave an appraisal score of 5. In sum, among the different natures of the tasks within TaskType2 there was not one type of problem that was clearly preferred in all ways, but it seems that the tasks with puzzle-like tasks are the closest.

To investigate whether there was a statistically significant difference between the students' degree of appraisal of the tasks with straightforward, puzzle-like and estimation problems, I first checked whether the distribution of the data in these groups of tasks (subcategories of TaskType2) were parametric. I found that they are not. Because there are now three groups, I used the Kruskal-Wallis H test to test the null-hypothesis of there being no difference, and I found that there was not a significant difference between the students' appraisal in these groups of tasks (see Table 7).

Table 7. Test of null hypothesis of students' appraisal of TaskType2: Tasks with straight forward problems versus tasks with puzzle-like problems versus tasks with estimation problems

Null Hypothesis	Test	Asymp. Sig.	Decision
The distribution of students' appraisal of tasks is the same across the subcategories of TaskType2.	Kruskal-Wallis H	,107	Keep the null hypothesis Reject the null hypothesis

Since there was not a significant difference between the appraisals for the different natures of the problems, it was not necessary to make a ranking of this.

4.3.2 Students' reasons for liking or disliking tasks with straightforward, puzzle-like and estimation problems

I first looked through the written responses for these tasks with the highest and lowers appraisal scores, and found that there was for the most part not much difference between the responses for these task types. There were also no tasks with estimation problems with a high or low mean appraisal score. Therefore, I instead looked at responses for all these types of tasks together where something specific is mentioned related to the type of task. In some of the written responses, the students mentioned some reasons related to a task being either a puzzle-like task or an estimation task. Such responses I did not find for tasks involving a straightforward problem. Therefore I will not write about these tasks. I will start by looking at the answers relating to tasks with puzzle-like problems, and then look at responses related to tasks with estimation problems.

It was at times a bit difficult to tell whether or not certain of the responses were related to the nature of the task, namely being a puzzle-like problem. Nevertheless, I could identify clear the responses that seemed to fit into what defines a puzzle-like task. For example, one student gave the responses "Equations :)" and "Equations (☞•ワ•)☞" to Task 5 and Task 16, and

did not mention much else in relation to puzzle-like tasks. The symbols after the word "equations" seem to be happy faces, where the second of them is doing finger guns. These responses both seem to indicate a positive attitude to these tasks. In total 25 students gave responses that referred to the nature of a puzzle-like task, resulting into 40 responses. Eleven students said they liked at least one of the puzzle-like tasks because they had to think more about it, puzzle a bit, or use other methods than the ones they typically use. However, there were also two students who disliked a puzzle-like task because they had to think a lot about it, and yet another two students said they disliked a puzzle-like tasks because it was complicated or confusing. One student preferred to be told how to solve a task.

Regarding the estimation tasks there were twenty-three students who gave responses that referred to the nature of the task. None of the estimation tasks were among either the most highest or the lowest appraised, but some students had a lot to say about them. Eight of these students seemed to say that they do not know what the word estimate means. Five other students said even outright that they did not know what estimate means. Nine of the twenty-three students said they needed more information to solve the task, like knowing the precise numbers they were supposed to use. One of these students gave a particularly long written response. This student said in their reason for disliking one of the estimation tasks that there was not enough information in the text, and that all the information needed to solve a task should be in the found in the task. For the last task, Task 24, that was about estimating how much you sleep in a year, this student said that they sleep for different amounts of time each night, and that it would be too difficult to find the answer. Five students said for this task that they do not know how much they sleep, or that the amount of sleep they get varies. One of the students said they would solve this task by using the average amount of sleep a teenager need. There was also one student who said they disliked an estimation task because they like following simple instructions.

Among the twenty-three students there were also four who gave positive responses related to the nature of the estimation task. Three students said they liked the last task, the one about estimating sleeping hours. One of them specified that they like tasks where they have to estimate how much they do things, and another gave the reason that only you can find an answer that is correct for yourself. The fourth student wrote to Task 18, which is the task about the traffic jam, what numbers could be used and how the task could be solved.

4.4 Students' appraisal of tasks and the perceived solvability of these tasks

4.4.1 General findings about the relation between appraisal and perceived solvability

As can be seen in Table 8, there is a clear relation between the students' appraisal of tasks and their beliefs about whether they are able to solve these tasks. The found correlation was 0,579, which indicates that there is a reasonably strong correlation between these two variables.

Table 8. Correlation of appraisal of tasks and perceived solvability

		Appraisal	Solvability
Appraisal	Pearson Correlation	1	,579**
	Sig. (2-tailed)		,000
	N	1568	1555
Perceived solvability	Pearson Correlation	,579**	1
	Sig. (2-tailed)	,000	
	N	1555	1571

** Correlation is significant at the 0.01 level (2-tailed).

This is also visible in the scatter plot displayed in Figure 9. Every dot in this diagram represents the combination of the appraisal and solvability score a student gave to a task. The diagram makes clear that the more the students think they can solve the task the more often their appraisal score was high. The opposite was found for a low solvability score. This often went together with not liking the task.

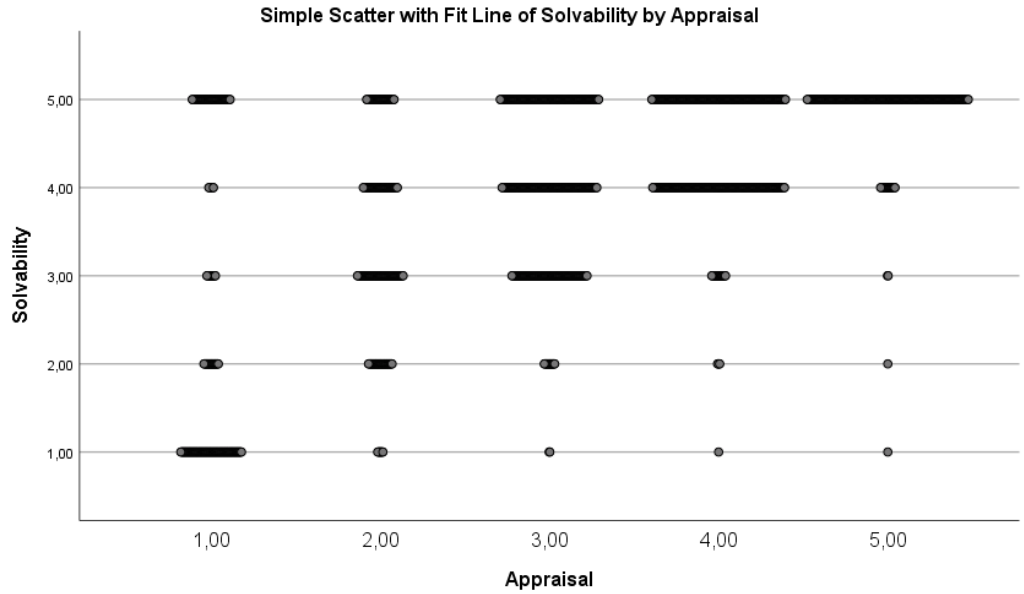


Figure 9. Scatter plot of combinations of solvability score and appraisal score

Another way of looking at the relation between appraisal and perceived solvability is shown in Figure 10. Here I calculated for every student for each task the sum of the appraisal score

and the negative value of the solvability score. In this calculation I excluded the responses where the appraisal and/or the solvability score was/were not given.

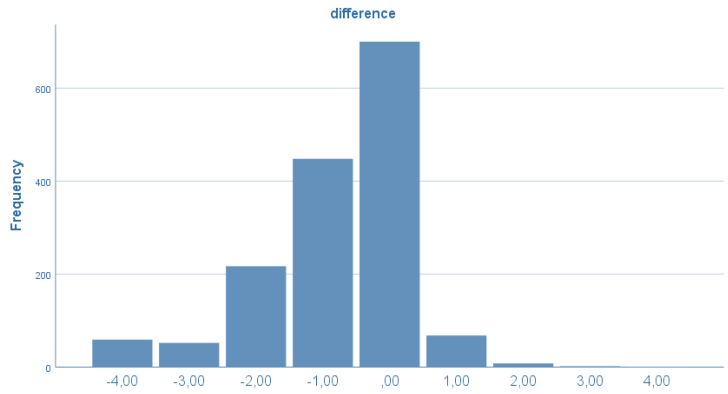


Figure 10. Frequency of the sum of the appraisal score and the negative value of the solvability score

In most cases, the answers the students gave for appraisal had the same value as the answers they gave for solvability, making the sum 0. It seemed to be common for the students to give the appraisal a lower score than the solvability. When subtracting the solvability score from the appraisal score this is resulted in a negative number. It was far less the case that the appraisal score was higher than the solvability score. Most of the more frequent combinations of appraisal and solvability were found when appraisal and solvability had the same value, or when the appraisal had a lower value than the solvability.

4.4.2 Findings for low and high appraisal scores and low and high solvability scores

In this section more specific findings are presented about the low and high appraisal scores and the low and high perceived solvability scores and how they are related to each other. Figure 11 shows for each solvability score the relative frequencies of the appraisal scores and for each appraisal score the relative frequencies of the perceived solvability scores.

The descriptive statistics of these findings are in Figure 12.

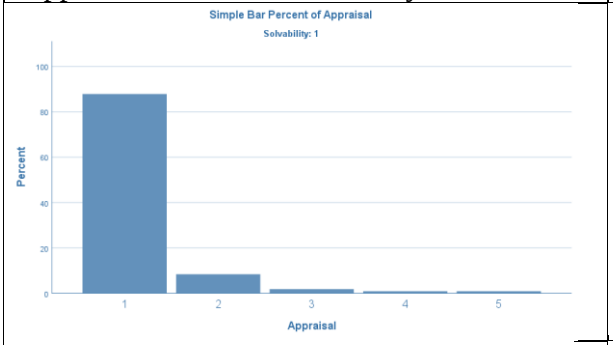
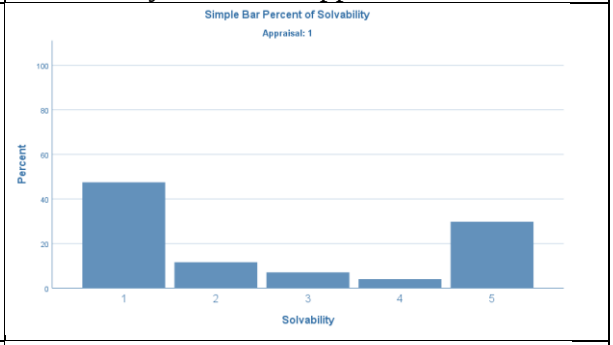
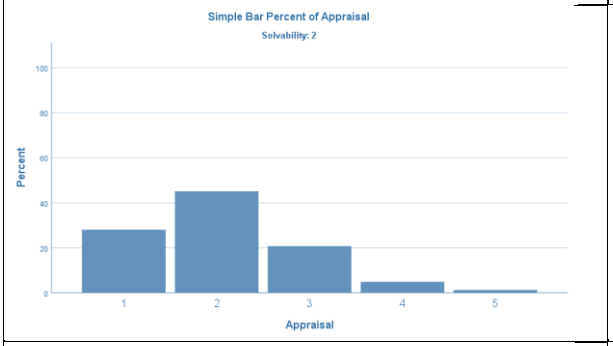
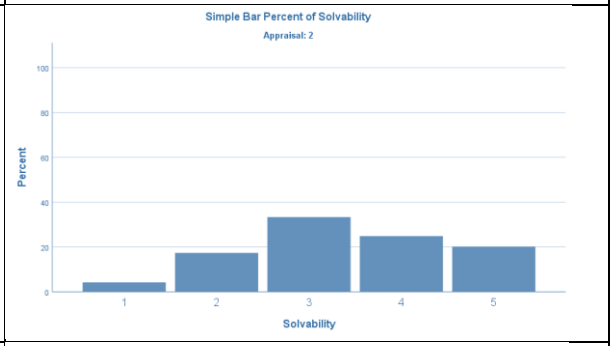
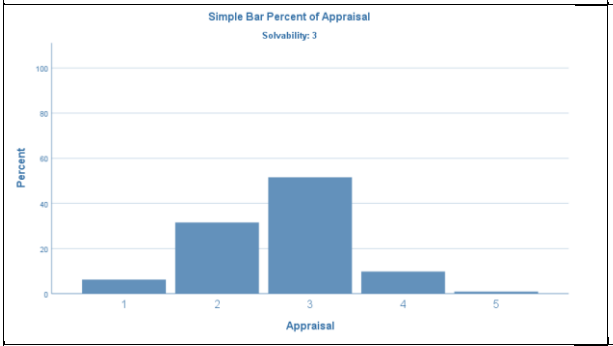
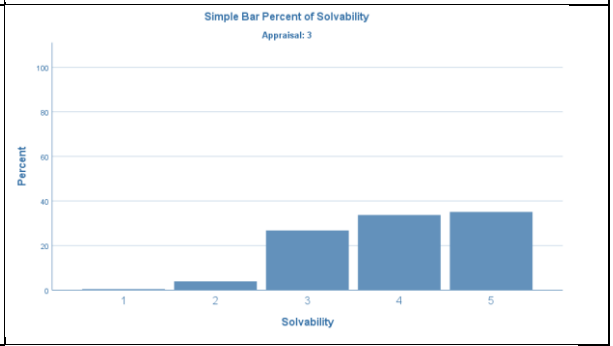
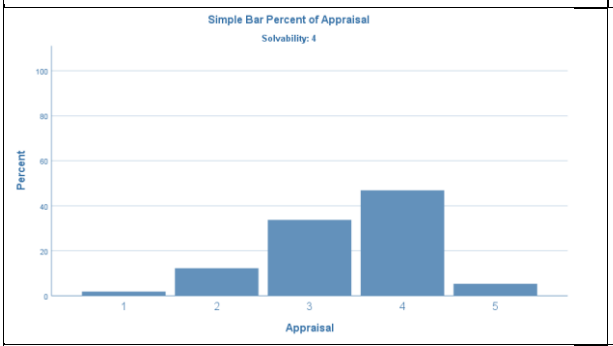
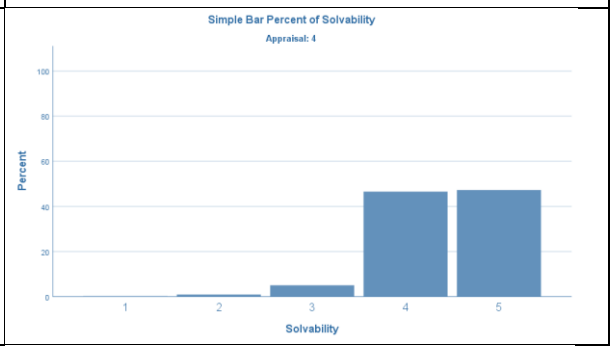
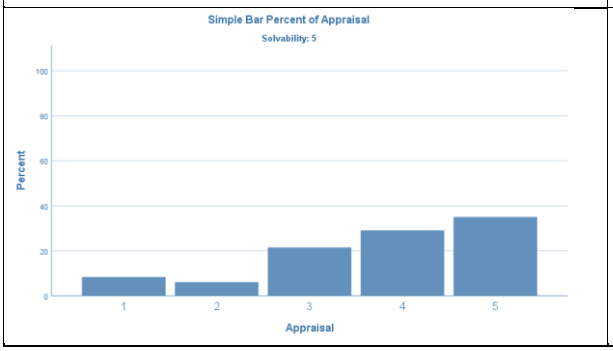
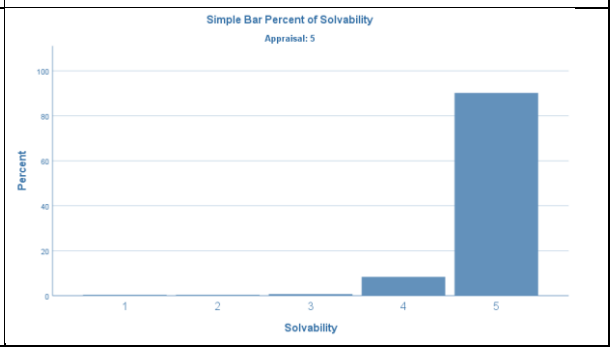
Appraisal scores for solvability scores 1 to 5	Solvability scores for appraisal scores 1 to 5
	
	
	
	
	

Figure 11. Relative frequencies of the appraisal scores for each solvability score (left) and the relative frequencies of the perceived solvability scores for each appraisal score (right).

Statistics of appraisal scores for Solvability 1

1,00	Mean		1,1869
	95% Confidence Interval for Mean	Lower Bound	1,0718
		Upper Bound	1,3021
	5% Trimmed Mean		1,0794
	Median		1,0000
	Variance		,361
	Std. Deviation		,60080

Statistics of solvability scores for Appraisal 1

1,00	Mean		2,5707
	95% Confidence Interval for Mean	Lower Bound	2,3248
		Upper Bound	2,8166
	5% Trimmed Mean		2,5230
	Median		2,0000
	Variance		3,079
	Std. Deviation		1,75463

Statistics of appraisal scores for Solvability 2

2,00	Mean		2,0610
	95% Confidence Interval for Mean	Lower Bound	1,8646
		Upper Bound	2,2573
	5% Trimmed Mean		1,9986
	Median		2,0000
	Variance		,799
	Std. Deviation		,89370

Statistics of solvability scores for Appraisal 2

2,00	Mean		3,3944
	95% Confidence Interval for Mean	Lower Bound	3,2434
		Upper Bound	3,5453
	5% Trimmed Mean		3,4296
	Median		3,0000
	Variance		1,249
	Std. Deviation		1,11777

Statistics of appraisal scores for Solvability 3

3,00	Mean		2,6756
	95% Confidence Interval for Mean	Lower Bound	2,5742
		Upper Bound	2,7769
	5% Trimmed Mean		2,6852
	Median		3,0000
	Variance		,595
	Std. Deviation		,77147

Statistics of solvability scores for Appraisal 3

3,00	Mean		3,9908
	95% Confidence Interval for Mean	Lower Bound	3,9053
		Upper Bound	4,0763
	5% Trimmed Mean		4,0436
	Median		4,0000
	Variance		,819
	Std. Deviation		,90518

Statistics of appraisal scores for Solvability 4

4,00	Mean		3,4157
	95% Confidence Interval for Mean	Lower Bound	3,3363
		Upper Bound	3,4951
	5% Trimmed Mean		3,4269
	Median		4,0000
	Variance		,706
	Std. Deviation		,84049

Statistics of solvability scores for Appraisal 4

4,00	Mean		4,3968
	95% Confidence Interval for Mean	Lower Bound	4,3355
		Upper Bound	4,4581
	5% Trimmed Mean		4,4562
	Median		4,0000
	Variance		,424
	Std. Deviation		,65100

Statistics of appraisal scores for Solvability 5

5,00	Mean		3,7641
	95% Confidence Interval for Mean	Lower Bound	3,6736
		Upper Bound	3,8546
	5% Trimmed Mean		3,8490
	Median		4,0000
	Variance		1,504
	Std. Deviation		1,22654

Statistics of solvability scores for Appraisal 5

5,00	Mean		4,8764
	95% Confidence Interval for Mean	Lower Bound	4,8247
		Upper Bound	4,9280
	5% Trimmed Mean		4,9465
	Median		5,0000
	Variance		,189
	Std. Deviation		,43478

Figure 12. Descriptive statistics of the appraisal scores for each solvability score (left) and the descriptive statistics of the perceived solvability scores for each appraisal score (right).

4.4.2.1 Frequencies of the appraisal scores from the perspective of the solvability scores

In the bar graphs for the relative frequencies of the appraisal scores (see Figure 11 on the left) it can be seen that when the students gave a solvability score of 1, meaning that the solvability of the tasks was considered very low, most students also did strongly dislike the tasks and gave them an appraisal score of 1. For the remaining solvability scores, the solvability scores 2 to 5, the most frequently chosen appraisal score had the same score value as the perceived solvability, but now they are more spread out. For solvability 1, the second most common

appraisal is 2. For solvability 2 to 5, the second most common appraisal is one value lower than the solvability. Appraisal having a higher value than solvability is less common than the reverse, but it did happen. One thing that stands out a bit regards solvability 5. Here, there were more appraisal scores 1 than 2. For all other solvability scores except solvability 1, it was the reverse. In general, the bar graphs with the relative frequencies of the appraisal scores for each solvability score show that when the solvability scores were higher the appraisal scores also became higher. This is most clearly seen for the solvability score of 5. Then a bit over 60% strongly liked the tasks or liked them a little.

As can be seen in Figure 12, the standard deviations in the appraisal scores were changing over the different solvability scores. If we ignore the results for solvability 2, the standard deviations grow with the value of the solvability score. The lowest standard deviation in the appraisal score is for solvability score of 1. From solvability score 3 on the standard deviations are increasing, with solvability score 5 having the highest standard deviation.

4.4.2.2 Frequencies of the solvability scores from the perspective of the appraisal scores

The bar graphs for the relative frequencies of the solvability scores (see Figure 11 on the right) are a bit different from those for the relative frequencies of the appraisal scores. Only for the solvability scores 1 and 5 was found that the most frequently chosen solvability score had the same score value as the appraisal score. This was especially the case for the appraisal score of 5.

In general, the bar graphs with the relative frequencies of the solvability scores for each appraisal score show that when the appraisal scores were higher the solvability scores also became higher. From appraisal score 3 on, the students were very sure or a bit sure that they could solve the task.

Something that stands out is about appraisal score 1. Here, the most given solvability score was 1 and the second most often given score was 5. This can also be seen in the results for the solvability score of 5, where more times than expected, tasks were given an appraisal score of 1. This finding is partly because of the responses of two students. One student gave all 24 tasks an appraisal of 1 and a solvability of 5. The other student did this for the first eight tasks and gave the rest of the tasks an appraisal score of 1 and a solvability score of 1.

As can be seen in Figure 12, the found standard deviations in the solvability scores were changing over the different appraisal scores. Again, if we ignore the results for the appraisal

score 2, the standard deviations decrease with the value of the appraisal score. The lowest standard deviation in the solvability score is for appraisal score 5.

4.4.2.3 Reasons for high and low appraisal and solvability scores

Since students often gave tasks an appraisal score of 1 when they gave the tasks a solvability score of 1 (see the top bar chart in Figure 11 on the left), I have looked more into the reasons these students gave for strongly disliking tasks of which they were very sure they could not solve them. There were 14 students who left a written response when giving these scores.

Table 9. Reasons for giving tasks, which got a solvability score of 1, an appraisal score of 1

Response	Number of times mentioned	Number of students who gave this response
Math is shit	15	1
Hate math	2	2
Difficult, does not understand, do not know how to solve	19	8
Perceived intelligence/ skill in math	9	3
Don't like division	1	1
Don't like football	1	1
The task does not explain well enough	1	1
Total		14

A reason that was given 15 times was "math is shit". Actually, this result came from only one student, the aforementioned second student. This student gave this reason for every task, and it was the only response this student gave. There were also two other students who explicitly said that they hate mathematics. Three students mentioned as a reason for why they do not like a task their perceived poor skill in mathematics, their lack of understanding of mathematics, or because of their perceived lack of intelligence. Eight students said that a problem was too difficult, there was something about the problem they did not understand, or that they do not know how to solve it. One of these students mentioned not knowing what estimate means. Another student thought the way the problem was written was difficult to understand, and yet another student said that a task did not explain well enough. One student mentioned not understanding percentage, liter, meter, subtraction, and division. There was one student who said they did not like the operation of a task, that being division. One student said disliked a task because of the topic of the context, which was football.

In the same way I also looked at the reasons given for strongly disliking tasks while being sure that the tasks could be solved (see the top bar chart in Figure 11 on the right). Here the students gave tasks a solvability score of 5 while at the same time, more than expected, they gave the tasks an appraisal score of 1. Therefore, I looked at the reasons given for strongly

disliking tasks while being sure they could solve them. In total of 10 students who left written responses when giving these scores.

Table 10. Reasons for giving tasks, which got a solvability score of 5, an appraisal score of 1

Response	Number of times mentioned	Number of students who gave this response
Math is shit	8	1
It is boring	24	2
It is easy	8	2
Because of the text of the task	4	2
Because it is short	1	1
Because of number type	2	1
Because of different denominators	1	1
Total		10

One reason mentioned by one student eight times was “math is shit”. This was said by the same student who gave for the first eight tasks an appraisal score of 1 and a solvability score of 5 and the rest an appraisal and solvability of 1. Two students gave the reason that they disliked one or more tasks because was boring. One of them said this for every task, and this is the same student who gave an appraisal of 1 and solvability of 5 for every task. There were two students who said that some tasks were too easy, and they gave this response eight times combined. Two students said that did not like text tasks, or that the text was too long. The student who said one of the problems were too long, also said that another problem was short. One student wrote that disliked a problem because it included percent, and disliked another because it included fractions. Another student said they disliked a problem with fractions because they hate multiplying with different denominators. One student said for one of the problems that it takes a long time.

Finally, I looked at the cases in which the tasks were given an appraisal score and a solvability score of 5 together (see the bottom-left and bottom-right bar chart in Figure 11). This involves 248 cases for which in 133 times a reason was connected for liking the tasks a lot. These were the reactions given by 37 students.

Table 11. Reasons for giving tasks, which got a solvability score of 5, an appraisal score of 5

Response	Number of times mentioned	Number of students who gave this response
Because easy	50	19
You can calculate in your head	15	3
Addition operation	4	4
Is a common task	1	1
I can understand/ can solve the task	5	4
Because of the text/context	17	11
Is practical	3	2
Is fun	12	7
Like finding an answer	1	1
Are aquations	2	1
You have to think	1	1
Because of numbers involved	4	3
Total		37

The reason that was given by far the most often for liking the task is that they thought that the task was simple or easy. This response was given 50 times by a total of 19 students. Similarly, four students said they liked tasks that they were able to solve or understand. There was one student who liked a task because it is a common task. There were three students who liked when they could calculate a problem in their head, with one of them giving this response 13 times. There were four responses from different students who liked a task because it had the addition operation. Eleven students who said that they liked the context in a task or text tasks in general. There were two students who liked that a task was practical. The last of the more common reasons given is that students thought that the task was fun. There were seven students who gave this response, and it was given 12 times in total. Some explained further and said it was fun because it was interesting, creative, or that you could use trial and error. There was one response from a student who likes to find answers in a task and another response from a student who likes that they have to think to solve the task. One student liked equations, and gave this reason for two tasks. Lastly, there were four responses by three students about liking the number type in the problem, these being fractions or percentage.

In the paragraphs above where I wrote about the reasons given for liking or disliking tasks with high and low appraisal and solvability scores, I chose to not include reasons such as just the word “no” or an emoji. This is because those responses do not explain much and were difficult to interpret. Same with responses where students just said they liked or did not like a problem without giving a reason, or gave other responses that I had trouble interpreting. Some of the answers the students wrote out gave more than one reason for liking or disliking the task, and some of the similar answers were given by the same participant.

4.5 Teachers' perception of their students' appraisal and solvability of mathematics tasks

In this section I report on the answers that the teachers gave to the three questions in the teacher questionnaire and what came out when I compared them to the answers given by the students. I limited myself here to the answers related to those tasks that stood out, especially the tasks for which the students gave the highest or the lowest appraisal scores. Unfortunately, only three teachers (Teacher 1, 2 and 3) out of the four teachers answered the questions in the teacher questionnaire. Moreover, one of these teachers, Teacher 2, said that they found it difficult to answer the questions for a lot of the tasks, and left some answers blank. Therefore, the questions from Task 11 onward were only answered from two teachers. In this way the teachers' answering pattern was similar to that of the students. They also gave fewer answers for the tasks that came later in the questionnaire. However, in contrast with the students, the teachers gave longer answers for the earlier tasks than for the later tasks.

4.5.1 The teachers' perception of the students' appraisal scores

4.5.1.1 Findings about the tasks that were highly appraised by the students

The teachers' estimates of how the students appraised the tasks that were highly appraised by the students were in general lower than those of the students themselves (see Table 12).

Only for Task 7 and Task 1 the scores were in agreement with the scores of the students. This was especially the case for Task 7, a puzzle-like problem in context. Teachers thought that the students liked this task a little and this score was also chosen by the largest proportion of students. Teacher 1 and Teacher 3 said that the students that like football will like the task probably more because of the context. This indeed seems to be the case as seven students said they liked this task because it was about football. Teacher 2 said that students who do not like text tasks will not like this task. This agrees with the students' response that they did not like this task because of the text.

Another task which had a high mean appraisal score was Task 5. This task was liked a little by about 40% of the students, the three teachers thought that most student would neither like or dislike this task. Teacher 1 and Teacher 2 said that they thought that only some students would like this task, but others would be confused and not understand it and therefore would dislike it. Teacher 3 said that the task was a lot of work for a little mathematics.

Table 12. Appraisal scores of students and teachers for tasks with the highest and lowest mean appraisal score

Tasks with the highest mean appraisal score									
	Task		Mean score	SD	Absolute and relative frequency				
					Score 1	Score 2	Score 3	Score 4	Score 5
Students	1	+ bare numbers	3.7879	1.08861	4 6.1%	3 4.5%	14 21.2%	27 40.9%	18 27.3%
Teacher 1									
Teacher 2									
Teacher 3									
Students	2	– bare number	3.5522	1.22206	6 9%	6 9%	17 25.4%	21 31.3%	17 25.4%
Teacher 1									
Teacher 2									
Teacher 3									
Students	5	puzzle-like problem bare numbers	3.7164	1.02361	6 9%	4 6%	12 17.9%	26 38.8%	19 28.4%
Teacher 1									
Teacher 2									
Teacher 3									
Students	7	puzzle-like problem in context	3.5909	1.16325	5 7.6%	5 7.6%	18 27.3%	22 33.3%	16 24.2%
Teacher 1									
Teacher 2									
Teacher 3									
Students	14	x bare numbers	3.5909	1.30062	6 9.1%	9 13.6%	11 16.7%	20 30.3%	20 30.3%
Teacher 1									
Teacher 2									
Teacher 3									
Students	16	puzzle-like problem bare number	3.6	1.18322	7 10.8%	3 4.6%	12 18.5%	30 40.2%	13 20%
Teacher 1									
Teacher 2									
Teacher 3									
Students	20	+/x in context	3.7846	1.25614	5 7.7%	5 7.7%	14 21.5%	16 24.6%	25 38.5%
Teacher 1									
Teacher 2									
Teacher 3									

Task 20 was a the second most highly appraised problem among the students, just barely below Task 1. Teacher 1 thought the students would dislike this problem a little because there was a lot of writhing for relatively easy mathematics. Teacher 3 thought they would not like or dislike it, because some students like text tasks and others do not. There were a few students who thought there was too much text or too many numbers, but most written responses were positive. Some students said they liked that the problem had text, or that this is an example of a good text problem or addition problem. There was one student who seemed to agree with the first teacher. This student wrote that it is just adding and multiplying with big numbers, and that solving a lot of these problems can get boring as they can take time to solve.

4.5.1.2 Findings about the tasks that were lowly appraised by the students

The teachers' estimates of how the students appraised the tasks that were lowly appraised by the students were almost in all cases lower than those of the students (see Table 13). Only for Task 3 the estimates of the teachers were in line with the appraisal scores given by the

students. About 50% of the students gave this task an appraisal score of 3 or 4 and that was also what the teachers thought the students would have chosen.

Table 13. Appraisal scores of students and teachers for tasks with the lowest mean appraisal score

Tasks with the lowest mean appraisal score									
	Task		Mean score	SD	Absolute and relative frequency				
					Score:1	Score:2	Score:3	Score:4	Score:5
Students	3	fractions in context	2.9701	1.15431	7 10.4%	18 26.9%	18 26.9%	18 26.9%	6 9%
Teacher 1									
Teacher 2									
Teacher 3									
	8	fractions bare numbers	2.4848	1.09884	15 22.7%	18 27.3%	21 31.8%	10 15.2%	2 3%
Teacher 1									
Teacher 2									
Teacher 3									
	9	percentages in context	2.9104	1.27602	13 19.4%	11 16.4%	19 28.4%	17 25.4%	7 10.4%
Teacher 1									
Teacher 2									
Teacher 3									
	13	puzzle-like problem in context	2.9841	1.07	6 9.5%	13 20.6%	25 39.7%	14 22.2%	5 7.9%
Teacher 1									
Teacher 2									
Teacher 3									
	22	fractions in context	2.8	1.09259	9 13.8%	14 21.5%	28 43.1%	9 13.8%	5 7.7%
Teacher 1									
Teacher 2									
Teacher 3									

Teacher 1 said that some students would be challenged in the right amount by the task, but that other students would not understand it. Teacher 2 said that most students will like it, and others would think that fractions are difficult to work with. Teacher 3 said that the students had just finished the fractions chapter, and that there were multiple tasks like this one in the test. Teachers 1 and teacher 2 were right that some students would like Task 3 and other students would dislike it, as there was an even distribution of the three middle appraisal scores. Teacher 2 was right that some students found fractions to be difficult, as this was a commonly given reason for students to dislike a task.

Task 8 is also a task on fractions but now it is a bare number problem. For this task the difference between the appraisal scores of the three teachers and the appraisal scores of the students was the largest. While one third of the students gave the tasks an appraisal score of 3 (meaning neither liking or disliking the task), Teacher 2 and teacher 3 gave this task an appraisal score of 2 and Teacher 1 gave it a score of 1. Teacher 1 said that the task was too difficult, Teacher 2 said the students were not that familiar with multiplying with fractions, and Teacher 3 said the numbers are too large if they are not allowed to use a calculator. Also

12 students made responses in which they referred to the difficulty of Task 8. Nine students said that the task is too difficult. One of these students said that it was difficult because of fractions. However, the remaining three students said that they liked it that this task was difficult, and gave it an appraisal score of 4 because of the difficulty.

4.5.2 The teachers' perception of the students' perceived solvability of the tasks

4.5.2.1 Teacher solvability estimation for highly appraised tasks

When comparing how many students the teachers thought would believe they could solve a task to what the students thought themselves, I only counted the solvability sores of 4 and 5 as a student thinking they can solve a task. Table 14 shows that there were a few cases where the teachers were mostly in agreement with each other and close to the percentage of students who thought they can solve the task, but in other cases the students answer were further off from the teachers guesses, or the teachers' guesses differed from each other.

Table 14. Students' perceived solvability and teachers' estimates of it for tasks with the highest mean appraisal score

Task		Mean score	SD	Absolute and relative frequency of the solvability scores by the students					Teachers guesses of the percentage of students think that they can solve the task		
				Score:1	Score:2	Score:3	Score:4	Score:5	Teacher 1	Teacher 2	Teacher 3
1	+ bare numbers	4.72	0.725	2 3%	0	1 1.5%	9 13.4%	55 82.1%	99%	100%	100%
2	– bare number	4.51	0.894	0	5 7.5%	3 4.5%	12 17.9%	47 70.1%	95%	86%	90%
5	puzzle-like problem bare numbers	4.45	1.01	3 4.5%	1 1.5%	4 6.1%	13 19.7%	45 68.2%	50%	42%	80%
7	puzzle-like problem in context	4.23	0.989	2 3%	2 3%	8 12.1%	21 31.8%	33 50%	85%	58%	75%
14	x bare numbers	4.28	1.111	4 6.2%	1 1.5%	6 9.2%	16 24.6%	38 58.5	70%		80%
16	puzzle-like problem bare number	4.15	1.265	6 9.2%	3 4.6%	2 3.1%	18 27.7%	36 55.4%	50%		85%
20	+/x in context	4.33	1.085	4 6.3%	1 1.6%	3 4.7%	18 28.1%	38 59.4%	80%		90%

For Task 1, the teachers agreed that either 99% or 100% of the students will be able to solve it. This is very close to the 95.5% of students who were either a little, or very sure that they could solve the task. For Task 2 the teachers gave answers from 86-95%, which is a bigger difference in opinion than the previous task, and 88% of students thought they could solve it. The teachers were all still pretty close to the actual number.

For Task 5, the teachers differed more in their responses. The guesses were that 50%, 42% and 80% of the students would believe they could solve this task. Some 90% of the student were either a little or very sure that they could solve the task. Teacher 3 came the closest to this, but it is still higher than any of the teachers had thought.

For Task 7, about 80% of the students thought they would be able to solve this problem, and Teacher 1 and Teacher 3 guessed close to this at 75% and 85%. Teacher 2 guessed 58%, which is a bit further off.

4.5.2.2 Teacher solvability estimation for lowly appraised tasks

When comparing how many students the teachers thought would believe they could solve a task to what the students thought themselves, I again counted only the solvability sores of 4 and 5 as a student thinking they can solve a task. In general, the teachers' estimates came close to the students' scores, but now they differed a bit. For Task 3 and Task 13 the teachers' score was lower than that of the students and for Task 22 the opposite was the case (see Table 15).

Table 15. Students' perceived solvability and teachers' estimates of it for tasks with the lowest mean appraisal score

Task		Mean score	SD	Absolute and relative frequency of the solvability scores by the students					Teachers guesses of the percentage of students think that they can solve the task		
				Score:1	Score:2	Score:3	Score:4	Score:5	Teacher 1	Teacher 2	Teacher 3
3	fractions in context	3.99	1.037	2 3%	5 7.5%	9 13.4%	27 40.3%	24 35.8%	60%	58%	60%
8	fractions bare numbers	3.3	1.24	8 12.1%	7 10.6%	20 30.3%	19 28.8%	12 18.2%	20%	14%	67%
9	percentages in context	3.61	1.239	5 7.6%	7 10.6%	17 25.8%	17 25.8%	20 30.3%	30%	58%	60%
13	puzzle-like problem in context	3.77	1.151	3 4.7%	6 9.4%	15 23.4	19 29.7%	21 32.8%	20%		50%
22	fractions in context	3.59	1.231	5 7.8%	7 10.9%	15 23.4%	19 29.7%	18 28.1%	80%		90%

Regarding Task 3 about 75% of students thought they could solve this task, while the teachers thought that only about 60% would think they could do this, which is a noticeably lower percentage. This was also the case for Task 13, but here the difference between the students' perceived solvability of the tasks and the estimates of the teachers was even larger. While a bit over 60% of the students thought they could solve this task, Teacher 1 thought that only 20% would think they could solve it and for Teacher 3 this was 50%. For Task 22, it was the reverse. Teacher 1 and Teacher 3 thought that respectively 80 and 90% of the students would think they could solve this task, while only hardly 60% of the students was a little or very sure that they could solve this task. When comparing the results for these two tasks then the students gave Task 13 (puzzle-like problem in context) and Task 22 (fractions in context) about the same solvability score, whereas the teachers thought that Task 13 would be more difficult for the students than Task 22.

5 Discussion

In this section I will discuss the findings brought forward in this study and what these finding could mean for making the teaching and assessment of students in mathematics education more in line with the needs and wants of the students. First, I go into the results I found for the different types of tasks with the focus on tasks with the highest and lowest appraisals. After that, I pay attention to the findings about the tasks containing context problems, puzzle-like problems, and estimation problems. Then I will continue with discussing the relation between the students' appraisal of the tasks and the perceived solvability. Next, I will discuss the data from the teachers with the data from the students. I will connect all these discussions to some relevant theory from Section 2.

5.1 Tasks with the highest and lowest appraisal

Looking at the most and least highly appraised tasks, it seems that the students tend to prefer bare number and natural number problems. Considering that Sidney, Thompson, Fitzsimmons, & Taber (2021, p. 3) and Reinhold, Obersteiner, Hoch, Hofer, & Reiss (2020, p. 1) both mentioned whole/natural number bias, it is not surprising that most of the tasks with the lowest appraisals have either fractions or percent while all the highest appraised tasks have whole numbers. The reason that no decimal tasks were in the low appraisal category can be that there were only two decimal problems. The number of percentage problems was also two, and the number of fraction problems was four, so half of the non-whole number problems had a low appraisal. Multiple students mentioned not liking or not understanding fractions or percent. While not all the participants seemed to mind fractions and percent, and I did not do a hypothesis test to see if there was a statistically significant difference, the results indicate that the natural number bias is a big reason for the number types of the most highly and lowly appraised tasks, meaning that a number type other than whole number had a negative effect on the appraisal of the problems in the study.

The only context tasks that were among the most highly appraised tasks were both about football, and multiple students mentioned football in a positive way in their written responses for these tasks. It therefore seems that football is a popular topic among a number of the students that partook in the survey.

5.2 Context problems

The results of the hypothesis test indicates that context problems tend to have a lower appraisal among students than bare number tasks. Looking at the written responses and appraisals of the individual tasks, shows that if the context is about something the students are familiar with and likes, as seen with the tasks about football, they are more likely to be highly appraised. This fits with what Clarke & Roche (2018, p. 96) said about the context problems having to feel relevant to the students to have the intended effect. Since there were also some students who disliked the football tasks because of the mention of football, the findings also fit with what Widjaja (2013, p. 152) said about the experiences of the students determining if the context is relevant. The students who have had bad or limited experiences with football would have a different attitude to problems mentioning football than the students who like football and play it in their free time. This can also fit with constructivist theory, which, as stated earlier, says that reality is constructed by humans through their experiences and social relations (Høgheim, 2020, p. 22). The reality of the students who like the specific context of a problem is different from the reality of a student who dislikes this same context. For one student, football could be fun, while for another it is not fun at all. Because of the different realities of each student, it would be difficult to find a context problem that every student in a class would like and relate to. Consensus theory, as mentioned in Section 2.7, states that a perception is correct if there is some sort of social agreement where it is agreed on universally or by a specific group of people (Høgheim, 2020, p. 22). There seems to be an agreement that having problems with a context that a student likes, makes the problem more enjoyable, but there was not an agreement between all the students about what such a context would be.

There were also cases in which the context of a task was mentioned for tasks not about football. In a lot of instances this was positive. For example, saying that they liked the specific topic of the context, or saying that the task seemed relevant. There were also negative responses to context tasks. For all the context tasks there were students who, while not necessarily complaining about the context itself, complained about the amount of text or about there being text in general. It seems that these students did not dislike the topic of the context, but they also did not find it to be engaging. There was one example of a student who said they disliked text tasks in general multiple times, but liked some context tasks because of the context.

There are many different responses from the students about their appraisal of context tasks, and it would therefore be a good thing if the teachers were able to adapt the teaching to the individual students in accordance to the Norwegian law of education (Opplæringslova, 1998, §1-3).

5.3 Puzzle-like problems

Three tasks with puzzle-like problems had a high appraisal and one had a low appraisal, but the tasks with puzzle-like problems were not liked significantly more or less than tasks with straightforward or estimation problems. There were some students who wrote that they liked that they had to think to solve this task, but other students preferred having instructions to follow. Russo and Minas found that most primary school students liked hard problem-solving tasks (2020, p. 222). Assuming that problem-solving and puzzle-like is similar, my findings are a bit different as I did not find that most of the students were particularly fond of these tasks.

5.4 Estimation problems

None of the tasks with estimation problems had a particularly high or low appraisal score, but this may be because of the low number of this type of task in the study. Looking at the written responses for these tasks, there were thirteen students who said that they did not know what estimation means, or who complained about not having all the information needed to solve the task, which is essential for an estimation problem. The students' reactions to this type of takes were not that surprising considering that Sunde, Petersson, Nosrati, Rosenqvist and Andrews found that Scandinavian schools, and particularly Norwegian schools, did not have much in the curriculum alluding to estimation problems (2021, p. 11). The fact that there was a bit of confusion about estimation among some of the students could be an indication that it is necessary to pay in education more attention to estimation. Estimation is, as said by Andrews, Xenofontos, and Sayers, an important skill for both adults and children (2021, p. 1). The students were in 8^{th} grade when answering the questionnaire, so it seems they have been through many years of school without learning much about estimation.

5.5 Appraisal and solvability

A correlation was found between the appraisal scores and the solvability scores that the students gave to the tasks. In most cases, the students gave a solvability score either equal to or higher than the appraisal score. There were many written responses given where students

said that they liked a task because it was easy or disliked a task because it was hard. There were also some students who said that they disliked a task because it was too easy. Some of the students wrote that they liked when a task was a little challenging, but not too difficult. Because of these reasons, I conclude that students thinking that they can solve a task tends to makes them like it more, so long as it is not too easy. I also conclude that students finding a task too difficult tends to make them like it less. There may be some nuance missing in my study, as I asked the students if they thought they could solve the task, and not if they thought it was difficult. It is possible to find a task difficult and still think you can solve it.

There were some students who liked when a task was a bit difficult, but not many. Rosso and Minas found that younger students tended to like challenging tasks more than older students (2020, p. 220). The students in my study were older than the ones in their study, so it is not that surprising that only a few liked when the tasks were challenging.

5.6 Students' versus teachers' appraisal and perceived solvability of tasks

The teachers often thought that most students would like tasks less than they actually did, but they also guessed right sometimes. The teachers were often close when estimating how many students would think they could solve a task, but were further off other times.

It could be the case that one or more of the teachers gave responses that were accurate to their own students. Unfortunately, it is not possible to see if this is the case because of the complete anonymity of the study. There were some cases where all teachers were off in their guesses by a similar and noticeable amount. It therefore seems likely that for at least some tasks, all the teachers were off in their guesses.

Wilkie (2016, p. 2061) had also found that teachers do not always know what students will think of a task. However, my study is of course different, as the students were not given a certain type of tasks to work with throughout the year.

The teachers did often write reasons for students liking or disliking tasks that some of the students also gave. For example, that some students would find a task too difficult and that students who like tasks about football such as Task 7. They did not get all the reasons the students gave, but there were too many different reasons to expect them to get all of them in one answer.

6 Conclusion

In this last section, I will come back to the research questions and answer them. Here I also reflect about my study and discussed some limitations of it. Finally, I will conclude with my ideas about further research the is necessary.

My first research question was about what type of mathematics tasks students tend to like or dislike, and why. Students tend to like tasks with bare number problems more than tasks with context problems, unless the context is about something that the student likes. A complaint often given to tasks with context problems was that they did not like text tasks. A lot of students preferred tasks with whole number problems over tasks with other number types, such as fractions and percentages. This was often because they found whole number problems to be easier.

My second research question was about whether there is a correlation between a student's perception of whether they can solve a task and the student liking the task. The perception of whether or not they can solve a task, has an effect on the students' appraisal of that task. They are more likely to like it if they think that they can solve it. However, a task being too easy can make some students dislike the task, and some students like tasks to be a bit challenging.

My third and last research question regards how well teachers know what types of tasks students like or dislike. The teachers tended to think most of the students would like tasks less than they actually did. The guesses for how many would think they could solve the tasks were both higher and lower than the actual amount. A lot of the time, the teachers came close. At other times they were not as close.

Although my study has resulted in interesting findings they should be viewed with a certain amount of restraint. My study certainly has some limitations. One big limitation is that the number of teachers included is very low, and is therefore not likely to reflect the general population that well. The number of students is larger, but they were only from four schools in the Nordland region in Norway. I also did not gather information about which teacher had which students. Therefore, it is not possible to know if one or more of the teachers gave good estimates for their own students. Another limitation is that I did not look at all the written responses from the students. If I would have done this, the hypothesis testing could have had more accurate results because then I would have removed the students who gave the same score and the same written response for every task. Two students in particular did this, and it did not seem that they read through the tasks before deciding what to answer. A further

limitation is that the study was only on students in 8th grade, and students in other grade levels may have different opinions about different types of tasks.

There are many things in this study that can be looked further into. For example, you could include more teachers in the study, so that it would be possible to investigate more deeply the relation between the teachers' and the students' opinion of tasks. In that case, it could be better to include only part of the students in class so that there will be not too much data to be analyzed. Another topic that asks for further investigation is how students think about their ability to solve particular tasks. Why do students think they can or cannot solve a task. In this way, more insight could be found for the reasons for the perceived solvability. More research could be done in regards to the difference and correlation between perceived solvability and appraisal of tasks. This is because some students said that they liked that a task was difficult, but still thought they could solve it. Another interesting thing to know is about the relation between the students' perceived solvability and the achieved solvability. For getting all this information it will be needed to have more in depth interviews with students as to why they like or dislike certain tasks, why they think they can or cannot solve the tasks. Further research could also look at students' appraisal and perceived solvability for tasks both before and after solving the tasks. For this, it may be necessary to have fewer tasks, or to give the students only a few tasks at a time. Doing this would help make sure that there is not too much work at once for the students.

My final reflections are that I have learned a lot about both how to do statistical analysis and about what students think about different types of tasks. It was interesting to see how some students could have completely different opinions from other students. It was especially interesting to see that in some cases a single student could give written responses that seemed to contradict each other. It was a bit sad to read the responses where students called themselves stupid or otherwise seemed to feel helpless when doing mathematics. Doing this study has made me want to do more research in the future, to find out more about how mathematics education can be improved.

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Appendix 1 Student questionnaire

Hei! Takk for at du deltar i denne spørreundersøkelsen.

Gjennom dette spørreskjemaet vil jeg undersøke hva du mener om noen typer matteoppgaver.

Det er til sammen 24 oppgaver. for hver oppgave vil du bli spurt hva din mening er om oppgaven, hvorfor du liker eller misliker den, og om du tror du kan løse den.

Du trenger ikke å løse oppgavene for å svare på spørsmålene!

Det er ikke tidsgrense for å svare på spørsmålene.

Oppgave 1

347 + 489 =

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?

(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 2

912 – 677 =

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 3

Det er 12 flasker som inneholder $\frac{1}{2}$ liter hver.
Hvor mange liter får hver person hvis det er åtte som deler?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 4

Estimer hvor mange burgere du kan kjøpe for en million kroner. Forklar hvordan du kom fram til svaret.

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 5

Fyll inn tallene som mangler i boksene.
☐3 – 2☐ = 25

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 6

Du selger boller til 15kr, og syltetøy koster 5kr ekstra.
Du kjøper ingredienser til 132kr og selger 84 boller. Hver fjerde bolle hadde syltetøy på.
Hvor mye tjente du?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 7

I en fotballturnering får lagene 3 poeng for å vinne. 1 poeng for uavgjort og 0 poeng for å tape.
Zedland har 11 poeng.
Hva er det minste antallet kamper som Zedland kan ha spilt?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 8

$$\frac{22}{15} \cdot \frac{45}{44} \cdot \frac{18}{10} =$$

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 9

Med 25% rabatt koster en kikkert 960kr. Hva er den vanlige prisen?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 10

I en familier er det tre barn som er til sammen 36 år gamle.
Det yngste barnet er halvparten så gammel som det midterste barnet.
Det eldste barnet er tre ganger så gammel som det yngste.
Hvor gamle er barna?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 11

Hva er størst. 15% av 750 eller 35% av 350?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 12

Et teppe er 8.5 meter bredt og 10 meter langt. 1.5 meter blir fjernet fra hver side av teppet. Hva er arealet til teppet nå?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 13

Det er en rad av bøker med ulik størrelse på ei hylle.
Det er 20 bøker til venstre for den største boka, og 22 bøker til høyre for den minste boka.
Både den største og den minste boka er ved siden av den eldste boka.
Hva er det laveste antall bøker det kan være på hylla?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 14

$14 \cdot 78 =$

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den)

- ○ Ja jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 15

Rocco har 1.5 liter appelsinbrus og 2.25 liter druebrus i kjøleskapet sitt.
Antonio har 1.15 liter appelsinbrus og 0.62 liter druebrus.
Hvor mye mer brus har Rocco enn Antonio?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 16

Fyll inn tallene som mangler i boksene.
243 + 1☐7 + ☐26 = 826

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 17

$$\frac{13}{6} - \frac{7}{15} =$$

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 18

En bilkø er 2km lang.
Omtrent hvor mange biler tror du det er i denne bilkøen?
Forklar hvordan du kom til svaret.

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 19

Differansen mellom to tosifrete tall er 50.
Hvor mange slike par av tosifrete tall finnes det?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 20

Et fotballag skal spille i en cup. 14 spillere skal delta.
Registrering for hele laget koster 1700kr.
Overnatting og mat koster 900kr per person.
Å leie buss til og fra cupen koster 4600kr.
Hvor mye koster det for laget å delta?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 21

592 : 37 =

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 22

$\frac{2}{9}$ av folkene på en restaurant er voksne.
Hvis det er 95 flere barn enn voksne, hvor mange barn er det på restauranten?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 23

Det er 100 klinkekuler i en rad.
Lisa begynner på venstresiden å ta 7 kuler.
Tim begynner på høyresiden å ta 3 kuler.
De fortsetter slike til det er tomt.
Hvor mange klinkekuler får hver av dem?

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Oppgave 24

Estimer hvor mye du sover på ett år.
Forklar hvordan du kom til svaret.

a. Hva synes du om denne oppgaven?

- ○ Jeg liker den veldig godt
- ○ Jeg liker den litt
- ○ Jeg verken liker eller misliker den
- ○ Jeg misliker den litt
- ○ Jeg misliker den sterkt

b. Hvorfor liker/misliker du denne oppgaven?

c. Tror du at du ville klart å løse oppgaven?
(Du trenger ikke å faktisk løse den.)

- ○ Ja, jeg er veldig sikker på at jeg kan løse den
- ○ Ja, men jeg er bare litt sikker på at jeg kan løse den
- ○ Jeg vet ikke om jeg kan løse den
- ○ Nei, jeg tror jeg mest sannsynlig ikke kan løse den
- ○ Nei, jeg er veldig sikker på at jeg ikke kan løse den

Tusen takk for at du fullførte spørreskjemaet!

Appendix 2 Teacher questionnaire

Hei! Takk for at du deltar i denne spørreundersøkelsen.

Spørreskjemaet har 24 oppgaver. for hver oppgave vil du bli spurt om hvs du tror dine elevers mening vil være om den, hvorfor de liker eller misliker den og om de tror de vil klare å løse den.

Elevene vil ikke trenge å løse oppgavene og det er ikke tidsgrense på spørsmålene.

Oppgave 1

347 + 489 =

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?

(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.

Fyll inn prosentandelen.

Oppgave 2

912 – 677 =

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 3

Det er 12 flasker som inneholder $\frac{1}{2}$ liter hver.
Hvor mange liter får hver person hvis det er åtte som deler?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 4

Estimer hvor mange burgere du kan kjøpe for en million kroner. Forklar hvordan du kom fram til svaret.

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 5

Fyll inn tallene som mangler i boksene.
☐3 – 2☐ = 25

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 6

Du selger boller til 15kr. og syltetøy koster 5kr ekstra.
Du kjøper ingredienser til 132kr og selger 84 boller. Hver fjerde bolle hadde syltetøy på.
Hvor mye tjente du?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 7

I en fotballturnering får lagene 3 poeng for å vinne, 1 poeng for uavgjort og 0 poeng for å tape.
Zedland har 11 poeng.
Hva er det minste antallet kamper som Zedland kan ha spilt?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 8

$$\frac{22}{15} \cdot \frac{45}{44} \cdot \frac{18}{10} =$$

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 9

Med 25% rabatt koster en kikkert 960kr.
Hva er den vanlige prisen?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 10

I en familier er det tre barn som er til sammen 36 år gamle.
Det yngste barnet er halvparten så gammel som det midterste barnet.
Det eldste barnet er tre ganger så gammel som det yngste.
Hvor gamle er barna?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 11

Hva er størst. 15% av 750 eller 35% av 350?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 12

Et teppe er 8.5 meter bredt og 10 meter langt. 1.5 meter blir fjernet fra hver side av teppet. Hva er arealet til teppet nå?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 13

Det er en rad av bøker med ulik størrelse på ei hylle.
Det er 20 bøker til venstre for den største boka, og 22 bøker til høyre for den minste boka.
Både den største og den minste boka er ved siden av den eldste boka.
Hva er det laveste antall bøker det kan være på hylla?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 14

$14 \cdot 78 =$

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 15

Rocco har 1.5 liter appelsinbrus og 2.25 liter druebrus i kjøleskapet sitt.
Antonio har 1.15 liter appelsinbrus og 0.62 liter druebrus.
Hvor mye mer brus har Rocco enn Antonio?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 16

Fyll inn tallene som mangler i boksene.

243 + 1☐7 + ☐26 = 826

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.
Fyll inn prosenentandelen.

Oppgave 17

$$\frac{13}{6} - \frac{7}{15} =$$

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 18

En bilkø er 2km lang.
Omtrent hvor mange biler tror du det er i denne bilkøen?
Forklar hvordan du kom til svaret.

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 19

Differansen mellom to tosifrete tall er 50.
Hvor mange slike par av tosifrete tall finnes det?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 20

Et fotballag skal spille i en cup. 14 spillere skal delta.
Registrering for hele laget koster 1700kr.
Overnatting og mat koster 900kr per person.
Å leie buss til og fra cupen koster 4600kr.
Hvor mye koster det for laget å delta?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 21

592 : 37 =

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at …..% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 22

$\frac{2}{9}$ av folkene på en restaurant er voksne.
Hvis det er 95 flere barn enn voksne, hvor mange barn er det på restauranten?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 23

Det er 100 klinkekuler i en rad.
Lisa begynner på venstresiden å ta 7 kuler.
Tim begynner på høyresiden å ta 3 kuler.
De fortsetter slike til det er tomt.
Hvor mange klinkekuler får hver av dem?

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørsmålet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Oppgave 24

Estimer hvor mye du sover på ett år.
Forklar hvordan du kom til svaret.

a. Hva tror du de fleste elevene dine vil mene om denne oppgaven?

- ○ De vil like den veldig godt
- ○ De vil like den litt
- ○ De vil verken like eller mislike den
- ○ De vil mislike den litt
- ○ De vil mislike den sterkt

b. Hvorfor tror du de vil like eller mislike denne oppgaven?

c. Har du en ide om elevene dine tror de kan løse denne oppgaven?
(De trenger ikke å faktisk løse den)

- ○ Det er vanskelig for meg å svare på dette spørs-målet
- ○ Ja, jeg kan gjette på hva de tror

Jeg gjetter på at .....% vil tro de kan løse denne oppgaven.
Fyll inn prosentandelen.

Tusen takk for at du fullførte spørreskjemaet!