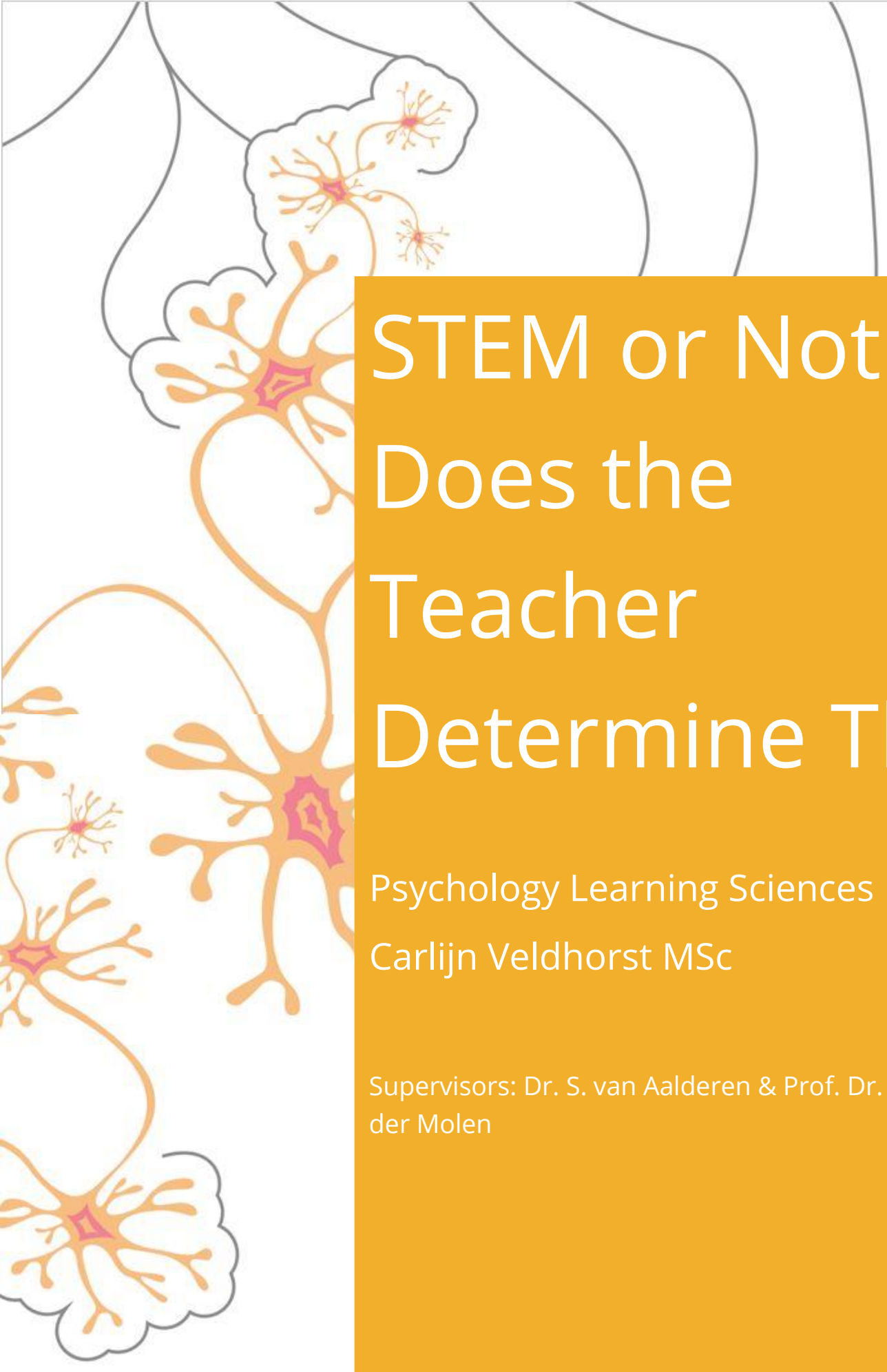

STEM or Not. Does the Teacher Determine This?

Psychology Learning Sciences

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Title of the final project
STEM or not. Does the teacher determine this?

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Acknowledgement

I investigated the mindset of teachers. By performing this master thesis I also investigated my own mindset. Although I think sometimes that I reached my limits, I learned to find new ways to reach my goal and to discover new challenges. So, performing this master thesis was an absolute mess of having a fixed and growth mindset. This master thesis is part of a result I did not expected: By following additional psychology courses, I decided to do the Master Psychology Learning Sciences. By being interested in the field, I did an internship. And by stepping outside comfort zone, I applied for a wonderful job.

Although you learn a lot by doing, I could not completed my master thesis without my two supervisors. Juliette, thank you for your honest feedback. Sandra, thank you for making it clear that I was learning and my skills improved. You are a very inspiring teacher. I think it is very special I met you during my first study, and after all these years you are my supervisor. And of course, I had a little (lot) help from family, friends, and my boyfriend Joeri. Thanks for helping me with my English language, listening to my extended speeches on education and all the nice things for extraction.

For now I will enjoy all the things I learned until now and focus on my job as educationalist. And after a while, I will find new things to learn. Because if I learned something from this master thesis, it is that you can always learn new things.

It took me so much, to get to where we are
And right now you are
~ Jeremy Loops ~

Contents

Abstract

In the Netherlands there is a great demand for technical employees. For that reason, The Dutch government initiates several activities in order to stimulate students for choosing a technical study profile, study and profession. Several factors influence these choices of students. Because teachers have a great influence on students' choices and performances, we focused on the teachers' expectancies and advices about the capabilities of students to follow a STEM study profile. Previous research showed that the mindset of teachers effects their expectancies of students. We investigated therefore the relation between the mindset of teachers and their expectancies and advice to students about following a STEM study profile. Combining the three concepts led to the following research question: What is the mediating role of expectancies in the relation between the mindset of teachers and the advice about the study profile? Because people with a more fixed mindset are sensitive to stereotypic thinking, we examined whether the gender and ethnicity of students influenced the expectations of teachers.

Quantitative data was gathered through an online survey. 38 STEM-teachers participated. Existing questionnaires were adapted to measure the mindset and effort beliefs of teachers. Fictive student scenarios were used to measure the expectancies and advices of teachers. Data analyses in SPSS showed that no significant relations were found. This means that the mindset of teachers did not influence their expectancies about students nor the advice they gave. Students' gender and ethnicity did not appear to influence the expectancies of teachers.

Introduction

Technical companies have an essential role in the Dutch economy; the technical sectors account for 40% of the national production and for about 66% of the exports. In addition, nearly 80% of the national expenditures which is spent on research and development is focused on this sector (Volkerink, Berkhout, Bisschop, & Heyma, 2013). Every year, about 30.000 new technical employees are needed to respond to new technological developments (Ministerie van Economische Zaken and Platform Bèta Techniek, 2015; Rijksoverheid, 2013). To stimulate employees to work in the technical sector, the Dutch government initiates several initiatives to increase the number of technical employees, but also to increase the number of technical students and the number of children that is choosing a technical study profile during high school (Ministerie Economische Zaken and Platform Bèta Techniek, 2015). Most interventions are targeting the students directly. However, several studies indicated that teachers have a great influence on the behaviour and achievement of students (e.g. Jussim & Eccles, 1992; Rosenthal & Jacobsen, 1968 as cited in Jussim & Harber, 2005). For this reason, this study is choosing a complementary angle: the influence teachers have on choosing for the technical field.

During high school, Dutch students already give direction to their (educational) career. During the third year of high school (9th grade) students of HAVO (higher general secondary education) and VWO (pre-university education) choose a specific set of school subjects, called study profile. In order to stimulate the choice for STEM-related study profiles (science, technology, engineering and mathematics), the above mentioned initiatives of the government are also focused on this moment of choice (VHTO, 2012). Namely, if students do not choose a STEM-related study profile at this moment, students restrict their career options to studies and function outside the technical field (Korpershoek, 2011). Van Langen and Vierke (2009) found that both student characteristics and classroom- and school characteristics play a major role in the choice for a specific study profile. Examples of important aspects are self-confidence in STEM-courses, the pleasure students experience with STEM-courses and the (estimated) talent in STEM-courses.

One of the factors that have been shown to influence students' performances is teachers' expectancies about students' performances and potential development. In 1968, Rosenthal and Jacobsen presented a study that showed the relation between expectations of teachers and student's performances. They found that high-expectancy students showed better performances than low-expectancy students. Also Miller and Turnbell (1986) showed that teachers' expectancies were important in such a way that it influenced students' performances.

A factor that has been shown to affect the expectancies of teachers is their mindset (Gutshall, 2013; 2014). A teachers' mindset can be described as the implicit beliefs about the nature and malleability of intelligence (Blackwell, Trzesniewski, & Dweck, 2007). Dweck (2000) makes a distinction between a fixed and growth mindset. Whereas a person with a fixed mindset has the implicit belief that intelligence is fixed and cannot be developed, a person with a growth mindset has the implicit belief that intelligence is malleable and something that can be developed (Dweck, 2000). Research of Gutshall (2013) showed that the mindset of teachers was related to their expectancies about their students' potential development. The study of Gutshall (2013) focused on students' development in general. In the context of the choice for a (technical) study profile, it is relevant to investigate whether this relationship does not only apply to students' development in general, but also for specific STEM-performances. Teachers express their expectations by means of an advice to a student when a student chooses a study profile. Hence, this advice of teachers can be seen as an indicator of their expectancies (De Boer, Bosker, & van der Werf, 2010).

The current study will investigate if teachers' advices are in line with their expectancies. In addition, based on the findings of Gutshall (2013) and De Boer et al. (2010), the current study is aimed to gaining insight in the relation between teachers' mindset, their expectancies about students'

potential to follow a STEM study profile and the advice teachers give to students about choosing a STEM study profile.

The expectations of teachers are generally influenced by students' characteristics like gender (e.g. Lavy & Sand, 2015), previous performances (e.g. Timmermans, Kuyper, & van der Werf, 2015), ethnicity (e.g. Glock & Krolack-Schwerdt, 2013) or socioeconomic status (e.g. De Boer et al., 2010). As appeared from the study of McKnown and Weinstein (2002), teachers had different expectancies about their immigrant and native students. Another example: Lavy and Sand (2015) found that teachers graded girls' answers on a math test lower than boys' answers on the math test, although the performances of boys and girls were equal. These biases can be seen as stereotypic thoughts. According to Dweck (2000), students with a fixed mindset are more likely to have stereotypical thoughts. Thus, the question arises if this also applies to teachers. And if yes, would teachers with a fixed mindset have different expectancies for students with different ethnical backgrounds or gender regardless of the equal level of achievement? Hence, it would be interesting to investigate if teachers with a fixed mindset do have different expectancies based on students' gender and ethnicity.

Blackwell et al. (2007) stated that students with a fixed mindset and a growth mindset have different beliefs about effort. These effort beliefs can be described as the extent to which one thinks that showing effort results in positive outcomes. For example, someone with strong positive beliefs believes that he or she can improve his or her STEM-grades with showing effort, although these grades are not high yet. If teachers have strong positive effort beliefs, it is plausible that they think students can improve their STEM-performances if they do their best. Hence, it is likely they are more tended to give students a positive advice regarding a STEM-study profile because they think students can improve their performances. On the other hand, teachers with strong negative effort beliefs think performances cannot improve by showing effort. It is likely that these teachers are more tended to give a negative advice regarding a STEM study profile because they think students cannot improve their STEM-performances. According to Dweck (2000), effort beliefs is a part of mindset. However, Tempelaar, Rienties, Giesbers, and Gijselaers (2015), stated that mindset and effort beliefs are two different concepts. They argued that someone with a fixed mindset can have both negative and positive effort beliefs. The same applies to someone with a growth mindset. Therefore, we will interpret effort beliefs as a mediating variable in the current study. Thus, we will investigate the relation between the teachers' mindset and the advice they give to students about choosing a STEM study profile to students and how effort beliefs could influence this relationship.

In order to gain insight in the choice for the STEM field of students, van Aalderen and Walma van der Molen (2016) conducted a study that investigated the relation between the mindset of students and their STEM study choice. The current study is related to this topic, and will investigate the mindset of teachers. Therefore, a questionnaire will be filled in by STEM-teachers teaching students of 3 HAVO and VWO or higher in order to measure teachers' expectancies, mindset and effort beliefs. To get more insight, the goal of this research is (1) to investigate how the mindset of teachers is distributed, (2) to examine the relation between the mindset of teachers and the advice they give, and subsequently whether this relation is mediated by (3) teachers' expectancies and (4) by the effort beliefs they have. Finally, it will be examined if (5) teachers with a strong fixed mindset are inclined to have different expectancies about students' performances based on students' gender and ethnicity.

Theoretical Framework

Expectancies of Teachers

After finishing primary school, Dutch students continue their educational career at high school (secondary education). Based on the educational level of students, they choose a specific level. In line with the law of inclusive education, this varies from preparatory secondary vocational education (VMBO) to pre-university secondary education (VWO) (PO-raad VO-raad, n.d.). Students follow a high school level that is most in line with their current performances. The placement of students at a

specific high school level is based on previous performances of students and the advice of teachers (Driessen & Doesborgh, 2005; PO-raad VO-raad, n.d.). Such advice can be seen as an expression of the teacher's expectations about the future performances of students during high school (De Boer et al., 2010). Accuracy of these expectations is of great importance for optimal positioning within secondary education. To illustrate, a recent research of CBS (2016) showed that, in case of equal scores on the final test of primary school (CITO), students with highly educated parents were more likely to have a higher school advice for secondary education than students with lower educated parents. This indicates that advices for students can have a detrimental effect if teachers base this on false expectancies.

Students that choose for senior general higher education (HAVO) or pre-university secondary education (VWO) at secondary school have to make another choice during the transfer from the third to the fourth year. These students have to choose a specific study profile that they will continue during their educational career. The choice for this study profile is based on several aspects like self-confidence, interest in the subjects, and the input of teachers and parents (Van Langen & Vierke, 2009).

Numerous studies showed that beliefs and expectations of teachers about their students affect the learning performances of students. Rosenthal and Jacobsen (1968, as cited in Jussim & Harber, 2005) presented the first study about the effect of the expectations of teachers about students' performances on the performances of students. In this study, students were randomly assigned to a group with potential for intellectual growth or a group with no potential for intellectual growth. Although the performances of both groups of students were similar in advance, results from the post-test showed that students from the group with potential for intellectual growth had better performances than the group with no potential for intellectual growth. The explanation for these results was not the actual potential of the students, but the behaviour of the teachers based on their expectations. Although this study of Rosenthal and Jacobsen (1968) was heavily commented in the later years (e.g. Jussim & Harber, 2005), this study can be seen as one of the founders of research on the effects of expectations of teachers on the performances of students.

Jussim & Eccles (1992) also studied the expectations of teachers about their students. Here they distinguished three components of expectations: self-fulfilling prophecy, perceptual bias, and accuracy. The first component, self-fulfilling prophecy, reflects the behaviour of teachers that derives from the expectations they have of their pupils. These expectations determine the actions of the teachers and they will act to confirm these expectations. For example, if a teacher has high expectations of a specific student, he or she will deliver more support to this student in order to confirm these expectations and stimulate the student to get high grades. Perceptual bias is the tendency to interpret results in such way that they match your expectations (Jussim & Eccles, 1992). This is a type of expectancy confirmation that is more situated in the mind of the teacher than the actual performance of students. For example, if a low-scoring student has a high grade for a difficult course, this can be attributed to chance and luck according to a negative view. With a more positive view, this can be attributed to effort and hard work. Lastly, accuracy refers to "successfully predicting achievement without influencing it" (Jussim, 1989, p. 469). In other words, teachers have right expectancies about students' performances, without influencing these performances. In Figure 1 a summarizing model of the three components is displayed. Miller and Turnbull (1986) summarized the effect of teachers' expectancies as "teacher's expectancies influence students' academic performance to a greater degree than students' performance influences teachers' expectancies" (p. 236).

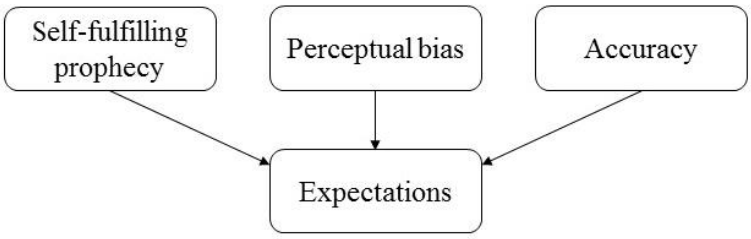

Figure 1. Components of expectations, adapted from Jussim & Eccles (1992).

Besides studies that investigated the relation between teachers' expectancies and students' performances, research has been done about the relations between teachers' expectations and teachers' actions. Fennema, Peterson, Carpenter and Lubinsi (1990) studied the relation between teachers' expectations and what attributions they make for students' successes and failures. They found that teachers attributed successes and failures of boys to ability and successes and failures of girls to effort. Furthermore, Lavy and Sand (2015) found that the different expectations teachers have of boys and girls have positive effects on boys' achievement and negative effects on girls' achievement.

Expectancies of teachers are widely investigated, for example by Rosenthal and Jacobsen (1968, as cited in Jussim & Harber, 2005), Jussim and Eccles (1992), Jussim and Harber (2005), and Lavy and Sand (2015), However, only a small amount of studies, focused on the effect of teachers' expectations and the advice they give their students regarding their educational career, was conducted in the Netherlands. Usually this advice was related to the transition from primary to secondary school. In previous studies, Mulder (1993) and Koeslag and Dronkers (1994) found that having positive expectations about students and pronouncing this, had a positive impact on the performances of students. This worked even if these positive expectations were not fully justified and actually overestimated students' capabilities. Research showed that students could fulfil these expectations and followed a higher learning level than they could manage in the first instance (Koeslag & Dronkers, 1994). A study of De Boer et al. (2010) also confirmed the positive effects of positive expectations, and stressed that positive expectations had more positive effects than negative expectations. The current study will focus on teachers' expectations about students' capability to follow a STEM study profile.

Mindset

Over the last few years, several researchers have studied how students perceive challenges (e.g. Eccles, Lord, & Midgley, 1991; Gutman & Midgley, 2000). It appeared that students cope differently with challenges. Where some students experienced challenges as something negative, other students experienced challenges as something positive. More insight in how students cope with challenges and failures, could help to understand what supports or bothers the motivation of students and their performances (Blackwell et al., 2007). Dweck (2000) developed a model with two components: the fixed mindset (i.e. entity theory) and the growth mindset (i.e. incremental theory). A person with a fixed mindset considers intelligence as a fixed concept, intelligence cannot change. By contrast, someone with a growth mindset considers intelligence as malleable and something that can be developed. Comparing people with fixed and growth mindset, a number of differences can be observed. First, someone with a fixed mindset is more focused on performance goals, compared to someone with a growth mindset. In other words, people with a fixed mindset try to stress their ability and want to show others that they are smart. On the other hand, someone with a growth mindset is more focused on learning goals (i.e. goals to increase the ability) (Blackwell et al., 2007; Dweck & Molden, 2013).

A second difference is that having a growth mindset is all about showing effort; through practice someone is capable to learn something. In comparison, someone with a fixed mindset thinks that showing effort is a confirmation of a lack of capacity (Blackwell et al., 2007; Dweck, 2000). A third difference mentioned is by Blackwell et al. (2007) and has to do with attribution. People with a fixed mindset often have helpless attributions in case of failing; they blame the failure to low ability. People with a growth mindset often have mastery-oriented attributions in case of failing; they blame the failure to low effort. Lastly, the fourth difference can be found in the strategies that are used to learn. People with a fixed mindset usually use helpless strategies in case of failing (e.g. withdrawing or repeating the strategy). Strategies of people with a growth mindset are usually mastery-oriented (e.g. increasing effort or changing strategies) (Blackwell et al., 2007). The four differences between having a fixed and growth mindset are shown schematically in Figure 2.

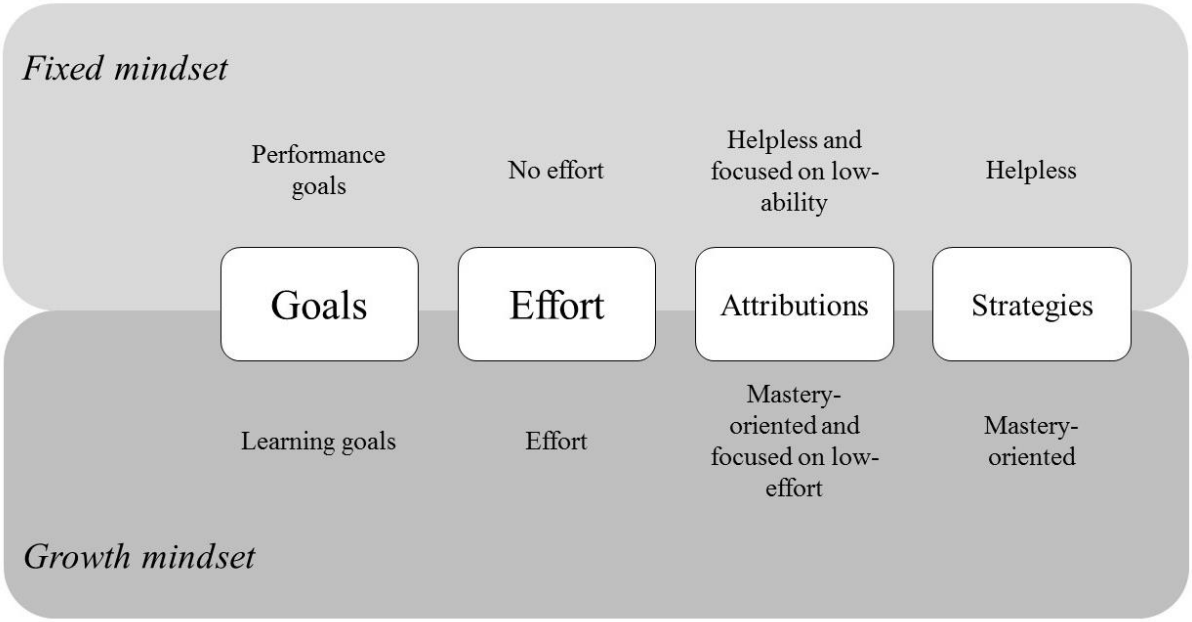

Figure 2. Differences between fixed and growth mindset based on Blackwell et al. (2007).

Several studies investigated the effect of mindset on different educational variables and found that having a growth mindset can support students during their school time (See Blackwell et al., 2007; Crocker, Karpinski, Quinn, & Chase, 2003; Dweck & Molden, 2013; Hong, Chiu, Dweck, Lin, & Wan, 1999; Molden & Dweck, 2006). For example, these studies indicated that in contrast to students with a fixed mindset, students with a growth mindset had a higher score on self-esteem, they more appreciated their social groups, had more harmonious relationships with others, believed that performances can be improved by effort and had better educational achievements. Having a growth mindset seems to have an added value for the educational career of students.

Although the mindset of students is thoroughly investigated, less studies are conducted that investigated the mindset of teachers (Gutshall 2013; 2014). However, it is suggested that teachers' mindsets affect their professional behaviour (Dweck, 2014; Gutshall, 2013; 2014; Swann & Snyder, 1980). Recent research of Gutshall (2013; 2014) mapped the mindset of teachers and indicated that teachers predominantly have a growth mindset regarding the general development opportunities and intelligence of students. Based on hypothetical student scenarios the researchers showed a significant relation between teachers' general mindset and their expectations about the potential development opportunities of students. This means that, if teachers believe in general that skills and intelligence are developable, it is highly probable that they believe that their students can also develop their intelligence and skills (Gutshall, 2013). For this reason, the mindset of teachers is measured in two

ways in the current study. Both the mindset regarding intelligence in general and intelligence of students will be measured.

In 1980, Swann and Snyder (1980) studied the effect of teachers' mindset on their didactic actions. The study showed that teachers who thought that intelligence is fixed and not developable, provided less support and ownership to their students. By contrast, teachers who believed that intelligence was malleable provided their students with more support and stimulated students to find their own answers. Similar studies were performed beyond an educational context. For instance, the study of Heslin, Vandewalle and Latham (2006) illustrated that managers with a growth mindset coached their employees more than managers with a fixed mindset.

The similarities between the above mentioned studies is that they all combined the constructs growth mindset and fixed mindset into one construct: mindset. Temperlaar et al. (2015) criticized this and chose to handle growth mindset and fixed mindset as two separate constructs. A first argument to use two separate constructs was the fact that previous studies showed correlations between scores on growth and fixed mindset from -.19 (Malmber & Little, 2007) to -.78 (Braten & Stromso, 2004). A second reason was the mediating role of effort beliefs in relations between the mindset and learning-related constructs. This is discussed further in the section effort beliefs. The current study follows the reasoning of Tempelaar et al. (2015) and will handle growth and fixed mindset as two single constructs.

Effort Beliefs

The theory of Dweck (2000) suggested that the mindset someone has, determines the beliefs about effort. Effort beliefs refers to the extent to which someone believes that showing effort results in positive outcomes (Honken, Ralston, & Snyder, 2014). So, people with a fixed mindset hold the belief that showing effort indicates you are not good enough (Dweck, 2000). By contrast, people with a growth mindset hold the belief that you can learn by showing effort. According to Tempelaar et al. (2015), these relations are more nuanced. Tempelaar et al. (2015) found in their study secondary cross-over effects. Although a negative correlation between a fixed mindset and positive effort beliefs was found, in a simultaneous model a fixed mindset contributed positively to positive effort beliefs. In a similar way, although a negative correlation between a growth mindset and negative effort beliefs was found, the simultaneous model showed that a growth mindset contributed positively to negative effort beliefs. This insinuated that both positive and negative effort beliefs were explained by both fixed and growth mindset. A sub note is that the weights of the two mindsets differed, but the signs of the paths did not differ (See Figure 3). Therefore, Tempelaar et al. (2015) indicated that adding effort beliefs as a mediator in the relation between mindset and a behaviour in achievement setting (for example, goal setting behaviour or motivation) can have more impact than the single impact of mindset. So, effort beliefs can be interpreted as a mediating variable: Effort beliefs can mediate the relationships between the mindset and several behaviours in achievement settings. For example, the construct mindset is only a little related to motivation. When adding effort beliefs as a mediator in this relationship, it appears that the impact of mindset on motivation mediated by effort beliefs is increased. The interpretations of Tempelaar et al. (2015) are in line with the results of Chen and Pajares (2010). Their study showed that epistemological beliefs mediated the relations between the mindset and achievement goal orientations, self-efficacy and science achievement. Previously, Tabernero and Wood (1999) found that self-efficacy beliefs mediated the relation between mindset and academic outcomes. Based on these findings, it is likely that mindset does not have a direct influence on the advice of teachers, but is mediated by effort beliefs. For that reason, it would be interesting to investigate this among teachers. No previously performed studies investigated the relationships between mindset, effort beliefs and the advice teachers give. It is expected that, based on previously demonstrated relations between mindset, effort beliefs and, for example task approach, the relation between mindset and the advice of teachers

(seen as behaviour) is mediated by effort beliefs. This reasoning makes it possible that, even though they have a growth mindset, teachers could have negative effort beliefs and vice versa.

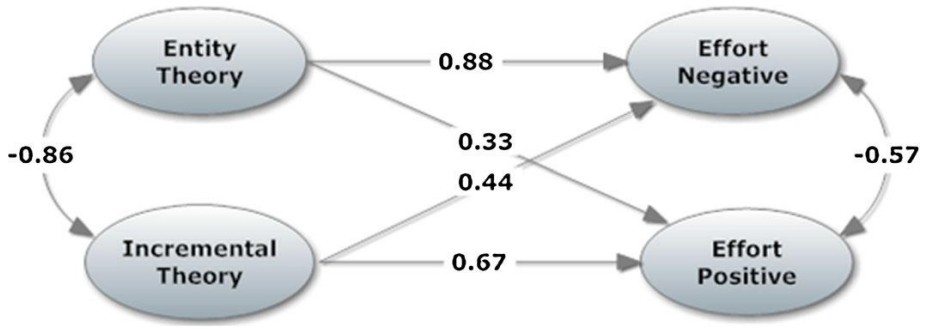

Figure 3. Path diagram with standardized estimates of the structural equation model relating mindset and effort beliefs, adapted from Tempelaar et al. (2015)

Student Characteristics

Accuracy of the expectations of teachers are important for the educational career of students (Südkamp, Kaiser, & Möller, 2012, as cited by Timmermans et al., 2015). Although most teacher have quite accurate expectations (Jussim & Eccles, 1992; Jussim & Harber, 2005) there is still an ongoing debate about the possible consequences of inaccurate recommendations for the educational career of students (Timmermans et al., 2015). Here, it is not particularly about low expectations or an expectation about a student that turned out to be wrong. It is about biased teacher expectations of specific subgroups or students (Timmermans et al., 2015). For example, these subgroups can be based on socioeconomic status (SES), age, gender and ethnicity (De Boer et al., 2010; Timmermans et al., 2015). Timmermans et al. (2015) found that teachers mostly base their expectations abouts' students' level on previous performances of students. Namely, they found that the variation in the expectations about students was determined on previous performances of students, for 80 %. However, the above aspects are of interest as well. For Example, McKown and Weinstein (2002) found in their study that teachers had lower expectations of students from stigmatized groups (African-American students versus white-American students and girls versus boys concerning math). Results of De Boer et al. (2010) showed that, among other things, previous performances, IQ, parents' aspirations and SES affected expectations of teachers. Although they did not find a moderating effect for gender and ethnicity, a study of Lavy and Sand (2015) showed a significant effect of gender and ethnicity on the expectancies of teachers.

Stereotyping: students' gender. The gender of students often leads to stereotypic thinking of both teachers and students. Several studies have been conducted investigating gender differences in performances. Keller and Dauenheimer (2003) performed a study where they divided male and female high school students over two groups. The first group was told that previous performed research showed gender differences in the scores of a math test, in disadvantage of girls. The second group was told that in previous research no differences in math-scores for gender were found. Notable, girls of the first group performed significantly worse than boys of the first group.

Apart from students (Jacobs & Eccles, 1992), the application of stereotypic thinking was also found by parents (Jacobs & Eccles, 1992; Yee & Eccles, 1988) and teachers (Fennema et al., 1990; Lavy & Sand, 2015; Tiedemann, 2000). The extent to which adults believe in stereotypic performances, affects their expectations and attributions. If teachers believe in performance differences between male and female students, this has major implications for their teaching actions. It thus appears that teachers who have stereotypic attitudes for math, base their judgments to a greater degree on categorical traits, for example gender, rather than on an individual basis (Fiske & Neuberg, as cited by Gunderson, Ramirez, Levine, & Beilock, 2011).

Lavy and Sand (2015) studied the differences in teachers' judgments about academic performances of girls and boys. Participating teachers were divided over two groups. Both groups had to evaluate an exam. The first group of teachers did not know the gender of the students who took the test. The second group did know the gender of the students who took the test. The results showed that girls graded by teachers of the first group (gender unknown) scored higher than boys. By contrast, girls graded by teachers of the second group (gender known) scored lower than boys. According to this study, girls were graded lower than boys based on their gender (Lavy & Sand, 2015). Levy and Sand (2015) also suggested that these teachers' biases of gender can have long term effects. For example, if students do not choose courses like math or science because teachers think they are not able to follow these courses, a career in the STEM field is ruled out as these courses are prerequisites for a STEM study.

Besides expectations for school performances, attributions for performances of boys and girls are affected as well. The attributional gender bias is the tendency to generate different attributions for school performances for boys and girls (Espinoza, Arêas de Luz Fontes, & Arms-Chavez, 2014). Teachers who believe that boys perform better in math than girls, have different attributions for the success. In general, if boys have great performance, it is devoted by talent. On the contrary, if girls have a great math performance, it is devoted to effort (Espinoza et al., 2014; Fennema et al., 1990; Yee & Eccles, 1988). These attributions are also evident in the feedback teachers give. Whereas teacher with stereotypic attributions praise girls mostly with non-intellectual feedback, they praise boys with intellectual feedback. An example of non-intellectual feedback is praising the neatness of an assignment. An example of intellectual feedback is praising the strategies the student used (Gunderson et al., 2011). Stereotypic attributions are most used for performances of middle-achieving students based on course grades. This may be because the performance of middle-achieving students is more ambiguous than obviously low- or high scoring students (Gunderson et al., 2011). Overall, understanding the behaviour of teachers and how this affects school performances can help to change teachers' (stereotypic) behaviour (Gunderson et al., 2011).

Stereotyping: students' ethnicity. In the Netherlands, there is an ongoing discussion about the accuracy of teachers' recommendations and the possible consequences of inaccurate recommendations for the school careers of students (Timmermans et al., 2015). Besides gender, the variable ethnicity and socio-economic background are often referred. Several studies investigated the effect of ethnicity and socio-economic background on students' school performances, with mixed results. Numerous studies did not find a structural bias against students from ethnic minority groups (e.g. Driessen & Doesborgh, 2005; Driessen & Smeets, 2007; Roeleveld, Driessen, Ledoux, Cuppen, & Meijer, 2011). On the other hand, several studies presented that ethnicity (e.g. Glock & Krolak-Schwerdt, 2013; Glock, Krolak-Schwerdt, Klapproth, & Böhmer, 2013; Rubie-Davies, Hattie, & Hamilton, 2006) and the socio-economic background of students (e.g. De Boer et al., 2010; Speybroeck, Kuppens, van Damme, van Petegem, Lamote, Boonen, & de Bilde, 2012; Timmermans, et al., 2015) are related to students' performances. Besides, the meta-analysis of Tenenbaum and Ruck (2007) showed that expectations of teachers and the accompanied behaviour varied, dependent on the ethnic background of students (after controlled for previous performances).

McKown and Weinstein (2008) and Timmermans et al. (2015) indicated that the composition of the class affected the expectations of teachers. When classes were mixed, which means that there were multiple ethnic groups in a class, teachers were more inclined to base their expectations on general group characteristics than individual characteristics. This is an important factor to take into account, since the Dutch society can be seen as a multicultural society. Around 12% of the inhabitants of the Netherlands has a non-western background (CBS, 2016). Socio-economic background and ethnicity are closely related (Crimmins, Hayward, & Seeman, 2004). In this study, ethnicity will be used as a student characteristic.

Context

In the Netherlands, where high school is divided over several levels, both HAVO (higher general secondary education) and (VWO) (pre-university education) know two phases. The first three years have a regular program. After these three years, all students choose a specific study profile. Four profiles can be distinguished, where two profiles have STEM-related courses (Science, Technology, Engineering and Mathematics), namely *Science and Health* and *Science and Technology*. The other two profiles, *Culture and Society* and *Economics and Society* are more related to the social sciences (DUO, 2015).

Figures of Ministerie van Economische Zaken and Platform Bèta Techniek (2016) show that the amount of students that is choosing a STEM study profile has increased since 2004. During the school year of 2015/2016 43% of the HAVO students chose a STEM study profile. For VWO students this share was even bigger, namely 62%. The increase of the amount of students that chose a STEM study profile can be found in Figure 4. DUO (2015) made an overview of the division of study profiles between the two educational levels HAVO and VWO (See Attachment 1).

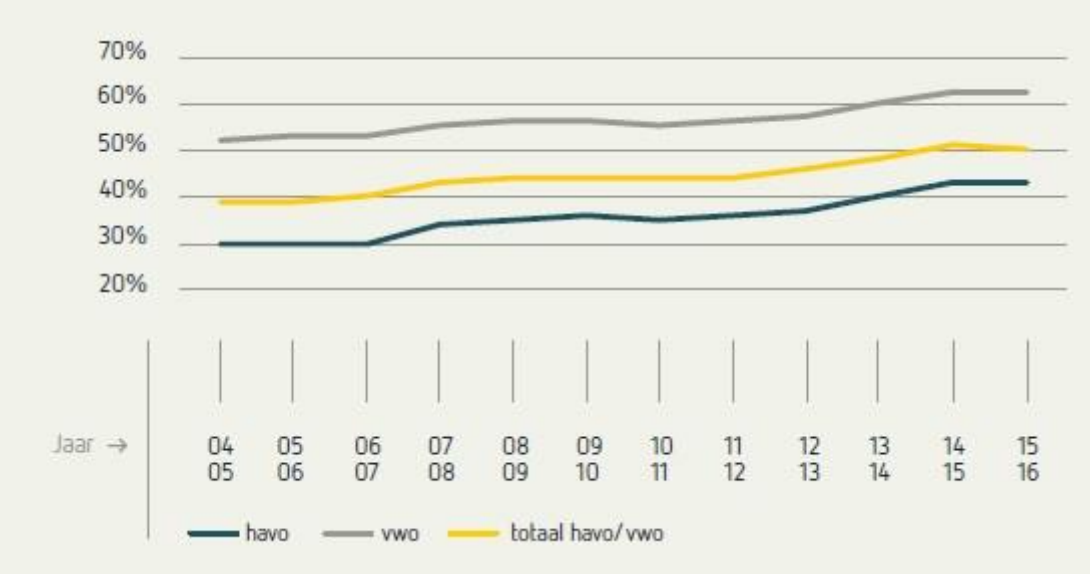

Figure 4. The amount of students from HAVO and VWO that chose a STEM study profile.

From the figure above, it can be concluded that more and more students are choosing for a STEM-related study profile. Looking closer to the differences between boys and girls, the figures show that the distribution became more equal (See

Table 1). However, the amount of female HAVO students that was choosing a STEM study profile is still smaller than the amount of male HAVO students (DUO, 2015). For students from VWO it was equal in 2015/2016. Because there is still a small difference for HAVO students and because this has been the same for a long time for VWO students, it would be interesting to take students' gender into account when measuring the expectancies of teachers. The same applies to students' ethnicity. Although no figures are known, according to Platform Bèta Techniek (2014) less minority students are choosing a STEM study profile relative to native students.

Table 1. *Increase of the amount of HAVO and VWO girls that is choosing a STEM profile relative to the total amount of students (DUO, 2015)*

	2005/2006	2015/2016
HAVO	35.0%	45.0%
VWO	46.0%	50.0%

The Current Study

In sum, while mindset and expectancies of teachers have been investigated previously, no relation has been made with the advice teachers give to secondary school students regarding the choice for a STEM study profile. The current study will build on the findings of Gutshall (2013; 2014). We hypothesize that the teachers' mindset is related to the advice they give to students whether to follow a STEM study profile, and that this relation is mediated by teachers' expectations about the ability of students to follow a STEM study profile. As expectations are influenced by several (students) aspects, we will examine the influence of students' gender and ethnicity on teachers' expectancies. Combining all these concepts lead to two research models that are explained below (see Figure 5 and Figure 6).

Research Question and Model

To investigate the mindset of teachers a quantitative method will be used. Five research questions are formulated in order to guide the research. A summarizing model can be found in Figure 5 and Figure 6. First will be investigated how the mindset of teachers is distributed. Therefore the following research question is formulated:

1. How is the mindset of STEM-teachers shaped?

Because both the mindset regarding intelligence in general (personal mindset) and students' intelligence (student-oriented mindset) will be measured, a sub-question is defined to get more insight in how these two mindsets are interrelated:

   a. How is the personal mindset of teachers related to the student-oriented mindset?

According to de Boer et al. (2010), the advice teachers give to students, can be seen as an expression of their expectancies. Gutshall (2013) found that the mindset effects the expectancies they have about their students. By combining these two findings, the following research question is posed:

2. What is the relation between the mindset of teachers and the advice they give to students with respect to choosing a study profile?

In order to study the relation between teachers' mindset, expectancies and advice in detail, expectancies will be used as a mediating variable for the relation between teachers' mindset and the advice they give. Research question 2 and 3 are displayed in Figure 5.

3. What is the mediating role of expectancies in the relation between the mindset of teachers and the advice about the study profile?

Next to the mediating role of expectancies between mindset and advice, effort beliefs could mediate the relation between mindset and advice. This reasoning is based on Tempelaar et al. (2015), who found that someone with a growth mindset can have positive effort beliefs as well as negative beliefs. Therefore, effort beliefs could be interpreted as a mediating variable in the relation between mindset and advice. This expectation is inspired by the results of Chen and Pajares (2010). They found that effort beliefs mediated the relation between the mindset and task and performance approach of students. Giving an advice can also be seen as an action. Therefore, we conducted a second research model (See Figure 6), accompanied by the fourth research question:

4. What is the mediating role of effort beliefs in the relation between the mindset of teachers and the advice about the study profile?

Students with a strong fixed mindset are more inclined to stereotypical thinking. The current research will study whether teachers with a high score on fixed mindset also are more tended to have

stereotypical thoughts and have different expectancies for students based on students' gender and ethnicity. The fifth research question of the study will be:

5. Do teachers with a strong fixed mindset have different expectancies about their students based on students' gender and ethnicity?

Following on the fifth research question, with the last research question we will investigate whether teachers with a high score on fixed mindset and teachers with a low score on fixed mindset differ in their expectancies about students and advices to students. Therefore the last research question is posed:

6. Do teachers with a strong fixed mindset have different expectancies about their students and give different advices to their students than teacher with a low score on fixed mindset?

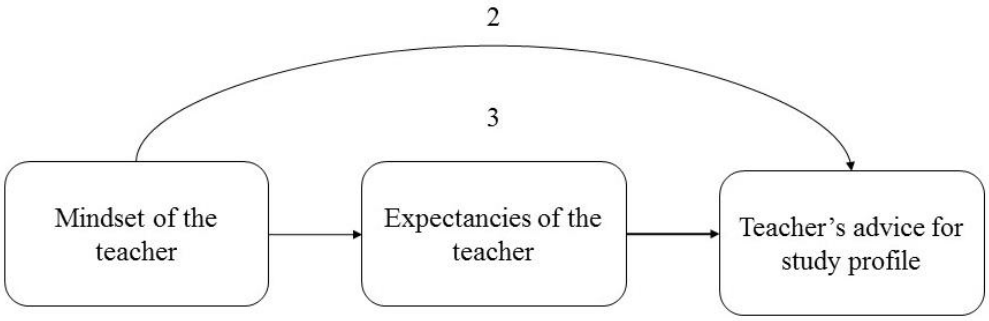

Figure 5. Research model of research question 2 and 3

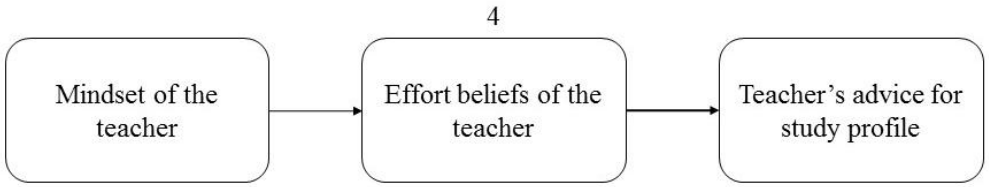

Figure 6. Research model of research question 4

Method

Research Design

For the proposed research we used a cross-sectional design, which was of quantitative nature (Babbie, 2010). A cross-sectional design is characterized by focusing on a specific group and measuring in one point of time. Although a longitudinal design (measurements for a longer period of time) could have delivered more information about the whole process, a cross-sectional design was more preferable for this study because of time-constraints (Bobbie, 2010). To gather information, we asked teachers that teach a STEM-course at a high school to fill in a digital questionnaire. To measure the expectancies of students' STEM performances and the advice about choosing a STEM study profile, fictive student scenarios were conducted. To measure teachers' mindset and effort beliefs, validated questionnaires were used. After gathering information, analyses were performed in the statistical program SPSS.

Participants

Since the study aimed to investigate the mindset, expectations, and advice of teachers, the target population consisted of teachers from different high schools in the Netherlands. A non-probability sampling strategy was used, specifically quota sampling (Onwuegbuzie & Leech, 2007), to select participants that meet the specific characteristics. The sample consisted of STEM teachers who taught math, chemistry, physics, biology, computer science or engineering to third-, fourth-, and fifth year

students of higher general secondary education (HAVO) or third-, fourth-, fifth-, and sixth year students of pre-university education (VWO). Teachers that did not teach STEM courses, only taught students from the first or second year or taught only students from preparatory general secondary education (VMBO) were excluded from this study. This was because they were not involved in the specific situation of choosing one of the four study profiles.

The sample consisted of 38 participants, (39.50 % men). The average age of the participants was M_{age}= 44.13 (*SD* = 9.98). The average teaching experience in years of the participants was $M_{teaching\ experience}$= 13.12 (*SD* = 9.75) in September and October 2016. All participants worked at a high school in the Netherlands. 97.40% had a Dutch nationality. An overview of the distribution of the teachers and their courses can be found in Table 2.

Table 2.
Demographical Background of the participants

Study year						
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	14	12	23	28	22	18
Level of students						
	HAVO			VWO		
	34			35		
Teaching course						
	Biology	Science	Mathematics	Physics	NLT	Informatics
	7	8	14	6	1	2
Gender						
	Male			Female		
	15			23		
Teaching grade						
	First grade			Second grade		
	24			14		
Nationality						
	Dutch			Other		
	37			1 (Italian)		

Instrumentation

The quantitative data was collected through an online survey (See Attachment 2). The questionnaire consisted of seven subscales measuring teachers' personal fixed mindset, personal growth mindset, student-oriented fixed mindset, student-oriented growth mindset, teachers' expectations, effort beliefs, and the advice they gave students. The questionnaire included a total of 81 items. The measured concepts are displayed in Table 4. It was not possible to perform a factor analysis due to too few participants. Usually, a factor analysis is used to explore correlations between items in order to form latent variables (Field, 2009). Since it was not possible to perform a factor analysis, we had to rely on the subscales that were based on existing, validated questionnaires, that all had a good Cronbach's alpha. To measure expectancies, we used the questions of Speybroeck et al. (2012); (α=.83). To measure personal mindset, we used questions of De Castella and Byrne (2015); (α=.87). To measure student-oriented mindset, we used questions of Dweck (2000). For measuring effort beliefs, we used questions of Blackwell (2002); (α=.79, by Blackwell et al., 2007). We translated the questions of these questionnaires into Dutch. Besides, we adapted the questions about expectancies, student-oriented mindset and effort beliefs towards a STEM-related situation. In addition to the measured variables of

the study, questions about the demographic background of the participants were added to the questionnaire.

The structure of the questionnaire was as follows: After an informed consent, the first part of the questionnaire was about the demographic characteristics of the participants. In the second part, teachers were presented with eight students scenario's each describing a fictive student. For each scenario, teachers were asked to indicate their expectations about the student's ability to follow a STEM study profile. Furthermore, they were asked to give their advice to this particular student. This was followed by a third part that included questions regarding the mindset of the participant. The last questions were about the effort beliefs of the teachers. The questionnaire ended with a short seclusion. Before distributing the questionnaire, it was checked by two employees of the University of Twente who were also teaching at a high school. All participants received the same questionnaire with the same order of questions and fictive student scenarios.

Fictive student scenarios. In the current study, we focus on the advice to students for whom it is unclear if they are able to follow successfully a STEM study profile. For example, this is the case for students with grades that are just sufficient, but are highly motivated. In these cases, the teacher's advice depends on whether he/she see sufficient development opportunities. This invokes among other things the mindset of teachers. The questionnaire included eight hypothetical cases about students for whom the choice for a STEM study profile was still unclear. The student scenarios consisted of the following aspects: motivation, insight, scheduling, behaviour, study approach, wellbeing, concentration, gender and ethnicity. Except for the last two concepts, the concepts were taken from the Dutch education monitoring system Magister. We tried to compose the scenarios in a similar way. This means that the eight scenarios were substantially the same, except for students' gender and ethnicity. The student scenarios were divided over three categories. The target group consisted of two boys and two girls. One boy and one girl had an autochthonous ethnicity. The other boy and girl had a minority ethnicity. School performances were all equal for the four students. The target group consisted of the students for who it is unclear whether they can handle a STEM study profile. The other two categories served as control categories. Control group 1 included two students (male and female) with low school performances. Based on their grades, a STEM study profile is not suitable. This group was added to confirm that students with low performances indeed received a negative advice. Control group 2 included two students (male and female) with high school performances. Based on their grades, a STEM study profile is suitable. This group was added to conform that students with high performances indeed received a positive advice. In Table 3 an overview of the fictive student scenarios can be found.

Student's gender. The fictive student scenarios differed between genders, to study the effect of students' gender. Four of the eight fictive students were male, the other four fictive students were female. Gender was indicated by the name and the photo of the fictive student.

Students' ethnicity. The fictive student scenarios of the target group differed between ethnicity. To measure the influence of students' ethnicity. Two of the students of the target group were minority students, the other two fictive students of the target group were autochthonous students. The two control groups contained only autochthonous students. Ethnicity was indicated by the name and the photo of the fictive student.

Expectancies. Teachers' expectancies about STEM intelligence of students and the expected capabilities to follow a STEM study profile were measured with questions regarding the fictive student scenarios. For each fictive student scenario, participants answered five questions regarding their expectancies of successfully following a STEM study profile by using a 6-point Likert scale (1 = totally disagree, 6 = totally agree). Four questions were based on Speybroeck et al. (2012). The fifth question was an additional question to investigate the learning opportunities with additional support. One of the questions was: "Jasper will successfully follow a STEM study profile". For the target group

the internal consistency was α= .89. The internal consistency of control group 1 and control group 2 was respectively α= .86 and α= .73. All alphas were indicated as good (Field, 2009).

Advice. The advice of teachers regarding choosing a STEM study profile was also measured by using the fictive student scenarios. Besides the expectancies concerning successfully following a STEM study profile, participants gave the fictive students a positive or negative advice for choosing a STEM study. For each student scenario, participants could explain their choice. The question participants had to answer for each fictive student was: "I will recommend Jasper to choose a STEM study profile". Participants could answer with 'yes' or 'no'.

Mindset. The concept mindset was measured by 16 items that both measured the general mindset of teachers (eight items) and a domain-specific mindset: the mindset about intelligence of students (eight items).

Personal mindset. First the general mindset of teachers (i.e. personal mindset) was measured by eight items based on De Castella and Byrne (2015). These items referred to the development opportunities of intelligence in general. In line with Tempelaar et al (2015), the scores for fixed and growth mindset were measured and analysed separately. Four items were measuring the score on a growth mindset (α= .93). One of the questions was: "With enough time and effort I think I could significantly improve my intelligence level". The other four items were related to a fixed mindset (α= .87). Both values of the alpha are good (Field, 2009). An example of a question was: "I don't think I personally can do much to increase my intelligence".

Student-oriented mindset. Next to the personal mindset, this study measured also the mindset of teachers when it comes to the STEM-intelligence of students. Because this study is conducted within a STEM-context, a mindset that is specifically focused on the STEM-performances of students, could have a distinct influence on the expectations of teachers. This division in the mindset is in line with a previous study of the mindset of students of Meijer (2016). The mindset of teachers regarding the STEM-intelligence of students (i.e. student-oriented mindset) was measured by seven items based on Dweck (2000). Four items were related to the score of a growth mindset (α= .59). One of these questions was: "I believe students can always change how well they perform in STEM-courses". The remaining three items measured the extent of a fixed mindset (α= .35). An example of a question was: "I think students cannot change how well they perform in STEM-courses". Both alphas were low (Field, 2009). Therefore, results from the analyses had to be interpreted with caution.

Effort beliefs. Beliefs about the utility of effort were measured by 11 items adapted from Blackwell (2002). We translated the original items of Blackwell (2002) into Dutch. Besides, we changed 'you' into 'student' and focused on STEM-performances. An example of an original question is: 'If an assignment is hard, it means I'll probably learn a lot doing it'. We adapted the question to: 'If a math- or science assignment is hard, a student will probably learn a lot doing it'.

In line with Tempelaar et al. (2015), we measured and analysed effort beliefs separately from mindset. Besides, the scores on positive and negative effort beliefs were measured separately. Six items were focused on negative effort beliefs (α= .29) and five items were focused on positive effort beliefs (α= .54). Both Cronbach's alphas were indicated as low (Field, 2009). In fact, such low alphas means that the constructs are not reliable to use. As we had no time to make adjustments in the questionnaire and distributed the questionnaires a second time, we used the constructs in the analyses. So, the results from the analyses have to be interpreted with caution. Two example questions measuring negative and positive effort beliefs were respectively 'If a student is not doing well in STEM courses it might be better to choose a different study profile' and 'If a student finds difficulties in the content of STEM-courses, work harder has always meaning'.

Procedure

The data collection took place from September 2016 till the end of November 2016. Before this data collection took place, participants from Dutch high schools had to be selected. In order to involve participants in the research, six Dutch high schools were visited in June 2016 and July 2016 to ask for participation. In total, seven schools accepted participation. Via a contact person from each participating high school, teachers were asked to participate. The participation was voluntary and all participants could make the choice to perform the questionnaire by paper-and-pencil or via an online survey. Eventually, all 38 participants filled out the questionnaire via an online survey per e-mail on a self-chosen time. The questionnaire started with a written informed consent. The informed consent informed the participants about the purpose, risks and benefits, the process and the use of the results. After a written confirmation of participation, participants started with filling in the questions. Completing the questionnaire took about 20 minutes per person. All participants filled in the questionnaire personally and no help of the researcher was needed.

The research was performed according to the ethical guidelines of the University of Twente. Before the data collection started, an ethical form was filled out and approved by the ethical committee of the University of Twente. Because the participants were fully informed by the informed consent at the start of the questionnaire, a debriefing sessions was not necessary (Bobbie, 2010). In addition, the risk of stress or discomfort was minimal and the anticipating benefits of participating were higher than the risk. Also, there was no question of a relation of dependency between the researcher and the participants. The data was handled confidentially, as the names of the participants were not asked and the names of the high school were not used in any published or written material concerning the research. Only the researcher and the supervisors had access to the interview materials. Participants could pose questions or comments regarding the research to the researcher by sending an e-mail. All contact persons were given the option to receive the research report after completion of the research.

Table 3.
Overview of the fictive student scenarios[*]

Fictive student scenario	Student name	Gender	Ethnicity	School performances	Condition
1	Jasper	Boy	Autochthonous	Doubtful	Target
2	Sophie	Girl	Autochthonous	High	Control
3	Fatima	Girl	Minority	Doubtful	Target
4	Sam	Boy	Autochthonous	Low	Control
5	Tom	Boy	Autochthonous	High	Control
6	Marieke	Girl	Autochthonous	Doubtful	Target
7	Ibrahim	Boy	Minority	Doubtful	Target
8	Lotte	Girl	Autochthonous	Low	Control

Note. [*]Displayed as the order of the questionnaire.

Methods of Analysis

The present study used descriptive statistics to explore the overall structure of the data. Cross-sectional analyses were performed in order to find an answer on the research questions. An overview of the relations between the variables can be found in Figure 5 and Figure 6. First, a paired sample *t*-test was performed to compare the scores on the personal and student-oriented mindset for both fixed and growth mindset. Continuing with the mindset of teachers, a linear regression analysis was used to

investigate the relation between the scores on the fixed and growth mindset and the advice teachers gave to the fictive students in the target group. Before this multinomial regression analysis was performed, an ANOVA confirmed the differences in advice for the three categories (target group, control group 1, control group 2). A mediation analysis by using PROCESS was executed to investigate the mediating role of expectancies on the relation between the fixed and growth mindset of teachers and the advice they gave. The same analysis was used in order to investigate the mediating role of effort beliefs. In order to investigate the effect of students' gender and ethnicity on teachers' expectancies and advice, a MANOVA was performed. Teachers' expectancies and advice were divided over two groups: teachers with a low score on fixed mindset and teachers with a high score on fixed mindset. This same division was used to analyse the last research question. With an independent sample t-test the differences for teachers with a low score on fixed mindset and a high score on fixed mindset on expectancies and advice were measured.

Table 4.
Overview of the subscales measurements

Construct	Measured by	Example question	Measurement level	α
Expectancies of teachers about the performances of the fictive students.	Five questions regarding expectancies, based on Speybroeck et al. (2012). Divided by student level over three categories: Target group, control group 1 and control group 2.	"Jasper will successfully follow a beta study profile"	Interval (Likert scale: 1= totally disagree, 6 = totally agree)	α_{target}= .89 $\alpha_{control1}$= .86 $\alpha_{control2}$= .73
Advice teachers give regarding choosing a beta study profile.	One question asking if a beta study profile is recommended.	"I advise Jasper to choose a beta study profile"	Categorical (1= no, 2 = yes)	Not applicable
Fixed mindset about general intelligence of teachers	Four questions regarding a fixed mindset based on questions De Castella & Byrne (2015).	"I can learn new things, but I do not have the ability to change my basic intelligence".	Interval (Likert scale: 1= totally disagree, 6 = totally agree)	.87
Growth mindset about general intelligence of teachers	Four questions regarding a growth mindset based on questions De Castella & Byrne (2015).	"I believe I can always substantially improve on my intelligence".	Interval (Likert scale: 1= totally disagree, 6 = totally agree)	.93
Fixed mindset about students' STEM potential development teachers	Three questions regarding a fixed mindset based on questions Dweck (2000).	"I think students cannot change how well they perform in STEM-courses".	Interval (Likert scale: 1= totally disagree, 6 = totally agree)	.35
Growth mindset about students' STEM potential development of teachers	Four questions regarding a growth mindset based on questions Dweck (2000).	"I believe students can always change how well they perform in STEM-courses".	Interval (Likert scale: 1= totally disagree, 6 = totally agree)	.59
Positive effort beliefs	Five questions regarding positive effort beliefs based on questions of Blackwell (2002).	"If a math- or science assignment is hard, a student will probably learn a lot doing it".	Interval (Likert scale: 1= totally disagree, 6 = totally agree)	.54
Negative effort beliefs	Six questions regarding negative effort beliefs based on questions of Blackwell (2002)	"If students are not good at a subject, working hard won't make them good at it"	Interval (Likert scale: 1= totally disagree, 6 = totally agree)	.29

Results

The current research aimed to investigate how the mindset of teachers was composed and how this was related to their expectancies of students and the accompanied advices they gave their students regarding the study profile. First, the goal was to identify the composition of both fixed and growth mindset of teachers and to analyse how these two mindsets differ. In addition we measured the relation between the personal mindset and the student-oriented mindset. The second goal was to determine the relationship between teachers' mindset and the advice they gave to students. Thirdly, the mediating role of teachers' expectancies in the relation between teachers' mindset and their advice to students was analysed. In the same way, the mediating role of effort beliefs was measured for the relation between the mindset and the advice of teachers. Finally, the influence of students' gender and ethnicity on teachers' expectancies with a (high) score on fixed mindset was studied.

To answer the research questions, quantitative analyses were performed. First, general descriptive statistics are presented. Thereafter cross-sectional analyses are discussed, structured by the research questions.

Descriptive Statistics

The descriptive statistics are presented in Table 5. The expectancies about students' potential performances and advice about choosing a STEM study profile, were divided over three categories, based on students' performances (target group, control group 1, control group 2). As expected, the mean score expectancies for control group 1 was the lowest with M = 1.64 (SD = .49), on a scale from 1 to 6, the mean score expectancies for the target group was M = 2.84 (SD = 0.58). The highest mean score for expectancies was for control group 2 (M = 3.17, SD = .33). A same distribution can be found for an advice ($M_{control1}$ = .06, SD = .24; M_{target} = 1.82, SD = 1.59; $M_{control2}$ = 2.00, SD = .00), on a scale from 1 to 4 for the target group and 1 to 2 for the control groups. Strikingly, the mean score of expectancies of control group 2 is still quite low while the mean score of advice is maximum. Results of the target group will be used for further analyses. The high standard deviation of mean score of the target group showed that there was a lot of variation in the advice and expectancies of the participants.

Participants had a mean score of M = 3.02 (SD = 1.10) on personal fixed mindset, on personal growth mindset they scored M = 3.72 (SD = 1.13). For student-oriented fixed mindset and student-oriented growth mindset these mean scores were slightly different. For student-oriented fixed mindset participants had a mean score of M = 2.79 (SD = .67) and for student-oriented growth mindset the mean score is M = 3.96 (SD = .68). Here, the difference was slightly larger. For all four constructs a maximum score of 6.00 was possible. The last two variables were effort beliefs. For negative effort beliefs, participants had a mean score of M=3.17 (SD = .46). For positive effort beliefs participants had a mean score of M = 3.68 (SD = .68).

Table 7 presents the correlations between the measured variables. I will mention some (marginal) significant correlations. If STEM-teachers had a growth mindset (both personal and student-oriented) they were less tended to have negative effort beliefs (r = -.42; r = -.44). By contrast, positive correlations were found for personal fixed mindset and negative effort beliefs (r = .31) and for student-oriented fixed mindset and negative effort beliefs (r = .53). Correlations between mindset variables will be discussed in the next section about the mindset of teachers. Further correlations between the variables will be discussed in the section of cross-sectional analyses.

Mindset of teachers. The current study aimed to identify the mindset of STEM-teachers. Four categories of mindset were measured. The mean scores can be found in Table 5.

If STEM-teachers had a high score on personal fixed mindset, it was likely that their score on personal growth mindset was lower (r = -.82). The same applies to student-orientated fixed and growth mindset (r = -.63). If participants had a higher score on personal growth mindset, participants had also a high

score on student-orientated growth mindset (r = .51). A positive correlation was also found for personal fixed mindset and student-orientated fixed mindset (r = .62). We must keep in mind that the Cronbach's Alpha from both student-oriented fixed and growth mindset was quite low. Results have therefore to be interpret carefully.

As the variables were continuous and not categorical, a paired-samples t-test was conducted to compare the scores of the personal mindset and student-oriented mindset for both fixed and growth mindset. Although the mean scores were slightly different, there were no significant differences in the growth mindset between the personal (M = 3.72, SD = 1.13) and student-oriented mindset (M = 3.96, SD = .68); $t(31)$ = -1.40, p = .17. Also for fixed mindset no significant difference was found between the personal mindset (M = 3.06, SD = 1.10) and student-oriented mindset (M = 2.79, SD = .67); $t(31)$ = 1.80, p = .08.

Expectancies. An ANOVA with repeated measures is performed in order to confirm that the expectancies for the three groups differed significantly. Using an ANOVA with repeated measures with a Greenhouse-Geisser correction, the mean scores for expectancies were statistically significantly different ($F(1.80, 59.59) = 172.24$, $p < .01$). Post hoc tests using the Bonferroni correction revealed that expectancies for the target group (M = 2.83, SD = .10) and control group 1 (M = 1.64, SD = .08) were significantly different ($p < .01$). Also the mean scores of expectancies between the target group and control group 2 (M = 3.18, SD = .06) differed significantly ($p < .05$). Lastly the mean scores for control group 1 and control group 2 were significantly different ($p < .01$). So, this analysis showed that the expectancies for the three groups differed significantly.

Table 5.
Descriptive statistics

	N	Minimum	Maximum	*M*	*SD*
Expectancies	34	1.00	3.80	2.8	.58
Personal fixed mindset	33	1	6	3.02	1.0
Personal growth mindset	32	1	6	3.72	1.13
Student-oriented fixed mindset	32	2	4	2.79	.67
Student-oriented growth mindset	32	3	6	3.96	.68
Advice	34	0	4	1.82	1.59
Negative effort beliefs	32	2.00	4.17	3.17	.46
Positive effort beliefs	32	2.40	5.20	3.68	.68

Advice. In order to confirm the differences in advice between the two control groups and the target group a one way ANOVA with repeated measures was performed. Before the ANOVA with repeated measures was conducted, the variable advice was changed from a dichotomous variable into a continuous variable. This change has been made to perform further analyses. Although advice was originally a dichotomous variable (positive advice vs. negative advice) because this relates to reality, for analyses we needed a continuous variable. The variable advice can now be interpreted as a mean score that indicates the tendency towards a positive advice instead of 'yes' or 'no'. M = .0 means that no positive advices were given, M = 1.0 means that all advices were positive.

Using an ANOVA with repeated measures with a Greenhouse-Geisser correction, the mean scores for advice were statistically significantly different ($F(1.40, 37.63) = 155.88$, $p < .01$). Post hoc tests using the Bonferroni correction revealed that the mean scores of advice for the target group (M =

.46, *SD* = .40) significantly differed from the mean scores of advice from control group 1 (*M* = .0.3, *SD* = .12) and the means cores on advice between the target group and control group 2 (*M* = 1.0, *SD* = .00) ($p < .01$, $p < .01$, respectively). Also, the mean scores for control group 1 and control group 2 were significantly different ($p < .01$). These results confirmed that the three groups based on the student scenarios were sufficiently distinctive. Table 6 shows the percentages of the positive advices the students of the target group received. The percentages showed that the ratio of positive and negative advice for this group was substantially equal. So indeed, there were doubts about the advices that are given.

Table 6.
Positive advice for choosing STEM study profile

	Jasper	Marieke	Ibrahim	Fatima
N	38	35	34	37
Positive advice	44.7%	45.7%	50.0%	45.9%

Table 7.
Bivariate correlations between the variables

	1. Personal fixed mindset	2. Personal growth mindset	Student-oriented Fixed mindset	3. Student-oriented growth mindset	4. Expectancies	5. Advice doubt	6. Negative effort beliefs	7. Positive effort beliefs
1.	1	-.82**	.62**	-.43*	-.33†	-.15	.31 †	-.30 †
2.		1	-.63**	.51**	.24	.12	-.42*	.22
3.			1	-.63**	-.12	-.31 †	.53**	-.05
4.				1	.10	.22	-.44*	.28
5.					1	.56**	-.22	.33
6.						1	-.42*	.28
7.							1	-.23
8.								1

Note. ** Correlation is significant at the .01 level (2-tailed). * Correlation is significant at the .05 level (2-tailed). † = Marginal significant

Cross-sectional Analysis
The descriptive statistics presented some basic information about the research variables. In the cross-sectional part, results regarding the research questions are discussed. First the relation between the

mindset of teachers and the advice they gave to students will be discussed (RQ 2). Subsequently, research questions three, four, five and six are answered.

The relation between teachers' mindset and the advice to students. To examine the relation between the mindset of the teachers and the advice they give to students, four simple linear regression analyses were performed. It would be logical to use a multiple regression analysis in order to test the relation between the several mindset variables and the dependent variable advice. This is because the variable advice was a categorical variable. However, using a multiple regression analysis requires some conditions. First, a multiple regression analysis requires a data set with many participants. As we had less than 40 participants in the current study, using a multiple regression analysis was difficult. Second, when using a multiple regression analysis, no high correlation between the dependent variables is allowed. This is because SPSS cannot distinguish the variables. Our descriptive statistics showed that there are some strong, significant relations between the mindset-variables. Third, in order to measure the mediating effect of effort beliefs on the relation between mindset and advice, we adapted the categorical variable advice into a continuous variable to perform the analyses. To stay consistent, it would be logical to interpret the variable advice as a continue variable as well in the regression analysis. Based on these three reasons, we choose to the simple linear regression analysis to measure the relations between the mindset variables and the advice of teachers. As we have four mindset variables, we performed for each variable a linear regression analysis.

To interpret the results of the linear regression analysis, a couple of values are of interest. First, we look to the *R*-value. This value indicates the degree of correlation between the mindset variable and the variable advice. R^2 indicates how much of the total variation in the variable advice can be explained by the mindset variable. The *F*-value indicates that the regression model predicts the dependent variable significantly well or not. The *p*-value indicates whether the regression model statistically significantly predicts the outcome variable or not. Lastly, we can use the coefficient (*b*). This value determines whether the mindset variable contributes statistically significantly to the model.

No significant regression was found for personal fixed mindset ($F(1, 31) = .69$, $p = .41$), personal growth mindset ($F(1, 30) = .43$, $p = .52$), student-oriented growth mindset ($F(1, 30) = 1.53$, $p = .23$) and student oriented fixed mindset ($F(1, 30) = 3.26$, $p = .08$). The *p*-value of student-oriented fixed mindset is lower than 1.0. Therefore we could speak of a trend. However, the Cronbach's alpha was insufficient. Therefore, there is no mention of a reliable effect or trend. The *R*-values, R^2-values and *b*-values are presented in Table 8. All *R*-values are quite low, which implies that there is only a small correlation between the mindset and the advice. The same applies for the R^2-values. The mindset variables explain only a little variation in the advice scores. Lastly, the *b*-values represent the change in the outcome advice from a change in the predictor mindset. Although all *b*-values are different from 0, the values are quite low. Notable, the *b*-values of personal fixed mindset and student-oriented fixed mindset are negative. This implies that, when the value of the predictor mindset becomes bigger, the value of the outcome advice becomes smaller. All *b*-values were not significant at a .05 level. The results of the linear regression analyse show that the mindset of teachers had no significant influence on the advice they gave to the students.

Table 8.
Linear regression analysis (N = 38)

	R	R^2	*b*
Personal fixed mindset	.15	.02	-.05
Personal growth mindset	.12	.01	.04
Student-oriented fixed mindset	.31	.10	-.19

Student-oriented growth mindset	.22	.05	.13

The mediating role of expectancies in the relation between mindset and advice.

The third research question entails the mediating role of expectancies in the relation between the mindset of teachers and the advice about the study profile. With a mediation analysis the mediating role of expectancies on the relation between mindset and advice can be studied. Because no significant relation is found between mindset and advice, a mediation analysis is unnecessary. Yet, the analysis has been conducted and described below in order to show which steps should be taken.

In order to confirm the mediating variable expectancies, first it has to be showed that while the mediator expectancies is caused by the independent variable mindset and is a cause of the dependent variable advice, the initial independent variable mindset lost significance when the mediator expectancies is included in the model (Elite Research LLC, 2013). To execute the mediation analysis, four steps are performed.

1. Confirm the significance of the relationship between the initial independent variable mindset and the dependent variable advice.[1]
2. Confirm the significance of the relationship between the initial independent variable mindset and the mediator expectancies.
3. Confirm the significance of the relationship between the mediator expectancies and the dependent variable advice in the presence of the independent variable mindset.
4. Confirm the insignificance or reduction in effect of the relation between the initial independent variable mindset and dependent variable advice in the presence of the mediator expectancies.

First the mediation analysis was executed for the mediating role of expectancies. Thereafter, the mediation analysis was executed for the mediating role of effort beliefs. The mediation analyses are only performed with the personal fixed and growth mindset because student-oriented fixed and growth mindset have an insufficient Cronbach's alpha.

Mediation of expectancies between fixed mindset and advice. In step 1 of the mediation model, the regression of the score on fixed mindset on the advice, without the mediator was not significant, b = -.21, $t(31)$ = -.83, p = .41. Conversely, step 2 showed that the regression of the score on fixed mindset on the mediator, expectancies, was marginal significant, b = -.17, $t(31)$ = -1.94, p = .06. Step 3 of the mediation process showed that the mediator (expectancies), controlling for the score on fixed mindset, was not significant, b=.1.52, $t(30)$ = .23, p = .82. Also step 4 of the analyses revealed that, controlling for the mediator (expectancies), fixed mindset was not a significant predictor of advice, b = .04, $t(31)$ = .23, p = .82. The Sobel test confirmed that there was no full mediation in the model (z = -1.65, p = .10). Overall, it was not found that expectations mediated the relationship between the score on fixed mindset and the advice teacher give to students regarding the study profile.

Mediation of expectancies between growth mindset and advice. In step 1 of the mediation model, the regression of the score on growth mindset on the advice, ignoring the mediator was not significant, b = .17, $t(30)$ = .66, p = .52. Step 2 showed that the regression of the score on growth mindset on the mediator, expectancies, was not significant, b= .12, $t(30)$ = 1.32, p = .20. Step 3 of the mediation process showed that the mediator (expectancies), controlling for the score on growth mindset, was significant, b= 1.49, $t(29)$ = 3.45, p < .01. However, step 4 of the analyses revealed that, controlling for the mediator (expectancies), growth mindset was not a significant predictor of advice, b = -.01, $t(30)$ = -.06, p = .95. Subsequently, a Sobel test was conducted and found no full mediation in

[1] In fact, the previous analysis (linear regression analyses) already confirmed that there is no significant effect of the independent variable on the dependent variable. To show the whole mediation analysis, all steps were performed.

the model (z = 1.19, p = .23). So, expectations did not fully mediated the relationship between the score on growth mindset and the advice teacher give to students regarding the study profile.

The mediating role of effort beliefs in the relation between mindset and advice. Like expectancies, also the effort beliefs of teachers can influence the relation between the mindset of teachers and the advice they gave to students. Therefore a mediation analysis was performed. As teachers can have both positive and negative effort beliefs, both were measured in separated tests.

Mediation of positive effort beliefs between fixed mindset and advice. First the mediating role of positive effort beliefs in the relation between fixed mindset and teachers' advice was measured with a mediation analysis. In step 1 of the mediation model, the regression of the score on fixed mindset on the advice, ignoring the mediator was not significant, b = -.25, t(30) = -.96, p = .34. Step 2 showed that the regression of the score on fixed mindset on the mediator, positive effort beliefs, was marginal significant, b = -.19, t(30) = -1.75, p = .09. The b-value was negative, which implied that a low score on fixed mindset tended to a higher score on positive effort beliefs. Step 3 of the mediation process showed that the mediator (positive effort beliefs), controlling for the score on fixed mindset, was not significant, b=.59, t(29) = 1.35, p = .19. Step 4 of the analyses revealed that, controlling for the mediator (positive effort beliefs), fixed mindset was not a significant predictor of advice, b = -.14, t(30) = -.52, p = .61. A Sobel test was conducted and found no full mediation in the model (z = -.97, p = .33). It was not found that positive effort beliefs mediated the relationship between the score on fixed mindset and the advice teacher give to students regarding the study profile.

Mediation of negative effort beliefs between fixed mindset and advice. In step 1 of the mediation model, the regression of the score on fixed mindset on the advice, ignoring the mediator was not significant, b = -.25, t(30) = -.96, p = .34. Like positive effort beliefs, step 2 showed that the regression of the score on fixed mindset on the mediator, negative effort beliefs, was marginal significant, b = .13, t(30) = 1.81, p = .08. Step 3 of the mediation process showed that the mediator (negative effort beliefs), controlling for the score on fixed mindset, was significant, b= -.1.41, t(29) = -2.30, p < .05. However, step 4 of the analyses revealed that, controlling for the mediator (negative effort beliefs), fixed mindset was not a significant predictor of advice, b = -.07, t(29) = -.25, p = .80.

Mediation of positive effort beliefs between growth mindset and advice. In step 1 of the mediation model, the regression of the score on growth mindset on the advice, ignoring the mediator was not significant, b = .17, t(30) = .66, p = .52. Step 2 showed that the regression of the score on growth mindset on the mediator, positive effort beliefs, was also not significant, b = .13, t(30) = 1.22, p = .23. Step 3 of the mediation process showed that the mediator (positive effort beliefs), controlling for the score on growth mindset, was not significant, b=.63, t(29) = 1.47, p = .15. Step 4 of the analyses revealed that, controlling for the mediator (positive effort beliefs), growth mindset was not a significant predictor of advice, b = .09, t(30) = .33, p = .74. A Sobel test found no full mediation in the model (z = .83, p = .41). So, it was not found that positive effort beliefs mediated the relationship between the score on growth mindset and the advice teacher give to students regarding the study profile.

Mediation of negative effort beliefs between growth mindset and advice. In step 1 of the mediation model, the regression of the score on growth mindset on the advice, ignoring the mediator was not significant, b = .17, t(30) = .66, p = .52. Step 2 showed that the regression of the score on growth mindset on the mediator, negative effort beliefs, was significant, b = -.17, t(30) = -2.50, p < .05. The b-value was negative which implied that the relation between the score on growth mindset and the score on negative effort beliefs was negative. Next, step 3 of the mediation process showed that the mediator (negative effort beliefs), controlling for the score on growth mindset, was significant, b= -1.55, t(29) = -2.44, p < .05. Still step 4 of the analyses revealed that, controlling for the mediator (negative effort beliefs), growth mindset was not a significant predictor of advice, b = -.10, t(30) = -.37, p = .72. Additionally, the Sobel test showed no full mediation in the model (z = 1.68, p = .09). It

was not found that negative effort beliefs mediated the relationship between the score on growth mindset and the advice teacher give to students regarding the study profile.

In summary, the teachers' mindset does not have a significant effect on their advices. It is therefore logical we found no mediating effect for expectancies and effort in the relation between mindset and advice. Further interpretations will be discussed in the conclusion and discussion section.

The effect of students' gender and ethnicity on teachers' expectancies and advice.

With the use of a MANOVA test, we could measure the effect of both students' gender and ethnicity on the expectancies and the advice of teachers. The relation was only calculated for the scores on fixed mindset, as Dweck (2000) indicated that people with a more fixed mindset are more tended to have stereotypic thoughts (e.g. girls perform worse in STEM-courses than boys) than people with a more growth mindset. The analyses were only performed with the personal fixed mindset, as student-oriented fixed mindset had an insufficient Cronbach's Alpha. First the effect of students' gender was measured, thereafter the effect of students' ethnicity was measured.

The influence of students' gender on expectancies and advice. The score on fixed mindset was split up in a low score (< 3.00) and a high score (> 3.10). It was an option to choose for a median split. Yet, we have chosen to split the group in two equal groups. In this way, it was clear that one group had a high score on fixed mindset, and the other group had a low score on fixed mindset. For expectancies, a maximum score of 6.00 was possible. Regarding advice, a maximum score of 2.0 was possible. For teachers with a low score on personal fixed mindset, there were no statistically significant differences in expectancies and advices based on students' gender, $\Lambda = 0.98$, $F(2, 41) = .49$, $p = .61$. The same test, MANOVA, was performed for teachers with a high score on fixed mindset. Again, no significant differences were found in teachers' expectancies and advices based on students' gender for personal fixed mindset ($\Lambda = 1.00$, $F(2, 19) = .04$, $p = .96$). Against expectations, students' gender did not influence teachers' expectations or advices. Because no statistically significant results were achieved, further follow-up tests were not performed.

Table 9.
Means on teachers' expectancies and advice based on students' gender (N = 34)

	Low score on fixed mindset (<3.00)		High score on fixed mindset (>3.10)	
	Girl	Boy	Girl	Boy
Expectancies	3.10	2.30	2.46	2.45
Advice*	1.09	1.14	.64	.55

The influence of students' ethnicity on expectancies and advice. The same division for a low score on fixed mindset and a high score on fixed mindset was made. Table 10 shows the mean scores for teachers' expectancies and advice, based on students' ethnicity. For expectancies, a maximum score of 6.00 was possible. Regarding advice, a maximum score of 2.00 was possible. The mean scores on expectancies and advice of teachers with a low score on personal fixed mindset were higher than for teachers with a high score. Notably, against expectancies the means scores for minority students were higher than autochthonous students. Yet, for teachers with a low score on fixed mindset, there were no statistically significant differences in expectancies and advices based on students' ethnicity, $\Lambda = 0.90$, $F(2,41) = 2.34$, $p = .11$. The same test, MANOVA, was performed for teachers with a high score on fixed mindset. Again, no significant differences were found in teachers' expectancies and advices based on students' ethnicity for personal fixed mindset ($\Lambda = .92$, $F(2,19) = .84$, $p = .45$). Likewise students' gender, it can be concluded that students' ethnicity did not influence teachers' expectancies and advice.

Table 10.
Means on teachers' expectancies and advice based on students' ethnicity (N = 34)

	Low score on fixed mindset (<3.00)		High score on fixed mindset (>3.10)	
	Autochthonous	Minority	Autochthonous	Minority
Expectancies	2.93	3.17	2.27	2.64
Advice*	1.14	1.10	.45	.73

Differences in expectancies and advice between teachers with a high and low score on fixed mindset.

To investigate whether teachers with a low score on fixed mindset have other expectancies and advices than teachers with a high score on fixed mindset, an independent t-test is performed. Teachers were based on their personal fixed mindset score assigned the group 'low score on fixed mindset' ($M < 3.0$) or the group 'high score on fixed mindset' ($M > 3.1$). First the differences in expectancies are analysed, thereafter the differences in the advice score.

Differences in expectancies. The independent sample t-test showed that the mean score on expectancies differed significantly for teachers with a low score on fixed mindset ($M = 3.10$, $SD = .43$) and teachers with a high score on fixed mindset ($M = 2.46$, $SD = .66$), $t(31) = 3.13$, $p < .01$. This means that teachers with a low score on fixed mindset have higher expectancies of the students that teacher with a high fixed mindset.

Difference in advices. An independent sample t-test was also used to analyse the advices of teachers with a low and high score on fixed mindset. It appeared that the advice score of teachers with a low score on fixed mindset ($M= .56$, $SD = .39$) did not differ significantly from the advice score of teachers with a high score on fixed mindset ($M = .30$, $SD = .35$), $t(31) = 1.86$, $p = .07$. Although a significant difference in the expectancies score was found for teachers with a low and high score on fixed mindset, this was not found for advice.

Conclusion

The current study investigated the influence of the mindset of teachers on their expectancies about students' ability to follow a STEM study profile and the advices they give. Besides, the influence of effort beliefs, and students' gender and ethnicity was measured. The research model was inspired by several previous studies like Gutshall (2013), Gunderson et al. (2011), and Tempelaar et al. (2015). This is just a sampling of the large number of studies that are performed regarding mindset and teachers' expectancies. The current study chose to focus on the effect of mindset on teachers' expectancies and advices as factors that influence students' choices. Hence, it is good to keep in mind that more variables are of interest. Van Tuijl and Walma van der Molen (2016) create an overview of the many variables that play a role in the educational career of students. Not only teachers, but also psychological aspects, sociological aspects and environment of students are of interest. Nevertheless, to perform reliable research, a choice must be made about which variables were measured.

In the following section, conclusions based on the results of the analyses are made. The sequence will be on the basis of the research questions. Thereafter, suggestions for future research will follow.

Mindset of STEM-teachers

First the composition of the mindset of teachers was explored. From the results it appeared that the mean scores on fixed mindset and growth mindset were close together. The difference between the mean scores of student-oriented fixed mindset and student-oriented growth mindset was slightly larger

than the difference between personal fixed mindset and personal growth mindset. This could mean that teachers saw more development opportunities specifically for students than for themselves. However, the paired sample t-test showed that the personal growth mindset and student-oriented growth mindset did not differ significantly. Yet, the difference between the mean scores of personal fixed mindset and student-oriented fixed mindset was significant. With respect to the intelligence of students, teachers scored slightly lower on fixed mindset. This suggests that teachers were less retained when it comes to the development of students. Notwithstanding, it has to be taken into account that the Cronbach's alpha of both student-oriented fixed and growth mindset was insufficient. Consequently, these two constructs cannot display reliable results. For that reason also, we performed the cross-sectional analyses only with personal mindset. In the section suggestions for future research this will be discussed further.

Besides, results showed a negative correlation between personal fixed mindset and personal growth mindset. The same was found for student-oriented fixed mindset and student-oriented growth mindset. This means that, if teachers had a higher score on fixed mindset, it was likely they had a lower score on growth mindset, and vice versa. This seems to correspond with the findings of Dweck (2000). She argued that people have a fixed mindset or a growth mindset. In contrast, Tempelaar et al. (2015) argued that people can have both a fixed and growth mindset, dependent of the situation. The mean scores of fixed and growth mindset were closely related in the current study. Follow-up research can investigate whether this separation between fixed and growth mindset is actually restrict or that people can have both fixed and growth mindset beliefs.

Relation Mindset and Advice

The current study investigated the relation between the mindset of teachers and the advice they gave. This research question was inspired by the findings of Gutshall (2013). Specifically, the relation between the mindset of teachers and the expectancies of teachers. According to de Boer et al. (2010), the advice of teachers can be seen as an expression of their expectancies. Therefore, it was expected that the mindset was also related to the advice teachers gave.

In order to confirm that there were indeed doubts about the students in the target group, a preliminary test was performed and confirmed the differences between the target group and control group 1 and 2. For the control groups, there was almost consensus about the advices students received. For the target group, this was different. As expected, there were doubts about the advices regarding choosing a STEM study profile. The percentages showed that the ratio of positive and negative advices was substantially equal. This is in line with findings of Gunderson et al. (2011). They argued that the performances of middle-achieving students are more ambiguous than obviously low- or high scoring students.

When testing the relation between the mindset of teachers and the advices they gave, it appeared that the mindset of teachers explained only a very small part of the variance. This is consistent with the overview of van Tuijl and Walma van der Molen (2016), which showed that many aspects play a role in the educational career of students. The linear regression analyses showed that mindset had no significant influence on the score of positive advices. To illustrate, having a higher score on growth mindset, does not mean that the teachers give more positive advices than teachers with a lower score on growth mindset. Based on the results, we can conclude that no relation was found between the growth and fixed mindset of teachers and the amount of positive advices they gave. Yet, results of the MANOVA test in order to measure the effect of students' gender and ethnicity on teachers' advice showed clear differences for teachers with a low score on fixed mindset and a high score on fixed mindset. Table 9 and Table 10 show that the mean advice scores for teachers with a low score on fixed mindset are actually lower than the mean advice score for teachers with a high score on

fixed mindset. The independent sample t-test showed that there was nog significant difference in advice between teachers with a high and low score on fixed mindset.

It is important to mention that the standard deviation of the mean score of advice was rather high. This means that participants had a low consensus in whether students of the target group deserved a positive or negative advice for choosing a STEM-profile. There are two possible explanations for this variation. First, participants were forced to give a fixed choice, namely a positive or a negative advice. A second explanation is that participants had a different mindset that influenced their advice. However, this second explanation is not confirmed by the results of the current study. Also, a high variation in giving a positive advice may indicate that teachers use different arguments to build up their advice. Questions about the reasons why teacher gave that specific advice could give more insight in the arguments that teachers use to form an advice and could give more insight in the high variation of the advices. Subsequently, this can ensure that the advices of teachers are more aligned.

Mediating Role Expectancies and Effort Beliefs in the Relation between Mindset and Advice

Inspired by the findings of Gutshall (2013), De Boer et al. (2011) and Tempelaar et al. (2015), the mediating role of teachers' expectancies and effort beliefs was studied. No significant relation was found between mindset and advice. So, we realized that performing a mediation analysis with expectancies and effort beliefs as mediators was in vain. But because the current study is a master thesis, we performed the mediating analyses anyway. As expected, we found no mediating role for expectancies nor effort beliefs. It is plausible that other variables than mindset can explain the variation in advice. In other words, it can be that effort beliefs and expectancies do not have a mediation role, but have a direct effect on the advice. From the mediation analyses it appeared that in the presence of the independent variable growth mindset, expectancies has a significant effect on advice. Likewise, negative effort beliefs has a significant effect on advice, in the presence of both growth and fixed mindset. For future research, it is strongly recommended to investigate the direct effect of expectancies and effort beliefs on advice.

Remarkably, from the descriptive statistics it appeared that the mean score of expectancies for control group 2 (high performing group) was quite low, especially in comparison with the accompanied advice, which was completely positive. So, participants did not had high expectancies (an average of $M = 3.72$ on a scale of 0 to 6), but they all gave control group 2 a positive advice regarding a STEM-profile. The scores of the target group were more related. However, according to the findings of control group 2, it could be that teachers were not aware of their reasons to recommend students a STEM-profile or not. As mentioned above, more argumentation of the advice could give more insight in the reasons why teachers give that advice.

The Effect of Students' Gender and Ethnicity on Teachers' Expectancies and Advice

Dweck (2000) argued that students with a strong fixed mindset, are more sensitive for stereotypic thinking. In order to investigate if such stereotypic thinking also applies to teachers and if this stereotypic thinking was reflected in the expectancies and advices of teachers, the current study aimed to measure the effect of students' gender and ethnicity on the expectancies and the advice regarding the study profile of teachers. Therefore we divided the participants in two groups; participants with a low score and a high score on fixed mindset. In the current study it was expected there was a bias for gender, especially for teachers with a high score on fixed mindset. This was based on several studies that found an attributional gender bias for teachers (Fennema et al., 1990; Lavy & Sand, 2015; Tiedemann, 2000). Remarkably, in the current study the mean scores of expectancies and advices for girls were slightly higher than the mean scores of expectancies and advices for boys. This was against

expectancies. Yet, no significant differences were found regarding the expectancies and advices for boys and girls.

Also students' ethnicity was taken into account. Several studies found that the ethnicity of students was related to their performances (e.g. Glock & Krolak-Schwerdt, 2013; Glock et al., 2013; Rubie-Davies et al., 2006). Based on these findings, and the fact that the meta-analysis of Tenenbaum and Ruck (2007) showed that teachers' actions varied depending on the ethnic background of students, the current study investigated the influence of students' ethnicity on the expectancies of teachers and their advices. Withal, no significant differences between autochthonous and minority students were found. This seems to connect with findings including Driessen and Doesborgh (2005), Driessen and Smeets (2007) and Roeleveld et al. (2011). They all did not find a structural bias against ethnic minority groups. Strikingly, the mean scores of expectancies and advice were somewhat higher for minority students than for autochthonous students.

Both analyses revealed that the results were against expectations. Regarding to students' gender, it was expected that teachers had higher expectancies for boys than girls. Regarding to students' ethnicity, it was expected that teachers had higher expectancies for autochthonous students than for minority students. In both cases, the opposite was true, although the differences were not significant. There are several possible explanations. To begin, it could be a coincidence. This means for example that teachers were unaware of the gender or ethnicity of students. Another possible explanation is the small sample. The (possible) effect of the sample will be discussed in depth in the section methodological limitations. It is possible that with a larger sample, differences between the groups become clearer and significant differences arise. With these explanations it is still possible that results will be in contradiction with the expectations. A possible explanation for that is the phenomenon positive discrimination. This is the tendency to give minority groups (unconscious) more chances in order to reduce inequalities (Levade, 2004). It is possible that participants were aware of the subject of the study (e.g. the effect of students' gender and ethnicity). If that was the case, the measurement should be adjusted. In the section 'future research', this will be discussed further.

Differences in Expectancies and Advice between Teachers with a High and Low Score on Fixed Mindset.

As we did expect from literature, the independent sample t-test showed that teachers with a low score on fixed mindset had higher expectancies than teachers with a high score on fixed mindset. In contrast, no significant difference was found for advice. This last result was to be expected, as the mediation analyse showed that fixed mindset did not affect the advice of teachers. The absence of a significant effect for advice can be due the fact that during in the questionnaire participants were forced to make a fixed choice between a positive advice and negative advice.

Suggestions for Future Research

The current study knows some limitations, and therefore we give some suggestions for future research. The content of this sections is divided by content, methodological suggestions and research design.

Content

The current study measured a large number of variables. By some small adaptions, future research is better able to analyse these variables.

Definition of intelligence. To measure the personal mindset, the term 'intelligence' was used. Yet, a lot of definitions of intelligence exist. Therefore, it would not be illogical that participants interpreted intelligence differently. This is an aspect Meijerink (2016) also encountered. For student-oriented mindset the definition was more specified. Namely, the ability to follow STEM-courses. Although the definitions of 'intelligence' were different for the personal mindset and the student-oriented mindset, the mean scores were substantially equal. Still, in future research it would valuable

to have a critical look at these descriptions and give participants a specific explanation in order to reduce the chance of different interpretations.

Variable advice. Based on the student scenarios, participants were asked to give a positive or negative advice to the students regarding choosing a STEM study profile. We choose for just two options instead of a Likert scale because this is representative for practice. Yet, this resulted in methodological limitations. To test the relations, we wanted to work with a mean score. However, nominal scores cannot be merged into a mean score. To be able to test the relation between mindset and advice, we changed advice into continuous variable. By this adjustment, it was possible to perform an ANOVA with repeated measures. Yet, this way of working is not desirable. In order to prevent such limitations at future research, it is recommendable to measure advice on a Likert scale wherefore advice can be used as a continuous variable just like mindset and expectancies. Then, advice can be interpreted as the tendency to give a positive advice. If the nominal score of advice is held, it is an option to change mindset into a nominal score with a high and low score. In this way, the relation can be analysed in a cross tab.

Effort beliefs. To measure the effort beliefs of teachers, we adopted the items of Blackwell (2002). Although effort beliefs was a reliable scale, $\alpha = .79$ ($N = 373$), our Cronbach's Alpha was insufficient. This may because we have made some adjustments to the items of the construct. To begin, we have translated the items into Dutch. Moreover, we changed the perspective. The original items of Blackwell (2002) are personal. The adapted items relate to students. Lastly, Blackwell (2002) merged all items both measuring negative and positive effort beliefs to create the construct effort beliefs. We separated negative and positive effort beliefs. All these adjustments changed the construct effort beliefs in such way it did not measure the same and therefore could be unreliable. In future research it is recommended not to make so many adjustments. Especially, not adjusting the perspective of the participant.

Effort beliefs are very personal and deciding on another person is very difficult. A person can have another perception about someone else and interpret the question diffuse. Yet, the current study is not the only study in which participants adopt another perspective. Rattan, Good and Dweck (2012) used the PEET scale (Perceptions of environmental entity theory) adapted from Good, Rattan and Dweck (2012). Using this scale, participants indicated the extent to which they perceived an entity-oriented math environment. An example question is: "My professor believes that I have a certain amount of math intelligence, and I can't really do much to change it", $\alpha = .96$ (Rattan et al., 2012). Reasoning from another perspective is therefore possible. However, this scale consisted of only four items. Thus, reduction of the number of items can be an important adjustment in future research. A footnote is that students were asked what they thought teachers thought. In our study, teachers were asked to perceive the capabilities of their students, this had a greater risk of social desirability. Nevertheless, the study of Rattan et al. (2012) can be used as inspiration for future research. Namely, there is a strong reliance on existing theories. Partly because of this, the number of items to measure the several constructs can be reduced. Subsequently, this makes the questionnaire less transparent and participants probably lose their motivation less quickly.

Methodological Suggestions

Although the composition of the questionnaire is thought out carefully and we made use of several validated questions, the measurement knows some weaknesses. In this section, these limitations will be discussed one by one, including suggestions for future research.

A low Cronbach's alpha. As described above, performing a factor analysis was not possible due to the small sample size. Therefore, we had to rely on the existing subscales of validated questionnaires. Still, the Cronbach's alpha of the concepts student-oriented mindset (both growth and fixed) and of effort beliefs was quite low. This means that we should not use the constructs, or at least

be even stricter in terms of conclusions. The low alpha can be explained in three ways. Both mindset and effort beliefs are broad constructs. These psychological constructs consist of several related aspects. Because multiple aspects are measured, the chances of being interpreted separately increases. Besides, both constructs say something about students, while the other constructs with a sufficient or good alpha say something about the participant itself. Perhaps, deciding on others is harder than deciding on yourself, causing no single construct. Lastly, the sample size was very small. This makes the likelihood of a low alpha great. It is very likely that the Cronbach's alpha will improve if the sample size increases. In order to achieve a higher Cronbach's alpha in future research, it is recommended to have a critical view on the constructs. This relates to both the aspects of the construct and the perspective the participant should take. Also, enlargement of the sample can increase the alpha.

Small sample. Against expectations, there are few significant findings in the current study. This can be partly due to a number of methodological limitations in this study. One of the most important limitations of the study is the size of the sample. A small sample has the consequence that results of tests can be shaky, or even insignificant. Green (1991, as cited in Field, 2009) proposes some guidelines for the minimum sample size. To test the overall model, the formula $N = 50 + 8k$ (k = number of predictors) can be used. This implies that for the current study the sample size had to be at least N=74. The current study did not achieve this prerequisite with 38 participants. The risk of such a small sample is the high risk of random data, which usually leads to insignificant effects (Field, 2009). In order to avoid the risk of random data, a bigger sample is recommended.

A (too) small sample has further consequences. The present study used latent variables. Latent variables are variables that cannot be observed directly. Rather, these latent variables are derived from other observed variables (Field, 2009). The use of latent variables is very common in educational and psychological science, for example in the measurement of intelligence. Normally, a factor analysis would be performed to control the validity of these latent variables. However, due to the small sample size, performing a factor analysis was not possible. Because of this, the accuracy of the variables could not be confirmed and we had to trust on the scales of the validated questionnaires that were used. Considering that performing a factor analysis was not possible, performing structure equation modelling (SEM) was not possible either. SEM is a confirmatory approach combining the structure of a covariance matrix, factor analysis and regression analysis. In fact, SEM is very suitable for testing hypothesis with latent variables (Teo, Tsai, & Yang, 2013). Performing a SEM would be appropriate for the current study. The advantage of this method is that all the inter-relationships between variables will be examined. For example, because of this the results of SEM provide insight into group differences. This way, it can be further examined how different variables relate to each other (Teo et al., 2013). In turn, this kind of information can provide more insight in the determinants of teachers' expectancies.

Another consequence of the small sample applies to testing the relationship between the mindset of teachers and the amount of positive advices. The amount of advices was divided in five categories (0 to 4 positive advices). Such a division requires a sufficiently large sample to ensure that every category contains sufficient participants to perform the multinomial regression analysis. This was partly solved by making advice a continue variable. This allowed us to perform a simple linear regression analysis instead of a multinomial regression analysis.

Due to the small sample size, conclusions should be drawn carefully. Moreover, enlarging the sample size can have the effect of more significant relations. This thought is reinforced by the various marginal significant relations that were found in the current study. In future research it is recommended to have a bigger sample size to ensure that a factor analysis and structure equation modelling can be performed.

Social desirability. People tend to give 'right' answers and present themselves rather positive than negative (De Jong, Pieters, & Fox, 2010). This fact is known as social desirability. Several aspects in the present study may indicate the presence of social desirability, reflected in the answers of the participants. First, a major part of the participants worked at a school that already participated in a study that investigated the mindset of students (Meijerink, 2016; Van Aalderen & Walma van der Molen, 2016). Due to this, some teachers were familiar with mindset and thus might have given answers they thought it were the right ones. This could have led to a higher score on growth mindset, a higher score on (positive) expectancies and more positive advices, while in reality this does not appear to be true. A possible solution for this to minimise this type of bias would be to use a more implicit measurement tool. This will be discussed in the next section of research design.

Second, data was gathered by self-report questions what can be interpreted as explicit measurement. Using this measurement method entails that participants have more time to overthink their answers, which leads to a higher risk of social desirability. Greenwald, McGhee, and Schwartz (1998) therefore introduced the implicit association test. With implicit measurements, underlying associations and motivations of participants are tested. Due to the short reaction time, participants do not have time to think about the 'right' answers, but have to give answers based on their (unaware) associations (Greenwald et al., 1998). A consequence can be that participants give other answers than when the questions are asked directly (explicit measurement). Therefore, the use of this implicit association method would be very suitable for testing the research questions of the current study, since, the risk of social desirability will be avoided.

Third, participation was voluntary. Teachers were asked by the contact person to participate in the study and could decide whether they were interested or not. Although this is not a case of social desirability, voluntary participation can give a distorted view. It could be that participants who took part had excessive interest in the subject, were more receptive to the theory and therefore were more inclined towards a growth mindset. In addition, the voluntary participation made the sample less representative of the population of STEM-teachers in the Netherlands. A combination of mandatory participation and the use of implicit measurements could correct this for this bias. For now, these limitations should be taken into account when drawing conclusions from the rest results.

In order to limit social desirability, first the fictive student scenarios were described, then questions about mindset followed. In this way, participants had not yet been thinking about the mindset questions before giving an advice. Yet, this had as disadvantage that participants finished with mindset questions while some participants were not motivated anymore and therefore gave no reliable answers.

Length of the questionnaire. Control cases were added to confirm that students with high grades for STEM-courses indeed received a positive advice, and students with low grades for STEM-courses indeed received a negative advice. To exclude the possible influence of gender, both male and female student scenarios were described. In total, four control cases were added. As a result, the length of the questionnaire was quite long. Some participants lost their motivation or even quit the questionnaire. Because of this, information was lost. Establishing partnerships with schools can enhance the engagement of participants. Schools could select a common time to fill out the questionnaire. This way, it can be ensured that all teachers with the right profile complete the questionnaire. If the sample would be enlarged by this, it would be also possible to make various versions of the questionnaires and give participants different versions. Following upon that, the questionnaire can be shorter because the eight student scenarios can be spread across multiple questionnaires. This reduces the risk of early drop out.

Randomization questionnaire. All participants received the same questionnaire. This means that the student scenarios were not randomized. As described above, the length of the questionnaire was too long. If participants lost their motivation, it is possible that their answers about the last student

scenarios were not reliable. The last three student scenarios were about two students from the target group and one student from control group 1. By that, it could be that the data of the target group was not reliable. Randomization of the student scenarios prevents that the same scenarios are neglected. It should be said that with the digital program we used it was not possible to randomize the items. An extended version of the program can facilitate this. Besides, different versions of the questionnaire over which the students scenarios are divided, shortens the questionnaire. Spreading the fictive student scenarios across several versions of the questionnaire also makes it less clear what the intention of the questionnaire is. This can minimize social desirability.

Likert scale. With the exception of the concept advice (positive advice – negative advice), we used a six-point Likert scale to measure the items. Next to a six-point Likert we could have used a five-point or a four-point Likert scale. We did not choose for a five-point Likert scale because we would like to force participants to a choice. Besides, the original scales consisted of a six-point Likert scale. For these reasons we also not chose for a four-point Likert scale. For future research we would advise to include a four-point Likert scale. As a result, less variation can occur. Besides, van Aalderen and Walma van der Molen (2016) used a four-point Likert scale to measure mindset.

Research Design

Follow up studies can choose a different design and method to investigate the mindset and expectancies of teachers. In the following section, we give some suggestions for future research.

Engaging students. The current study was conducted because the Dutch government has several initiatives in order to enlarge the number of students that is choosing for a STEM-study and a STEM-related career. Because it was assumed that teachers have an influence on the decisions of students, the current study focused on teachers. But, the present study did not measure the influence teachers have on students. So the question arises, what is the influence of such advice of teachers on their students? How are students influenced by the expectations of teachers? For future research it would be interesting to focus on the extent to which such advices are important for students. For example, we can perform an intervention study with a pre and post-test. Students will be divided in a control group and experimental group. First, during the pre-test students give their preference for the study profile. Then, teachers express their advice to the experimental group. After that, students will be asked again for their preferable study profile. Combined with this measurement, students can be asked for their considerations for the choice of the study profile in order to discover the important factors for students. After the measurements, the choice for the study profile of both groups can be compared. This design of the study is inspired by the study of Meijerink (2016) who compared the study choice of students.

Qualitative research design. Another option is to set up the research differently. The mindset of both students and teachers is extensively examined, mostly by self-report based on Dweck (1999). We can build on the findings of these studies and study the mindset in-depth via a case-study. Instead of a great sample of participants, only a few teachers will participate. This allows us to investigate the mindset, effort beliefs and the advice of teachers in detail. Besides, not only the final advice can be considered, also the considerations teachers make. Information can be gathered by interviews, using IAT and, possibly observations. By performing a more qualitative case study, hopefully we get more insight in the relationship between teachers' mindset and the advices they give.

Implicit Association Test. The present study had no significant findings. We can consider two reasons why this happened. First, mindset has no effect on expectancies. Second, the method of the current study was not suitable. Based on the significant findings of Gutshall (2013), we assume the latter. This implies two changes in the design of the study. First, mindset should be measured differently. Second, the effect of mindset on other variables should be measured differently. As mentioned previously, implicit measurements can help to receive more reliable reproduction of

participants' attitudes, motivations and mindset. Van den Bergh, Denessen, Hornstra, Voeten, and Holland (2010) made use of the implicit association test (IAT, devised by Greenwald et al., 1998) to measure whether prejudiced attitudes of teachers relate to their expectations of students. Using IAT, the relative strength of the association between ethnic background (i.e. autochthonous vs. minority) and the valence of words (i.e. the positive vs. negative connotations of words) was measured. It was assumed that low associations (for example, 'bad' and 'Dutch') ensured longer response times compared to strong associations (for example 'good' and 'Dutch'). A standardized score can be interpreted as an indicator for a positive or negative attitude towards autochthonous and minority students. Next to the implicit measurement method, they used explicit measurements (self-reports). Remarkably, whereas explicit measurement showed no relations of prejudiced attitudes, the implicit measurement of prejudiced attitudes was found to explain different teacher expectations based on students' ethnical background. This difference in results shows that the IAT is a valuable method for testing latent variables like attitudes in educational or psychological research (Van den Bergh et al., 2010). As mindset can also be interpreted as a latent variable, it is advisable to use the IAT to measure mindset in future research. One critical remark that needs to be respected, is the fact that IAT leaves no room for other, relevant, factors that may influence the measured variable. As Van Tuijl and van der Molen (2016) appointed, many factors are involved in education. Therefore, conclusions still have to be drawn cautiously.

Because the current study contained several variables that were in all probability sensitive to social desirability, we have to consider if we use the IAT method for all variables. And if so, how? A first option is to measure both mindset and effort beliefs via IAT. The advice of teachers can be measured via the current method of the study. Another option is to measure mindset and effort beliefs via a traditional measurement. Indeed, many studies used the questions of Dweck (1999), both modified and not. To prevent social desirability and positive discrimination, IAT can be used to measure the advice of teachers.

Practical Implications

Although some results of the study were against expectations, the study also provides some valuable information, including some practical implications. The present study gives a little awareness about the justification of teachers' advices. Participants indicated that grades of students were not the most important factor of the advice. Rather, insight and motivation were very important aspects that participants took into account while forming their advice. This emphasizes that initiatives should not only focus on performances of students, but also on the motivation of students. Although motivation and insight were described in the fictive student scenarios, teachers maybe need more information.

Besides, the current study can be interesting for teacher training. Although we did not find significant effects for mindset, the theoretical framework described several studies that found an effect. Because the mindset of teachers (and also students) can have considerable impact on for example, teachers' attributions, advices or students' achievement, it can be important to pay attention to mindset during teacher training. Then, this awareness can help teachers to give reasoned advices to students.

Concluding

Overall, the current study offers many suggestions for improvement and future research. Nevertheless, we have to take into account that such research is difficult to conduct. As it is a master thesis, we did not had the time the research requires. Besides, it is difficult to find respondents who make time to fill out the questionnaire. Therefore, we are grateful for the fact that participants filled out the questionnaire. Because the study focused on psychological constructs, we had little control about what participants filled out. Lastly, the current study made use of comprehensive measurements.

To conclude, a lot of initiatives to stimulate students for choosing a STEM-study or STEM-related career are focused on students. Because teachers play a major part in the educational career of students, the current study focused on the mindset of teachers and how it influenced their expectancies about students. But, no significant relations were found. As a matter of fact, the current study offers suggestions for follow-up studies and other research methods. For that reason, the current study can be seen as an explorative study. Namely, the insignificant results offer no reason to think that the mindset of teachers is not important, the contrary is confirmed by previous studies. And the current study had a significant result, namely that the extent of having a fixed mindset significantly influences the expectancies of teachers. Besides, the current study showed that with explicit measurement it is likely that teachers are tended to give social desirable answers. The current study can be seen as a small part in the big picture of education. More insight in the teachers' mindset will ultimately provide more insight in the educational career of students, our potential new engineers.

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Attachment 1

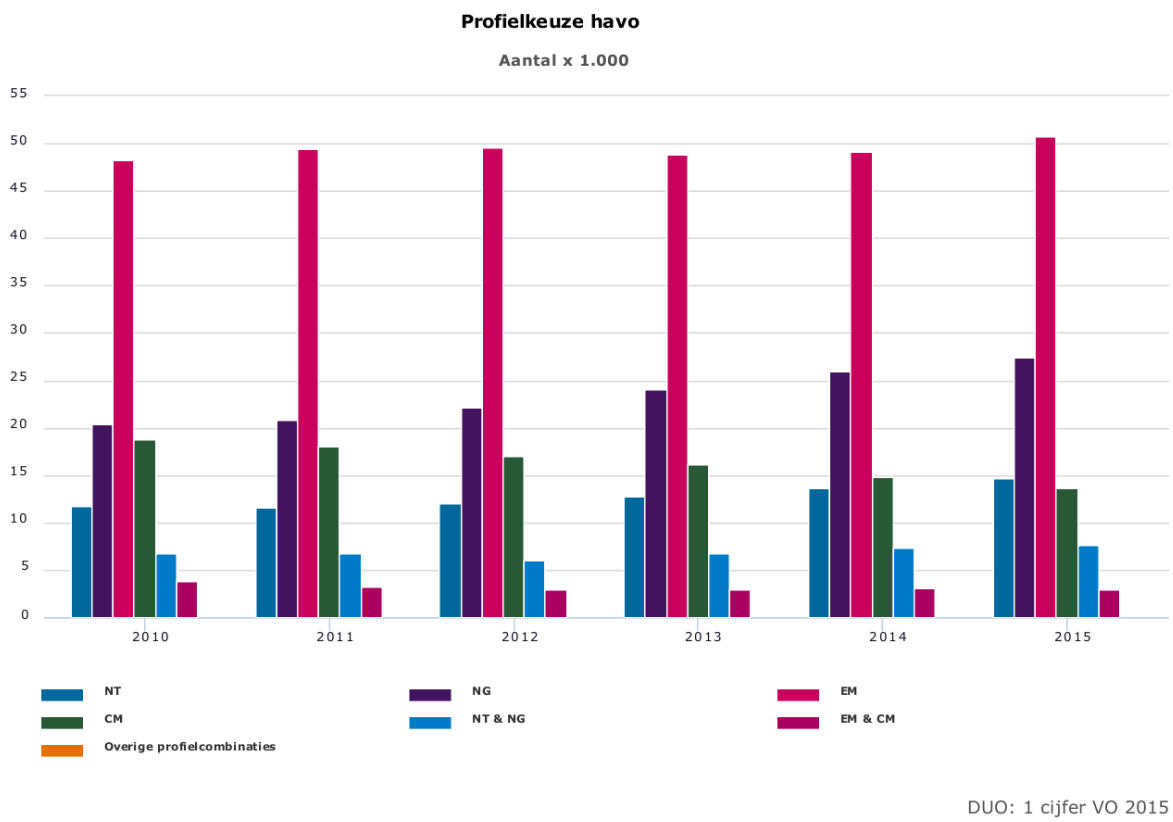

Figure 7. Distribution study profiles HAVO

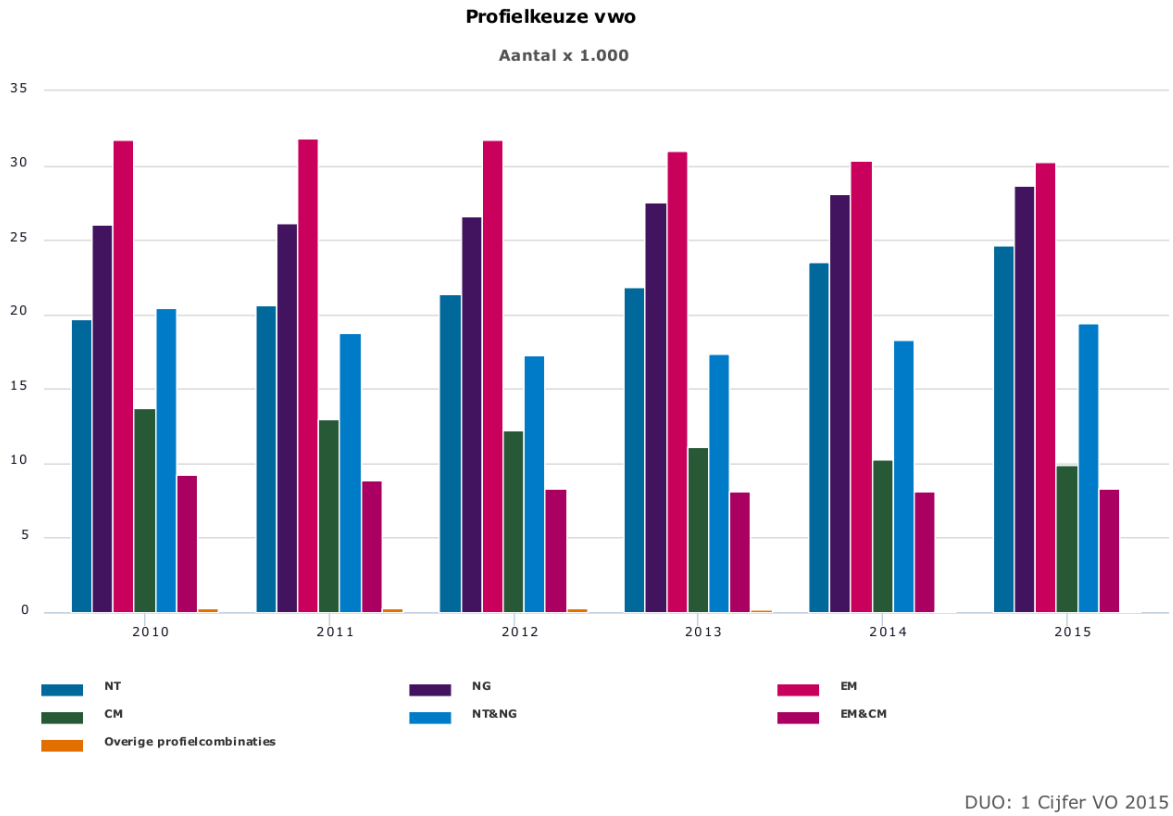

Figure 8. Distribution study profiles VWO

Attachment 2 - Questionnaire Teacher Mindset

Q1 Advies van docenten: waar wordt dit op gebaseerd?

Beste docent,
Leerlingen kiezen gedurende het derde jaar van de middelbare school een profiel dat ze vanaf het vierde jaar zullen volgen. Dit doen ze doorgaans op basis van interesses en het advies van hun docenten. In het kader van mijn afstudeeronderzoek ben ik geïnteresseerd in de informatie die docenten gebruiken om leerlingen een advies te geven over de profielkeuze. In deze vragenlijst zal u hierover vragen beantwoorden. Het invullen van de vragenlijst duurt ongeveer 20 minuten. Uw antwoorden worden anoniem opgeslagen en alle gegevens zullen strikt vertrouwelijk worden behandeld. Aan het begin van de vragenlijst wordt u wel gevraagd uw naam in te vullen, dit wordt alleen gekoppeld aan de toestemmingsverklaring en niet aan de verdere gegevens die u invult in de vragenlijst. Niemand anders dan de onderzoekers zullen inzage hebben in de gegevens. Het uiteindelijke rapport bevat alleen informatie over groepsgemiddelden zodat individuele antwoorden niet te achterhalen zijn.

Indien u vragen danwel opmerkingen heeft, kunt u te allen tijde een e-mail sturen naar het onderstaande e-mail adres.
Carlijn Veldhorst c.veldhorst@student.utwente.nl

Q2 Toestemming
"Ik verklaar op een voor mij duidelijke wijze te zijn ingelicht over de aard, methode en het doel van het onderzoek. Ik weet dat de gegevens en resultaten van het onderzoek anoniem zijn en dat er vertrouwelijk omgegaan zal worden met mijn gegevens. Ik stem geheel vrijwillig in met deelname aan dit onderzoek. Ik behoud me daarbij het recht voor om op elk moment zonder opgaaf van redenen mijn deelname aan dit onderzoek te beëindigen"
Naam:

Q3 Klik op het akkoord om te starten met de vragenlijst
Ik ga akkoord met de bovenstaande verklaring (1)

Q4 Alvast bedankt voor uw medewerking en succes met het invullen van de vragenlijst.

Q5 Wat is uw geslacht?
Man (1)
Vrouw (2)

Q6 Wat is uw leeftijd?

Q7 In welke vakken geeft u les? Vul hieronder in:

Q8 Hoeveel jaar leservaring heeft u?

Q9 Welke studie(s) heeft u gevolgd?

Q10 Wat is uw nationaliteit?
Nederlands (1)
Anders, namelijk (2) _____

Q16 Ik ben een...
eerstegraads docent (1)
tweedegraads docent (2)
docent in opleiding (3)

Q11 Aan welke niveau's geeft u les? (meerdere antwoorden mogelijk)
VMBO (1)
HAVO (2)
VWO (3)

Q12 Aan welke leerjaren geeft u les? (meerdere antwoorden mogelijk)
Leerjaar 1 (1)
Leerjaar 2 (2)
Leerjaar 3 (3)
Leerjaar 4 (4)
Leerjaar 5 (5)
Leerjaar 6 (6)

Q45 Op welke middelbare school geeft u les?

Q13 Een collega docent is bezig met de adviezen voor de profielkeuze van de leerlingen. Bijna alle leerlingen hebben een advies ontvangen, maar bij een aantal leerlingen komt uw collega er nog niet helemaal uit. Het gaat hierbij vooral om leerlingen die graag een bèta-profiel willen kiezen en interesse hebben in Wetenschap en Technologie, maar zelf heeft de docent twijfels of deze leerlingen het aan kunnen. De docent heeft informatie van andere docenten vergaard, maar komt er toch niet helemaal uit. Op de volgende pagina's vindt u informatie over de desbetreffende leerlingen. Kunt u uw collega helpen?

De gemiddelde cijfers voor bèta-vakken staan in een tabel weergegeven. Daarnaast is ook van alle leerlingen aangegeven of ze hun huiswerk bijhouden en of ze inzicht in het vak hebben. Dit wordt aangegeven met een ?, V of O. ? = twijfelV = voldoendeO = onvoldoende

Q14 Jasper staat bekend als een vrolijke jongen. Samen met zijn ouders en zusje woont hij in een nabijgelegen dorp. Gedurende de les is zijn concentratie prima. Zijn huiswerk heeft hij doorgaans op tijd af en indien hij vragen over de leerstof heeft, vraagt hij zijn klasgenoten of de desbetreffende docent om hulp. Soms heeft hij wat extra instructie nodig om het lesmateriaal te begrijpen, maar hij heeft voldoende motivatie om wat extra werk te doen. Ik twijfel wel wat aan zijn inzicht. In zijn vrije tijd voetbalt hij graag.

Als Jasper deze lijn voortzet...

	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
verwacht ik dat Jasper ruim voldoende (>7) zal staan voor de bèta-vakken (1)						
verwacht ik dat Jasper tijdens de les soms wat extra aandacht van de docent nodig heeft (2)						
verwacht ik dat Jasper op een normaal tempo een bèta-profiel doorloopt (3)						
verwacht ik dat Jasper beter presteert in bèta-vakken dan zijn klasgenoten (4)						
verwacht ik dat Jasper met extra instructie een bèta-profiel op een normaal tempo kan volgen (5)						

Q15 Ik adviseer Jasper om een bèta-profiel te kiezen
Ja (1)
Nee (2)

Q21 Licht hier eventueel uw antwoord toe:

Q22 Sophie woont samen met haar ouders in het dorp. Tijdens de les doet ze goed mee en haar huiswerk is vrijwel altijd up-to-date. Sophie heeft soms wat extra begeleiding nodig maar ze heeft een goed wiskundig inzicht en is ijverig en gemotiveerd te leren. Bij onduidelijkheden schroomt ze niet om docenten of klasgenoten aan de mouw te trekken. Nadat ze haar huiswerk heeft afgerond kruipt ze het liefst achter de computer om te chatten met haar vrienden.

Als Sophie deze lijn voortzet...	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
verwacht ik dat Sophie ruim voldoende (>7) zal staan voor de bèta-vakken (1) verwacht ik dat Sophie tijdens de les soms wat extra aandacht van de docent nodig heeft (2) verwacht ik dat Sophie op een normaal tempo een bèta-profiel doorloopt (3) verwacht ik dat Sophie beter presteert in bèta-vakken dan haar klasgenoten (4) verwacht ik dat Sophie met extra instructie een bèta-profiel op een normaal tempo kan volgen (5)						

Q23 Ik adviseer Sophie om een bèta-profiel te kiezen
Ja (1)
Nee (2)

Q24 Licht hier eventueel uw antwoord toe:

Q25 Fatima is een leerling de zich tijdens de les goed weet te concentreren, maar tevens een kwebbelkous op z'n tijd is. Haar docenten en klasgenoten vraagt ze om hulp indien dit nodig is. Deze extra instructie is soms ook nodig om de stof te begrijpen, maar Fatima is voldoende gemotiveerd om wat harder te werken. Ik kan niet goed bepalen hoeveel inzicht ze in de exacte vakken heeft. Met haar huiswerk is ze zeer secuur. Wanneer Fatima klaar is met haar werk, vertelt ze graag over haar grote hobby koken. De Marokkaanse keuken is haar specialiteit.

Als Fatima deze lijn voortzet...

	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
verwacht ik dat Fatima ruim voldoende (>7) zal staan voor de bèta-vakken (1)						

verwacht ik dat Fatima tijdens de les soms wat extra aandacht van de docent nodig heeft (2) verwacht ik dat Fatima op een normaal tempo een bèta-profiel doorloopt (3) verwacht ik dat Fatima beter presteert in bèta-vakken dan haar klasgenoten (4) verwacht ik dat Fatima met extra instructie een bèta-profiel op een normaal tempo kan volgen (5)						

Q26 Ik adviseer Fatima om een bèta-profiel te kiezen
Ja (1)
Nee (2)

Q27 Licht hier eventueel uw antwoord toe:

Q28 Sam staat bekend als een gezellige jongen. Zijn huiswerk houdt hij keurig bij. Hoewel hij soms wat extra hulp nodig heeft en wat inzicht in de exacte vakken mist, is hij ijverig genoeg om te leren. Deze hulp vraagt hij doorgaans aan zijn docenten, klasgenoten of zijn oudere broer die sinds kort in ijmegen studeert. In de vakantie gaat Sam graag bij hem op bezoek. Tijdens de les werkt Sam goed mee, dat geldt ook voor zijn huiswerk wat hij doorgaans op tijd af heeft.
Als Sam deze lijn voortzet...

	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
verwacht ik dat Sam ruim voldoende (>7) zal staan voor de bèta-vakken (1) verwacht ik dat Sam tijdens de les soms wat extra aandacht van de docent nodig heeft (2) verwacht ik dat Sam op een normaal tempo een bèta-profiel doorloopt (3) verwacht ik dat Sam beter presteert in bèta-vakken dan zijn klasgenoten (4) verwacht ik dat Sam met extra instructie een bèta-profiel op een normaal tempo kan volgen (5)						

Q29 Ik adviseer Sam om een bèta-profiel te kiezen
Ja (1)
Nee (2)

Q30 Licht hier eventueel uw antwoord toe:

Q31 Tom is een vriendelijke jongen. Hij houdt zijn huiswerk doorgaans goed bij. Zijn klasgenoten of een docent vraagt hij soms om hulp, als hij de stof niet begrijpt. In de klas is Tom een geconcentreerde en gemotiveerde jongen; hij wil hard werken om te presteren. Af en toe heeft Tom wat extra instructie odig om de stof volledig te

begrijpen, maar hij beschikt over een goed inzicht in exacte vakken. In zijn vrije tijd staat hij het liefst op het hockeyveld.

Als Tom deze lijn voortzet...

	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
verwacht ik dat Tom ruim voldoende (>7) zal staan voor de bèta-vakken (1)						
verwacht ik dat Tom tijdens de les soms wat extra aandacht van de docent nodig heeft (2)						
verwacht ik dat Tom op een normaal tempo een bèta-profiel doorloopt (3)						
verwacht ik dat Tom beter presteert in bèta-vakken dan zijn klasgenoten (4)						
verwacht ik dat Tom met extra instructie een bèta-profiel op een normaal tempo kan volgen (5)						

Q32 Ik adviseer Tom om een bèta-profiel te kiezen
Ja (1)
Nee (2)

Q33 Licht hier eventueel uw antwoord toe:

Q34 Marieke is te typeren als een rustig meisje. Haar huiswerk heeft ze vrijwel altijd op tijd af. Mocht ze hierover vragen hebben, dan stelt ze deze zonder aarzelen aan docenten of haar klasgenoten. Ook haar oudere broer kan ze om raad vragen. De extra studiehulp heeft ze af en toe ook wel nodig omdat haar inzicht wat twijfelachtig is, maar zelf onder vindt ze hier geen problemen mee en is ze gemotiveerd hard te werken. Tijdens de lessen is ze voldoende geconcentreerd, net zoals dit terug te zien is wanneer ze in haar vrije tijd tekent.

Als Marieke deze lijn voortzet...

	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
verwacht ik dat Marieke ruim voldoende (>7) zal staan voor de bèta-vakken (1)						
verwacht ik dat Marieke tijdens de les soms wat extra aandacht van de docent nodig heeft (2)						
verwacht ik dat Marieke op een normaal tempo een bèta-profiel doorloopt (3)						
verwacht ik dat Marieke beter presteert in bèta-vakken dan haar klasgenoten (4)						

verwacht ik dat Marieke met extra instructie een bèta-profiel op een normaal tempo kan volgen (5)						

Q35 Ik adviseer Marieke om een bèta-profiel te kiezen
Ja (1)
Nee (2)

Q36 Licht hier eventueel uw antwoord toe:

Q37 Ibrahim is een gezellige jongen. Samen met zijn ouders en broertje en zusje woont hij nu al weer 12 jaar in Nederland. Tijdens de les doet hij enthousiast mee en als iets hem iets onduidelijk is, vraagt hij om hulp van de docenten of medeleerlingen. In zijn vrije tijd Ibrahim veel met motorcross bezig, maar zijn huiswerk lijdt er niet onder; hij heeft het doorgaans op tijd af. Ibrahim is en gedreven leerling en is bereid extra werk te doen wanneer dit nodig is. Soms heeft hij wat extra studiebegeleiding nodig om de stof te beheersen, zijn inzicht in de exacte vakken is wat twijfelachtig.

Als Ibrahim deze lijn voortzet...

	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
verwacht ik dat Ibrahim ruim voldoende (>7) zal staan voor de bèta-vakken (1) verwacht ik dat Ibrahim tijdens de les soms wat extra aandacht van de docent nodig heeft (2) verwacht ik dat Ibrahim op een normaal tempo een bèta-profiel doorloopt (3) verwacht ik dat Ibrahim beter presteert in bèta-vakken dan zijn klasgenoten (4) verwacht ik dat Ibrahim met extra instructie een bèta-profiel op een normaal tempo kan volgen (5)						

Q38 Ik adviseer Ibrahim om een bèta-profiel te kiezen
Ja (1)
Nee (2)

Q39 Licht hier eventueel uw antwoord toe:

Q40 Lotte is een rustig meisje. Tijdens de les is ze geconcentreerd bezig. Dit is ook terug te zien in haar huiswerk; hiermee is ze vrijwel altijd up-to-date. Soms heeft ze wat extra hulp nodig van haar docent of klasgenoten om de stof volledig te begrijpen. Zelf heeft ze niet zoveel inzicht in de exacte vakken. Lotte geeft de moed echter niet op; ze is gemotiveerd om te leren. Haar grote hobby is handbal, hier besteedt ze dan ook veel vrije tijd aan. Haar ouders komen bij elke wedstrijd kijken.

Als Lotte deze lijn voortzet...

	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
verwacht ik dat Lotte ruim voldoende (>7) zal staan voor de bèta-vakken (1)						
verwacht ik dat Lotte tijdens de les soms wat extra aandacht van de docent nodig heeft (2)						
verwacht ik dat Lotte op een normaal tempo een bèta-profiel doorloopt (3)						
verwacht ik dat Lotte beter presteert in bèta-vakken dan haar klasgenoten (4)						
verwacht ik dat Lotte met extra instructie een bèta-profiel op een normaal tempo kan volgen (5)						

Q41 Ik adviseer Lotte om een bèta-profiel te kiezen
Ja (1)
Nee (2)

Q42 Licht hier eventueel uw antwoord toe:

Q43 De volgende vragen gaan over uw overtuigingen over intelligentie en inzet. Er zijn geen goede of foute antwoorden. Ga af op uw eerste gevoel, probeer niet te lang over uw antwoord na te denken. Sommige vragen lijken erg op elkaar. Dat is nodig voor de statische betrouwbaarheid van de vragenlijst. Ik wil u wel vragen alle vragen te beantwoorden.

Q44 Geef aan in hoeverre u het eens bent met de stelling

	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
Om eerlijk te zijn, denk ik dat leerlingen niet kunnen veranderen hoe goed ze in bèta-vakken zijn (1)						
Als een leerling niet goed is in een bèta-vak, zal hard werken ervoor zorgen dat hij/zij het tot in detail snapt (2)						
Ik denk dat mijn intelligentie iets van mij is waar ik zelf niets aan kan veranderen (3)						
Als een leerling hard moet werken voor een bèta-vak, is hij/zij er waarschijnlijk niet zo goed in (4)						
Afgezien van hoe goed leerlingen op dit moment scoren op bèta-vakken, denk ik dat ze altijd in staat zijn om te veranderen in hoe goed ze zijn in deze vakken (5)						
Als leerlingen niet goed zijn in bèta-vakken, zullen ze er ook niet goed in worden door er hard voor te werken (6)						

Ik denk dat ik altijd mijn intelligentie kan veranderen (7) Ik denk dat ik zelf mijn intelligentie niet kan veranderen (8) Ik denk dat leerlingen het vermogen hebben om hun capaciteiten in de bèta-vakken te veranderen over tijd (9)						

Q45 Geef aan in hoeverre u het eens bent met de stelling

	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
Als een leerling het niet goed doet bij bèta-vakken, is het misschien beter om een ander profiel te kiezen (1)						
Ik denk dat ik met voldoende tijd en moeite mijn intelligentie kan veranderen (2)						
Ik geloof dat ik het vermogen heb om mijn intelligentie te veranderen over tijd (3)						
Het maakt niet uit hoe hard een leerling werkt, als een leerling niet goed is in bèta-vakken, zal hij /zij dat nooit worden (4)						
Ik kan nieuwe dingen leren, maar ik denk niet dat ik het vermogen heb om mijn intelligentie te veranderen (5)						
Ik denk dat leerlingen niet kunnen veranderen hoe goed ze zijn in bèta-vakken (6)						
Om eerlijk te zijn, denk ik niet dat ik kan veranderen hoe intelligent ik ben (7)						
Als een leerling de stof bij bèta-vakken moeilijk vindt, zal harder werken altijd zin hebben (8)						
Hoe meer moeite een leerling zal doen voor bèta-vakken, hoe beter hij/zij zal worden (9)						

Q46 Geef aan in hoeverre u het eens bent met de stelling

	Volledig mee oneens (1)	Overwegend mee oneens (2)	Deels mee oneens (3)	Deels mee eens (4)	Overwegend mee eens (5)	Volledig mee eens (6)
Ik geloof dat leerlingen altijd kunnen veranderen hoe goed ze zijn in de bèta-vakken (1)						
Als een leerling een onderwerp binnen een bèta-vak moeilijk vindt, dan betekent dit dat het hem/haar niet zal lukken hier heel goed in te zijn (2)						

Als een wiskunde- of natuurkundeopdracht moeilijk is, zullen leerlingen er waarschijnlijk veel van leren (3) Als een leerling hard zijn/haar best moet doen voor bèta-vakken, betekent dat hij/zij er niet goed in is (4) Als een leerling niet hard werkt voor wiskunde, zal hij/zij het waarschijnlijk niet zo goed doen (5) Het maakt niet uit om welke leerling het gaat, ze kunnen altijd veranderen hoe goed ze zijn in bèta-vakken (6) Ongeacht wat mijn capaciteiten nu zijn, denk ik dat ik mijn intelligentie kan veranderen (7) Hoe goed leerlingen in bèta-vakken zijn is iets waar ze weinig aan kunnen veranderen (8)						

Q47 Dit is het einde vragenlijst. Ik dank u hartelijk voor uw medewerking. Indien u nog vragen of opmerkingen hebt, kunt u een e-mail sturen naar c.veldhorst@student.utwente.nl

Klik op de onderstaande button om de vragenlijst te beëindigen.