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Abstract

Important adolescents' career-related decisions might be influenced by their beliefs about malleability of intelligence and learning (mindset). We combined quantitative and qualitative data to provide in-depth insights in the beliefs that 13- and 14-year olds hold about learning and intelligence, the factors influencing these beliefs, and the consequences of these beliefs in relation to classroom behavior and study choices. To establish students' mindsets quantitatively, we categorized theory of intelligence (TOI) questionnaire averaged scores into three levels: entity, intermediate, or incremental mindsets, to provide insight into the distribution of the different mindset types in our sample ($N = 492$). The results of this quantitative study show that more than half of the students believed intelligence is "fixed" (entity mindset), these data showed no effect of gender. To gain more in-depth insight in the views of these students, focus groups about mindset and its influences and consequences were held in a subsample ($n = 176$). The qualitative data provide more nuanced insights, for example, they reveal subtle gender differences regarding effort beliefs and motivation. Integrated discussion of the quantitative and qualitative results demonstrates that

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this multimethod approach reflects the complexity of the concept mindset better than only the widely used TOI questionnaire.

Keywords
academic motivation, mindset, adolescence, education, gender, qualitative methods, quantitative methods

Introduction

Previous research has revealed that in addition to ability, many other factors are involved in students' motivation, achievements, and study-related choices. For example, it has been shown that achievements and motivation are increased when students have higher levels of social economic status (SES; Farooq et al., 2011), better communication and learning facilities, less family stress (Mushtaq & Nawaz Khan, 2012), and well-structured learning environments and teacher support (Klem & Connell, 2004; Meece et al., 2006; Ryan & Deci, 2000). In addition to these socio-economic and environmental variables, students' beliefs about intelligence and learning might also influence their academic achievement, motivation, and classroom behavior. Of these various factors, students' mindsets, or their implicit beliefs about the malleability of intelligence and learning, are of particular interest as these can be influenced with interventions (Blackwell et al., 2007; Paunesku et al., 2015; Yeager et al., 2019; but see Sisk et al., 2018) and therefore may provide an interesting pathway for enhancing motivation, achievements, and adaptive study-related choices.

Students can hold different beliefs about their intelligence (Dweck, 1999). Some students believe that their intelligence is an entity (also called a "fixed" mindset), and that their abilities are largely unchangeable. In this view, making mistakes and receiving negative feedback are seen as confirming one's inability. Others believe that their intelligence is malleable, and that it can be changed through effort and persistence (incremental, or "growth" mindset) (Blackwell et al., 2007; Burnette et al., 2013). Depending on situational factors such as academic domain (Quihuis et al., 2002), aspects of both mindsets may be simultaneously present (Burnette et al., 2013).

Previous research on students' mindset was mostly quantitative and based on test results or grades, and student self-reports (Sisk et al., 2018). The most widely used quantitative measure is the theory of intelligence (TOI) questionnaire, which assesses mindset using three to eight self-report items (Dweck, 1999; Dweck et al., 1995). A recent study combined quantitative with qualitative data to gain a deeper insight in how different conceptions of intelligence,

explored qualitatively, affect the self-report questionnaire responses (Limeri et al., 2020), thereby demonstrating how qualitative data can enrich quantitative results on mindset. Qualitative approaches to investigating the role that students' mindset may play in their classroom behavior and study-related choices are largely lacking, while they may enrich our understanding of factors influencing mindset, and the behavioral consequences of mindset. To fill this gap, we studied students' mindset using an approach in which we complement quantitative data with qualitative data describing and understanding the ideas and views of young adolescents about intelligence and learning, classroom behavior,and study choices in more detail.

We focused on students in the preparatory vocational secondary education track (abbreviated in Dutch to "VMBO"), for several reasons. First, it is the largest track in the Dutch educational system with more than 55% of all students attending this type of secondary education (OC&W et al., 2015), making this a representative sample of the Dutch population Students with a lower SES and with a non-western European background are more frequently found in this type of education as compared to other tracks of the Dutch school system (Hiteq, 2008; OC&W, Inspection of Education, 2017). Second, as it is a 4-year track, students have to make choices regarding their future career (often limited to health and care or technology) at the end of the second year (age 13–14). That is at a rather early age, compared to students in the other tracks of the Dutch system which last longer (5 or 6 years), or with students in other countries. Previous work suggests that mindset may influence study-related choices (Garg et al., 2010; van Aalderen-Smeets et al., 2019; Van Aalderen-Smeets & van der Molen, 2016). Moreover, in the Dutch educational system, students are grouped into different educational levels directly after leaving primary school, at age 12, based on the teacher's advice combined with standard test scores. As students in the VMBO track make career-related choices not long after being tracked based on their teacher's advice, this may provide a relatively strong influence on their self-concept (Jerrim & Sims, 2019) and study choices. In other words, in this sample, both important *consequences* of mindset (potential influence on study choices) as well as several potential factors *influencing* mindset (teachers expectations and feedback) are all intertwined in this phase of the VMBO track. In the following, we will outline factors influencing mindset and the potential consequences of mindset in more detail, followed by the rationale and research question of this study.

Factors Influencing Mindset

Feedback, including praise or criticism, is one of the powerful factors influencing learning and achievement (Hattie & Timperley, 2007). External feedback

influences how students feel about themselves (positively or negatively), and what and how they learn (Dweck, 1999). Not surprisingly, children's self-conceptions of their abilities and competences are influenced from an early age on by comments, values, and feedback from their parents (Brummelman et al., 2015; Gunderson et al., 2012). At school, responses and feedback that teachers provide with regard to the behavior and achievements of their students further influence the development of these mindsets (Mueller & Dweck, 1998). The type of feedback teachers provide might support the development of a more incremental or more entity mindset. In general, feedback focused on a change in behavior or effort enhances a more incremental mindset (Dweck, 2006).

Another factor that might influence mindset is gender. Several studies have indicated that boys may be more likely than girls to endorse an incremental mindset on intelligence (Dweck et al., 1978; Gunderson et al., 2013; but see Macnamara & Rupani, 2017) and tend to be more confident about their own abilities (Driessen & Van Langen, 2013). At the same time, girls have generally been found to report higher levels of academic intrinsic motivation (Bugler et al., 2015; Rozendaal et al., 2003), to work harder, to demonstrate greater school commitment (Borg, 2014) and to be more motivated for doing homework (Bugler et al., 2015; Kitsantas et al., 2011; Xu, 2014); all factors that are illustrative of effort and persistence, typically linked to the incremental mindset.

In addition to gender differences in general mindset, stereotyped beliefs may be present in specific academic domains. Gender-stereotyped beliefs already occur at an early age (Bian et al., 2017; Vander Heyden et al., 2015). In general, science, technology, engineering and mathematics (STEM) subjects are regarded as "male" (Bian et al., 2017). Especially in these fields, practitioners believe that raw, innate talent is the primary requirement for success. The under-representation of women in these fields might be related to the stereotypical view that women inherently lack such talent (Leslie et al., 2015).

Behavioral Consequences of Mindset

Several studies have investigated incremental and entity mindsets of students and related these to achievement. Ability beliefs and related expectancies for success were positively related to performance (Wigfield & Eccles, 2000), specifically regarding mathematics scores for girls (Good et al., 2003). Furthermore, students having an incremental mindset had higher achievements across challenging school transitions (Yeager & Dweck, 2012) and incremental mindset interventions were shown to improve general test scores

(Paunesku et al., 2015; Yeager et al., 2019), although a recent meta-analysis shows these effects are small and not always replicated (Sisk et al., 2018).

It is thought that mindset might impact academic achievement by shaping responses to academic challenges, setbacks, and feedback: effort-based strategies such as working harder or taking remedial action for example, are found to be effective strategies in response to failure, but their use may depend on mindset (Blackwell et al., 2007; Hong et al., 1999). Burnette et al. (2013) conducted a meta-analysis and found that incremental mindset was negatively related to helpless-oriented strategies and positively related to mastery-oriented strategies. However, links between implicit beliefs and behavioral consequences were also found to be complex and "moderated and mediated, and very likely mediated-moderated" (Burnette et al., 2013, p. 680). This complexity illustrates that there is no simple link between the construct "mindset," typically quantitatively measured with a brief self-report questionnaire, and (consequences for) behavior. Therefore, students' explanations or views regarding the nature of intelligence and learning, in the context of classroom behavior and study-related choices, might help to understand these complex relations (Limeri et al., 2020).

A specific example of where mindset may have important consequences is for career choices. The mindset and learning experiences of students may have both direct and indirect effects on their career choices, due to their influence on self-efficacy, outcome expectations and interests (Garg et al., 2010; van Aalderen-Smeets et al., 2019; Van Aalderen-Smeets & van der Molen, 2016). Gender differences in study-related choices may provide an interesting example of the complex interplay of influences to, and consequences of, mindset. Beginning as early as secondary education, girls are particularly likely to decide against choosing courses in, for example, mathematics and science (J. S. Eccles et al., 2004; Nagy et al., 2008; Watt, 2010). Such potential gender differences are also suggested by other studies, as well as the influence of peers and parents (M. Gottfried et al., 2017; Nugent et al., 2015; Robnett & Leaper, 2013; Rodrigues et al., 2011; Rozek et al., 2015; Wang & Degol, 2013; Watt et al., 2017). But while career choices differences between boys and girls are often found to be large, the differences in achievement often are found to be rather small (J. Eccles, 2011; Korpershoek et al., 2014; Lauermann et al., 2015; Reuben et al., 2014; Sáinz & López-Sáez, 2010). Mindset, possibly shaped by stereotyped expectations (see above), may at least partly explain this discrepancy. For example, J. Eccles (2011) suggested that girls are less likely to make career choices in the field of STEM partly because they have less confidence in their STEM abilities as compared with boys.

Rationale and Research Objectives

The overarching aim of this study is a better understanding of young adolescents' mindset, by complementing questionnaire data with qualitative focus group data to gain in-depth insights in the influences to and consequences of mindset, just before students make important course and career choices at a rather early age. To reach this overarching aim, we designed this study to involve the collection and analysis of both quantitative and qualitative data, which were collected from the same sample (Creswell, 2003; Creswell et al., 2003) of Dutch preparatory vocational track students. The quantitative research was conducted to generate a clear, numerical picture of the construct "mindset" comparable to how the construct is typically measured in previous research, using a brief self-report questionnaire (Dweck et al., 1995; Dweck, 1999). The quantitative data were enriched through collection of open-ended qualitative data in a subsample (Creswell, 2003). In this qualitative component, we conducted focus groups to explore the views, beliefs, feelings, choices, and experiences of students (Kidd & Parshall, 2000; Liamputtong, 2011; Plummer-D'Amato, 2008; Rabiee, 2004). The qualitative research was performed to provide insights into influences to mindset and its consequences for behavior, focusing on processes rather than just outcomes (Barbour, 2007) and describe the concrete and detailed ideas and views of the participants with regard to the malleability of intelligence in the context of classroom situations and study choices. Therefore, the qualitative data lead to a deeper and more nuanced understanding of factors influencing student's mindsets and more general beliefs, and the processes by which mindsets are related to behavior and choices (outcomes). This in-depth information cannot be inferred by a brief self-report questionnaire (the standard TOI questionnaire; Dweck, 1999; Dweck et al., 1995).

The first objective was to assess the distribution of students' mindsets for the population under investigation (proportion of entity, intermediate or incremental mindsets). To compare the results to previous research, this objective was addressed using the standard mindset questionnaire (Dweck, 1999; Dweck et al., 1995). As discussed above, quantitatively obtained data might not capture enough of the context and the complexity of the processes and factors relating to mindset (influences and outcomes). Therefore, the second objective was to obtain richer information regarding students' mindset in the context of classroom behavior and learning, including course and career choices, and reactions to teachers' praise or criticism. Within both objectives, we explored gender differences with regard to mindset in the context of classroom behavior and learning because gender has been frequently identified as one of the variables influencing mindset (Dweck et al., 1978; Gunderson

et al., 2013) and at the same time is related to the consequences of mindset, for example, by influencing study choices (J. Eccles, 2011).

The study can be characterized as a concurrent triangulation design in which the qualitative data are used to expand and enrich quantitative data (Creswell, 2003). In the qualitative part, we explored students' beliefs and views underlying the information obtained in the quantitative study (Barbour, 2007), and the results of both strands are combined in an integrated discussion. Quantitative and qualitative results on gender as factor influencing mindset can be integrated directly because this was analyzed in both strands of data, and quantitative and qualitative data regarding behavioral consequences are linked more indirectly in the discussion as these were not assessed in the quantitative study. A nested sample was used, where the full sample took part in the quantitative component of the study and a subsample took part in the qualitative component.

Quantitative Strand

Method

Participants. The sample ($N = 492$) were part of a larger study on teachers' and students' beliefs, who were second-year students at 10 secondary schools for preparatory vocational secondary education, spread over 22 mixed-gender classes. Participants ranged in age from 13 to 15 years ($M_{age} = 13.77$, $SD = 0.66$); 53.7% were boys ($n = 264$) and 46.3% girls ($n = 228$). This distribution is representative of the national population of students in prevocational education (52% male, 48% female). In the Dutch educational system, a student's ability is measured by means of the score on a standardized test from the Central Institute for the Development of Assessments (CITO) at the end of primary education. The teachers' advice, combined with this CITO-score, determines the type of secondary education for a student. More than 55% of the secondary education students are enrolled in the 4-year prevocational track; higher levels are "higher general secondary education" (HAVO, 5-year track) and preuniversity secondary education (VWO, 6-year track).

Procedure. All schools in one south-western region of the Netherlands ($n = 11$) with a track for prevocational education were invited to participate: six public schools and five schools with a religious signature. The principals of 10 of the 11 schools accepted the invitation (one school manager from a religious school declined to participate). The principals were asked to approach key figures within their schools (e.g., staff members, coordinators, section managers, and division managers) in the prevocational track for the

researchers to visit and present the research project. These contacts then approached the teachers working primarily with students aged 13 to 14 years (either face-to-face or through email) to invite them to participate with the students in their classes.

Participants were informed by the researchers about the aims, procedure, and confidentiality of the study in their own classrooms. All procedures of the research were in strict conformity with the ethical guidelines of the university faculty. Informed passive (opt out) consent was obtained from the parents before the start of the study, participants were asked for informed consent before taking part. Data collection took place in the period April 2012 through October 2012. The researcher explained the TOI questionnaire, and the participants completed a three-item version of the TOI questionnaire individually during a regular lesson, on computers in a computer classroom, using an anonymous survey link to guarantee anonymity for privacy reasons.

Instruments. We used the original TOI questionnaire (Dweck et al., 1995) consisting of three "entity" statements: (a) You have a certain amount of intelligence and you really can't do much to change it. (b) Your intelligence is something about you that you can't change very much. (c) You can learn new things, but you can't really change your basic intelligence. Items were scored along a Likert-type scale with six response options: strongly agree (1), agree (2), mostly agree (3), mostly disagree (4), disagree (5), strongly disagree (6). The reliability of the TOI questionnaire was calculated by Cronbach's alpha which in the current sample was .78.

Data analysis. To address the first main objective, we categorized subscale averaged TOI scores into three levels: entity (≤ 3), intermediate (>3 score <4) or incremental (≥ 4) mindsets, in accordance with Dweck et al. (1995) and Dweck (1999), to provide insight into the distribution of the different mindset types in our sample. To explore the role of gender, a chi-square analysis tested whether the distribution of mindset categories was related to gender. Continuous averaged TOI scores were also compared by gender using independent samples *t*-tests.

Results

Means and standard deviations for boys' and girls' scores on the TOI are presented in Table 1. These ranged between 1 and 6, with a mean score of 3.15 ($SD = 1.19$). Categorizing scores into the three classifications (incremental, intermediate, and entity), most participants (54.3%) demonstrated an

Table 1. Means and Standard Deviations of Theory of Intelligence (TOI) Scores and Classification Into Incremental, Intermediate, and Entity Mindset (in %) for Boys and Girls.

Sample	*N*	Average TOI scores	*SD*	Incremental (%)	Intermediate (%)	Entity (%)
Boys	264	3.18	1.20	29.2	17.8	53.0
Girls	228	3.12	1.18	26.3	18.0	55.7
Total	492	3.15	1.19	27.8	17.9	54.3

entity mindset, with 17.9% demonstrating an intermediate and 27.8% an incremental mindset. The chi-square test for gender and mindset categories revealed no significant association, $\chi^2(2, N = 492) = .52, p = 77$. Also when analyzed as continuous variable, boys and girls showed similar scores for mindset, $t(490) = .49, p = .63$.

Qualitative Strand

Method

Participants. The participants in this qualitative component ($n = 176$) were a subsample from the quantitative component. We organized two focus groups with four students each in each of the 22 school classes, which resulted in 44 focus groups. This sample consisted of 88 girls and 88 boys, ranging in age from 13 to 15 years ($M_{age} = 13.77$, $SD = 0.66$). The focus groups were single-sex to increase the likelihood that participants felt comfortable rather than limited in expressing their views regarding differences between girls and boys (Morgan, 1997). Participants were selected by choosing every second, fourth, sixth, and eighth boy and every second, fourth, sixth, and eighth girl from the alphabetical list of names for each school class. We determined in advance that if a selected boy or girl did not wish to participate, the next in line (10th, 12th etc.) would be invited until a group of four students of the same gender had been composed. Because of this, we did not know or screen for specific mindsets in the focus group participants. We assumed, but could not be sure that participants of the focus groups represented the distribution of mindsets of the entire sample. All participants were told that quantitative and qualitative results would be anonymous.

Data collection. Within each focus group, data were collected through interaction among the participants as they reflected on and reacted to what was said, thereby shaping their ideas (Finch et al., 2003). The small group size created

the opportunity for all participants to take an active role in the conversation. A topic list (Figure A1) was used to structure the focus groups, based on a number of primary topics: classroom behavior, the learning process, course and career choices, reactions to feedback from teachers, and the stable or malleable nature of intelligence. For all these topics, differences between the characteristics of boys and girls were discussed. We structured the focus groups on purpose to begin with the topics related to influences and outcomes and to end with mindset (malleability of intelligence). By not explicitly linking the discussed influences and outcomes to mindset, we could examine whether and how they were more indirectly linked spontaneously during the discussions.

Procedure and design. When children enter secondary school, their parents are asked to provide written consent for video/audio recording. All participants were informed about the aims and procedure of the research, and they were asked to consent to audio recording of the focus groups. Next, parents were asked for permission to let their children participate in the research through an informed consent form. Confidentiality was guaranteed; at the beginning of each session, it was mentioned that everything they said, would be kept "between these four walls." The moderator did not mention any names while addressing questions to make sure no identifiable information was stored in the audio recordings. Each session was held in a quiet, separate classroom during normal classroom hours. Each focus group conversation took about 20 minutes.

The first author of this article is experienced and trained in conversation techniques and coaching and was the moderator in all focus groups. During the sessions the moderator promoted debate by asking open questions (see Figure A1 for the core questions). The moderator ensured everyone's participation and gave all the chance to speak. In case of yes/no answers (e.g., questions 2b, 3c, 4b), the interviewer always asked follow-up questions, for example: "can you tell me some more about that?" "can you explain your answer?" or "Can you give an example of that?." An important task of the moderator was to keep the discussion focused and on course. Being a good listener, nonjudgmental, and adaptable was necessary in pursuing the likelihood of an open, interactive session.

Data analysis. To ensure the accuracy of the transcription, the analysis of the data and the archiving of the data, audio recordings were made of all focus groups. Audio recordings storage also contributes to transparency, if future investigators would want to re-analyze the data. Due to technical failures, however, the recordings of two groups were unusable and therefore excluded

from analyses. Transcripts were therefore made of the audio recordings of 42 focus groups. Units of meanings (one or more words belonging together because they jointly form an answer or a thought) were distinguished with reference to each topic discussed in the focus groups (Figure A1). In some cases, a unit of meaning consisted of a single word, and in others, several sentences. Within each topic, subcategories and further subdivisions were made through an "open-coding" and "axial-coding" technique (Boeije, 2005). Interrater reliability was established through researcher triangulation. Two coders (the first author and a trained psychology student) both analyzed the first 15 interviews and compared their results to identify common themes. After coding these first 15 interviews, no new codes were added. They established the final coding scheme, after which they each coded half of the remaining interviews. Afterwards, they compared their analyses again and checked whether all units of meaning were adequately coded according to both researchers. The inductive coding schemes are presented in Figures A2–A6. To test for gender differences in the qualitative data, we looked at differences in which specific codes were identified in each set of data.

Results

Malleability of intelligence. Analysis of the focus group transcripts revealed five dominant beliefs within the context of the malleable or stable nature of intelligence. Independent of gender and domain, three of these beliefs were consistent with the entity mindset. The first entity belief was summarized as "intelligence can't be changed": "*Intelligence can't be changed; I'm not smart. That's just the way it is"* (18th focus group of girls, fgg 18). The second belief was summarized as "effort is useless," as illustrated by one female participant: "*No, I don't understand it easily. I can't change that, trying harder doesn't help*" (fgg 2). One male participant explained this belief according to an example: "*I don't study unless I know I'm good at it. If not, I don't. For example, mathematics: I don't get it at all, so I don't study for it*" (4th focus group of boys, fgb 4). The third belief concerned the importance that the students attached to their teachers' opinions regarding their abilities. Several students accepted the opinions of their teachers in this regard as "true." Their own mindsets were subsequently influenced by the opinions of their teachers: "*She [the teacher] called me stupid; I believe her*" (fgg 9). In reference to teacher opinions, one boy cited a teacher who had said, "You're stupid." Another boy in the same focus group believed that his teachers were right, thinking of him as being stupid, "*They say it [being stupid], and I know that*" (fgb 1). For some participants, this belief ("you're stupid") resulted in an inattentive classroom attitude. In other

words, these students reported that they did not pay attention during class or invest any effort in their homework.

In contrast to the three entity beliefs, the two other dominant beliefs expressed during the focus groups were related to the incremental mindset. The fourth belief, shown by a minority of participants, reflected the possibility of changing their own intelligence. One girl reported: "*I think that, by learning new things, you remember more. You just learn more, and then your intelligence or something improves. I'm sure I can change it*" (fgg 18). Finally, some participants were convinced that effort could improve intelligence and that studying hard could improve academic achievement: "*I can improve my academic achievement by studying a lot*" (fgg 4).

No gender differences were discerned for beliefs about malleability of intelligence: girls as well as boys mentioned the five dominant issues mentioned above. For other related topics, for example, classroom behavior and learning, which express possible *consequences* of mindset, the qualitative data revealed nuanced gender differences, presented below.

Classroom behavior and learning. With regard to classroom behavior, in general students attributed better achievements to efforts: an expression that may indirectly indicate an outcome of an incremental mindset. Lack of effort was mentioned as an explanation for being downgraded to a lower educational track: "*I don't do anything. I'd rather go play with my playstation*" (fgb 1). Some students doubted their own abilities and shielded themselves in advance against disappointing achievements, possibly pointing to outcomes of an entity mindset.

A few students mentioned being "more gifted" as an explanation for better achievements (alluding to outcomes of an entity mindset). They believed their own gender to be more gifted in general. Related to this view was one boy's explanation of the differences between girls' and boys' classroom behavior. He referred to differences in the brains of boys and girls: "*It's all because of our brains; we [boys] rather play soccer and go outside with friends"* (fgb 7).

Almost all of the participants thought that girls and boys learn in different ways (e.g., "*we have different brains, we think differently"* [fgg 8]), with girls being more precise, accurate, and neat. In general, students thought that girls tend to achieve better learning outcomes, due to their efforts and more serious working attitudes, expressing gender-related consequences of an incremental mindset, with boys being less motivated to learn. In one focus group of boys, the participants said that the girls in their class have higher marks. They discussed possible explanations for this, suggesting that "*they [girls] probably just understand it* [the curriculum] *better*" (fgb 12), which corresponds to

outcomes of an entity mindset. A second explanation mentioned by the participants for the tendency for girls to achieve better was that the girls probably study more (i.e., exert more effort, which may be the outcome of an incremental mindset).

Interestingly, girls were more likely than boys to provide examples of statements from teachers regarding alleged abilities—both negative: "*my teacher says I am just a stupid girl*" (fgg 9) and positive: "*if he [my teacher] says I can do it [a task], I just don't believe him*" (fgg 19); "*when they [teachers] say I'm able to do it, I think*, '*let's do it*,'" (fgg 2). Regardless of domain, girls also seemed to be less confident about their opinions, and expressed lower self-esteem. This was expressed in two different manners. First, some girls used specific words (e.g., "insecure") when talking about their abilities: "*Even if I make A's, I won't move to a higher track. I'm insecure about myself, whether I can reach the norm*" (fgg 3). Second, throughout the entire conversation, and in reference to different items, girls were more likely than boys to use such phrases as "I think I can . . ." or "maybe . . .": "*I think you can learn new things*" (fgg 18); "*if I work hard, perhaps I can move to a higher academic level"* (fgg10); "*I think I can handle it"* (fgg 11). In general, boys did not use the words "think" and "maybe," instead simply stating "I can . . ." or "I can't . . . ."

Course and career choices. In general, students attributed achievement outcomes to efforts and working attitudes, coherent to outcomes of an incremental mindset, although the participants clearly held domain-specific beliefs concerning various school subject domains. In several focus groups, students expressed that, for some subjects (e.g., mathematics), abilities are innate: "*I can change it [intelligence], except for mathematics*" (fgg 20). When discussing options for courses and careers, all of the students opted for stereotypical course choices, with girls choosing in the field of health and care, while boys preferred options of a more technical nature. Although in several focus groups students expressed that for some subjects (e.g., mathematics), abilities are innate (corresponding to outcome of an entity mindset), they did not directly associate ability and career choice.

Two participants from a focus group of boys stated that boys were smarter than girls with regard to *mathematics*: "*mathematics, we [boys] understand it much more quickly"* (fgb 20). Some boys perceived a preferential treatment of girls by teachers as being inherent in the opinions of some teachers that girls lack ability for the subjects they teach: "*some teachers favour girls in sports and technical subjects; they are not dismissed when they behave negatively or do not participate, because teachers think that the girls can't help it*" (fgb 2). Comments from other boys mirrored this observation: "*Girls get better marks (in technical subjects), even if they only submit one small project"*

(fgb 2); "*they don't have to clean up in technology class"* (fgb 20). In contrast to the boys, none of the girls mentioned being treated any differently or being held to lower standards than boys.

Reaction to praise and criticism. Some students reported that they became more motivated after receiving praise, noting that praise influences self-confidence: "*Then [after a compliment] I think, ok, I'm performing in the right way, maybe I can even get it a little better"* (fgb 13), corresponding to consequences of an incremental mindset. About a quarter of the participants in our study reported never receiving praise, and almost the same number of participants said that they sometimes receive praise. Most examples of teachers' praise provided by the participants could be classified in the category of "general praise or criticism" (e.g., "well done"). About half of the participants of those who indicated that they received praise stated that it had no influence at all on their learning attitudes or motivation. Two reactions were somewhat surprising. One boy explained that he tended to *decrease* his efforts after receiving a compliment, concluding that "*it [the mark] was already ok, so I can take it easy"* (fgb 2). One of his classmates declared that "*compliments don't motivate me. I try a little bit harder just for one day, and not the day after, without them knowing*" (fgb 2).

Similar to the perceived lack of influence of compliments, participants reported that teachers' criticism appeared to have little effect. In 38 of the focus groups, participants mentioned that, although they regularly received criticism from their teachers, most participants were not impressed by critical comments: "*Then he [the teacher] criticises me, but I just don't pay attention to it*" *(*fgb 8). A few students reported that they intended to try harder after criticism, while others expressed the opinion that they thought it had no effect on their learning.

Discussion

This study used quantitative (questionnaire) and qualitative (focus groups) methods to gain insight into influences to and consequences of mindset in 13- to 15-year-old adolescents who are about to make important career-related choices. Below, we first discuss how the qualitative information can be used to nuance the quantitative data and generate hypotheses for future research. We then discuss the quantitative results in the context of similar studies. In the final paragraph, we discuss limitations of the study and implications of the results for educational practice.

First, in the quantitative study, more than half (54%) of participants demonstrated an entity mindset, and only 28% of an incremental mindset.

In line with these findings, entity beliefs in the "direct" sense (believing "you cannot change your intelligence") were also expressed by a majority of participants in the focus groups. Similarly, "direct" incremental beliefs (believing "you can improve your intelligence") were also articulated, but by a minority of the participants. However, when discussing the downstream consequences of mindset in the context of learning and classroom behavior (outcomes), more differentiated explanations or arguments were brought forward in the qualitative data. Participants for example attributed achievement outcomes to efforts and working attitudes: (lack of) effort was the explanation for good (or bad) learning outcomes. Only a minority mentioned being gifted as an explanation for better performance. This suggests that when asked directly, many students may be inclined to adhere to an entity perspective, but their views about learning and performance may still include an important role for effort. This may stimulate further research into the determinants and consequences of beliefs about intelligence versus beliefs about achievement. Furthermore, the qualitative results demonstrated that individuals have different mindsets with regard to different subjects. For example, some students expressed that abilities are innate only for some subjects (e.g., mathematics). These results are consistent with those of previous studies, which suggest that individuals can adhere to some aspects of both mindsets simultaneously (Burnette et al., 2013), depending upon situational factors (Quihuis et al., 2002), such as academic domain. This finding highlights the need to discuss the concept of incremental and entity beliefs with students, for example, within the context of their study choices, rather than just in the general sense.

Second, the quantitative data did not reveal any gender differences in mindset, and this was echoed by boys' and girls' shared direct expression of entity beliefs in the focus groups. Yet, subtle differences emerged from the discussions related to possible outcomes, such as classroom behavior and learning, course/career choices, as well as possible influences such as reaction to praise and criticism. Interestingly, both boys and girls expressed that girls achieve better due to them working harder and paying more attention in class, reflecting outcomes of incremental beliefs, although the notion that girls just understand the curriculum better (outcome of an entity belief) was also mentioned. Especially boys demonstrated a kind of indifferent attitude toward effort and appeared to be proud of this attitude. This is consistent with earlier findings in secondary and high schools in the United Kingdom, that boys might adopt an attitude that disregards academic work and proposes that hard work is generally incompatible with "cool" masculinity (Jackson & Dempster, 2009). This also suggests that more factors than mindset play a role in the decision to invest effort.

Based on their choice of words and expressions, girls in general seemed less confident of their opinions, beliefs, and self-esteem compared with boys, a notion that is also present in previous literature (Archard, 2012; Herbert & Stipek, 2005; OECD, 2015; Watt, 2010). Boys and girls also voiced similar views about gender differences in subject and career choices. Stereotypical beliefs about abilities that might influence students' educational choices (J. Eccles, 2011) emerge at an early age (Bian et al., 2017; Vander Heyden et al., 2015). The stereotypical course or career choices expressed by participants—with boys opting for technical subjects and girls opting for subjects relating to health and care—were only to a very limited extent explicitly associated with beliefs about differences in brains and mindsets. However, several boys expressed the belief that girls are less able to do STEM topics. Regarding possible influences on mindset, several boys expressed the belief that teachers adjust their expectations and feedback to the presumed lower ability of girls in STEM topics. Girls mentioned more often than boys that they received comments—both positive and negative—from their teachers regarding their abilities, regardless of domain. A previous study reported that girls perceived lower teacher ability expectations for their mathematical success (Lazarides & Watt, 2015), but this pattern did not emerge from our focus group data.

In sum, the qualitative data confirmed the presence of directly expressed entity beliefs in a majority of students, but in the discussions of classroom behavior and learning, it appeared that students nonetheless attribute achievement to a large extent to effort. No quantitative gender differences emerged, but the qualitative information suggested that boys and girls both believe there are gender differences in factors that may be possible outcomes of mindset, such as in classroom behavior and learning, investing effort, and course/career choices; as well as factors that may possibly influence mindset, such as reactions to praise and criticism and dealing with feedback. It should be noted that, as mentioned above, it is likely that more factors than mindset play a role in the decision to invest effort. One likely powerful factor, especially in this age group, is the fact that working hard may be associated with an "uncool" reputation (Jackson & Dempster, 2009), an opinion that in this study was expressed by boys in particular. Even if a student thinks that effort is useful, he or she must be motivated to make that effort. The different ways participants talk about effort emphasizes the complex nature of mindset and its consequences.

Mindset in the (Inter)national Context

Our quantitative results are in contrast to findings from a study with 233 older undergraduate students from two American universities, where 29%

demonstrated an entity mindset and 71% of participants believed that general intelligence could be improved through efforts (incremental mindset) (Lee et al., 2012). In a study among 349 pediatric residents and attending pediatricians (Jegathesan et al., 2016) with a response rate of 50%, participants were equally distributed between mindsets, with 49% "entity" and 51% "incremental" (however, no intermediate category was used). In an American study among secondary and elementary school students (Dweck, 1999), participants demonstrated incremental and entity mindsets in equal proportions (40%), and 20% demonstrated an intermediate mindset.

The discrepancy between the results of these studies could be partly due to differences in the composition, for example, ability or age, of the samples. The participants in the study of Dweck (1999) were students attending three secondary schools (age range 15–17 years) and 17 primary schools (age range 5–9 years) in areas of higher than average deprivation (lower SES). All of the participants in our study (age range 13–15 years) were attending prevocational secondary education. The average age of participants could have influenced their mindsets with regard to their abilities, as mindsets might develop with age. Future research can help to clarify this discrepancy.

The mindset outcomes of the three American studies mentioned above (Dweck, 1999; Jegathesan et al., 2016; Lee et al., 2012) might also have been influenced by country of origin or a cultural aspect, for example, the "American dream." This belief that everyone prepared to work hard can reach the top, could explain the stronger tendency toward the incremental mindset in the American studies compared to the results in our study. The educational culture in the Netherlands presents a situation which is described as a "culture of C's" (Westenberg, 2011). Score C (In Dutch: a 6 out of 10) is normative and sufficient, so there is no need for students to show off. For decades, the Dutch educational system invested especially in students who were performing at a low level. The drawback was that more gifted students were not challenged to reach the best of their capacities. The Dutch educational system can be characterized as egalitarian, with little spotlight on high-performing students, or even the opposite: good performers often face lack of understanding and exclusion and receive little attention from their teachers (OC&W, Ministry of Education, Culture & Sciences, 2013). Furthermore, as mentioned in the Introduction, the Dutch educational system tracks students into different educational levels directly after leaving primary school, mainly based on the teacher's advice combined with standard test scores. Depending on the SES of the parents, students with a comparable intelligence quotient (IQ) and standard test scores are more likely to receive advice for a higher (richer, higher-educated parents) or lower (poorer, lower-educated parents) track of the school system (Bakker et al., 2007; OC&W, Inspection of

Education, 2016; Van den Bergh et al., 2010). This double standard might negatively impact students' mindset and behavior in the prevocational track: working hard might not lead to advice for a higher track if you are a student with a lower social economic background. The Dutch "culture of C's" and early educational tracking versus the culture of the "American Dream" might influence the development of a mindset in two opposed directions, with the American culture stimulating the development of a more incrementally oriented mindset. Future research may further investigate this hypothesis.

Measuring mindsets through the questionnaire, we found no significant differences between boys and girls. This lack of gender differences is in line with a recent study in adults (Macnamara & Rupani, 2017) but contrasts with that of earlier studies (Diseth et al., 2014; Gunderson et al., 2013) indicating that boys were more likely than girls to endorse the incremental mindset. As discussed above, the qualitative data capture also more indirectly expressed influences on and consequences of mindset and revealed subtle gender differences. Future qualitative studies may therefore shed more light on the more subtle influences of gender on mindset.

Implications for Educational Practice

The integrated discussion of the quantitative and qualitative results suggests that the mindset of students captures a complex set of beliefs that is not necessarily coherent. The qualitative data suggested that views on downstream consequences of mindset in the context of learning and classroom behavior may reflect incremental beliefs more so than more directly expressed beliefs about intelligence. The finding that students generally endorse the notion that better performance is related to effort may offer a useful starting point for educational interventions. Another observation from the qualitative results was that students expressed mixed reactions to the feedback they received from their teachers. About a quarter of the students reported never receiving praise and about the same number of participants reported sometimes receiving praise. About half of the participants who received it, stated that praise or criticism from teachers had only little effect on their learning attitudes or motivation. At the same time, several students expressed that beliefs about their own abilities were influenced by the opinions of their teachers. Based on these focus group reflections, it may be useful to promote further awareness among teachers on how feedback can be optimized to promote student motivation and learning.

In addition, there is some evidence that mindset interventions are beneficial for specific groups of adolescents. Sisk et al. (2018) examined in two meta-analyses the effectiveness of mindset interventions on academic

achievement and potential moderating factors. They concluded that overall effects were weak. However, some results suggested that students with low SES or who are academically at risk, might benefit from mindset interventions. Therefore, it might be interesting to study the impact of mindset interventions on the longer term and on study-related choices in specific groups of adolescents.

Limitations and Suggestions for Future Research

This study is subject to several limitations. First, the results provided insight into beliefs and views of 13- to 15-year-old students, in the prevocational track of Dutch education. Thus, it is possible that the findings are not generalizable to students in other tracks or other educational systems. Second, although focus groups are useful for collecting opinions, views, and beliefs, the method relies on assisted discussion to produce results. Group dynamics can play an important role, with participants who held explicit opinions possibly dominating the discussions (Leung & Savithiri, 2009), or vice versa, too much consensus may be generated. We analyzed all available material, although we reached theoretical saturation already at 15 interviews (i.e., no new coding labels were found after coding 15 interviews) because every new interview might still elucidate a new aspect and deepen the results (Boeije, 2005). The same results could be achieved with a lower number of focus groups; however, a larger number of interviews might contribute to ascertaining the reliability.

Third, the data generated in our study were not suitable for linking statements that the participants made in the focus groups to specific mindset categories because all data were processed anonymously. A limitation of this approach was that we did not screen for specific mindsets in the focus group participants. In future, it might be interesting to combine quantitative and qualitative data for each individual, which might more specifically elucidate nuances in the beliefs that students hold with regard to intelligence and contribute to explaining students' classroom behavior, learning, and motivation. For example, it would be very useful to know if students with high incremental beliefs experienced teacher influence to the same extent as students who reported entity beliefs. In future studies, it would be interesting to investigate the alignment between the amount of entity and incremental beliefs in the quantitative and qualitative data. This might raise the question how to measure mindsets: it might be valuable to design additional methods of measuring mindsets, which do justice to the complexity of the concept. As we found that mindset might depend upon situational factors, another interesting possibility for future studies could be to unravel mindsets in different educational settings

(other educational tracks) or with regard to specific academic subjects or situations (e.g., mindset in the context of collaborative working or project-based learning).

Another limitation might be the possibility that the concept of "intelligence" has been interpreted in different ways by participants. For example, some students might have interpreted intelligence in terms of "academic skills," while others might have interpreted it as a general mental capability involving such abilities as reasoning, planning, problem-solving, abstract thinking, comprehension of complex ideas, comprehension of the surroundings, figuring out what to do, learning quickly, and learning from experience (Gottfredson, 1997). A recent study demonstrated that different conceptualizations of intelligence indeed impact responses on mindset questionnaires (Limeri et al., 2020).

In the qualitative data, we found some subtle differences between boys and girls regarding mindset in associations with learning and classroom behavior. Further research on the relationship between mindset concerning intelligence and the well-being of students might provide insight into differences between boys and girls in terms of self-confidence. Studies on the association between the mindsets of students and their observed classroom behaviors could further enhance our understanding of behavioral and learning processes in classrooms, specifically regarding the relationships between mindset and its possible outcomes, such as effort and motivation. Furthermore, in future studies, it would be interesting to look at relations across the codes, for example, mindset in relation to classroom behavior.

In conclusion, our approach of studying the complex concept of mindset showed how qualitative data can nuance and enrich quantitative results. The quantitative data suggested that the majority of students expressed entity beliefs. While the qualitative data confirmed the presence of directly expressed entity mindsets, in the discussions about classroom behavior, learning, and study choices, which can be seen as possible consequences of mindset beliefs, it appeared that students nonetheless attribute achievement to a large extent to effort. No quantitative gender differences emerged, but the qualitative information suggested that boys and girls both believe there are gender differences in responding to possible influences on mindset (e.g., praise and feedback) as well as in possible consequences of mindset (e.g., classroom behavior and effort). In sum, triangulation of quantitative and qualitative data seemed to capture the complexity of the concept of mindset, and its possible influences and outcomes, better than quantitative data alone.

Appendix

1. Classroom behaviour
   a. *Can you tell me something about your, and your fellow students' behaviour during lessons?*
   b. *Do you think there are differences between boys and girls in classroom behaviour? If so, can you describe them?*
2. Learning process
   a. *What are important issues which have to do with "learning" in your opinion?*
   b. *Do you think there are differences between boys and girls in the learning process?*
3. Course and career choices
   a. *Have you already made your decisions regarding course-choice next year?*
   b. *What arguments do you have for this choice?*
   c. *Do you notice any differences between girls and boys regarding course and career-choices?*
4. Teachers' feedback
   a. *Do teachers provide feedback to you, if so could you provide some examples?*
   b. *Does your teachers' feedback influence your behaviour?*
   c. *What is in your opinion important for teachers when they provide feedback?*
5. Differences in boys' and girls' classroom- and learning behaviour, mindset
   a. *Do you think intelligence is malleable or stable?*
   b. *Do you think there are differences between girls and boys regarding (malleability of) intelligence?*

Figure A1. Focus groups: topic list with main questions.

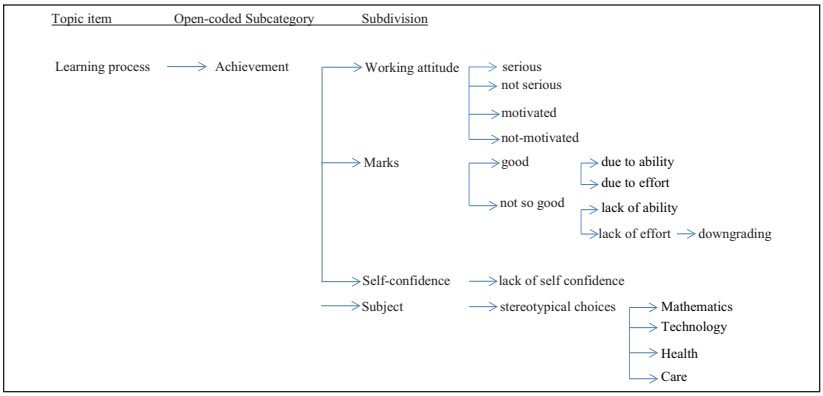

Figure A2. Example of a construction of the inductive coding scheme with subdivisions belonging to the topic "learning process."

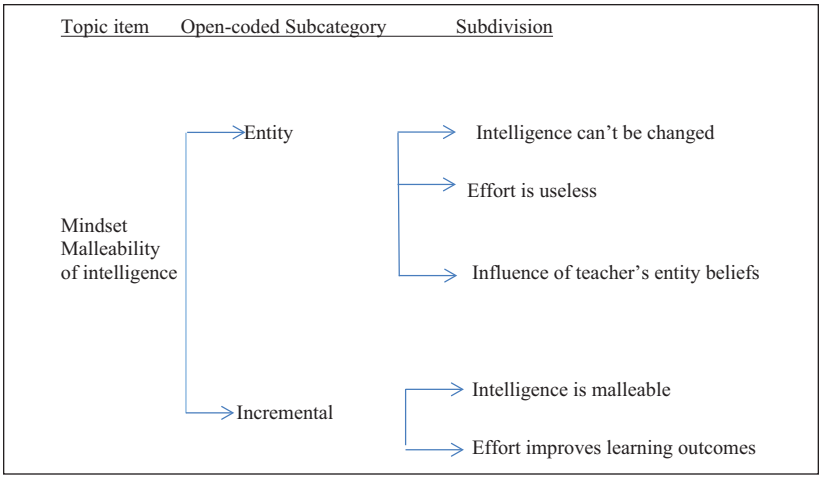

Figure A3. The construction of the inductive coding scheme with subdivisions belonging to the topic "mindset."

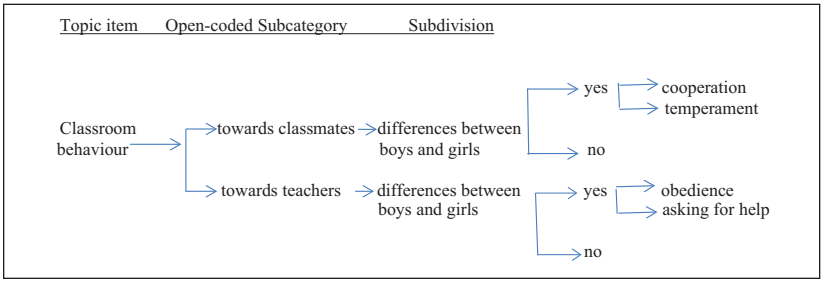

Figure A4. The construction of the inductive coding scheme with subdivisions belonging to one subcategory of the topic "classroom behavior including gender differences.

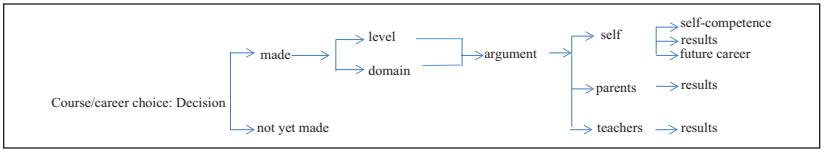

Figure A5. The construction of the inductive coding scheme with subdivisions belonging to the topic "course- and career choices."

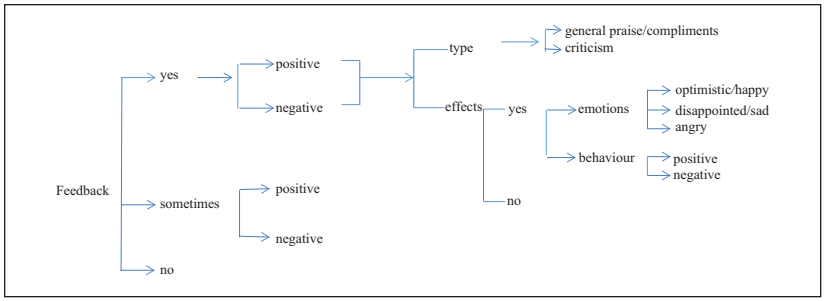

Figure A6. The construction of the inductive coding scheme with subdivisions belonging to the topic "(receiving teachers') feedback."

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References

Archard, N. (2012). Adolescent girls and leadership: The impact of confidence, competition, and failure. *International Journal of Adolescence and Youth*, *17*(4), 189–203. https://doi.org/10.1080/02673843.2011.649431

Bakker, J., Denessen, E., & Brus-Laeven, M. (2007). Socio-economic background, parental involvement and teacher perceptions of these in relation to pupil achievement. *Educational Studies*, *33*(2), 177–192. https://doi.org/10.1080/03055690601068345

Barbour, R. (2007). *Doing focus groups*. SAGE.

Bian, L., Leslie, S. J., & Cimpian, A. (2017). Gender stereotypes about intellectual ability emerge early and influence children's interests. *Science*, *355*(6323), 389–391. https://doi.org/10.1126/science.aah6524

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development*, *78*(1), 246–263. https://doi.org/10.0000/j.1467-8624.2007.00995.x

Boeije, H. (2005). *Analyseren in kwalitatief onderzoek, denken en doen* [Analysis in qualitative survey, thinking and doing]. Boom Lemma.

Borg, E. (2014). Classroom behaviour and academic achievement: How classroom behaviour categories relate to gender and academic performance. *British Journal of Sociology of Education*, *36*, 1127–1148. https://doi.org/10.1080/01425692.2014.916601

Brummelman, E., Thomaes, S., Nelemans, S. A., Orobio de Castro, B., & Bushman, B. J. (2015). My child is god's gift to humanity: Development and validation of the parental overvaluation scale (POS). *Journal of Personality and Social Psychology*, *108*(4), 665–679. https://doi.org/10.1037/pspp0000012

Bugler, M., McGeown, S. P., & St Clair-Thompson, H. (2015). Gender differences in adolescents' academic motivation and classroom behaviour. *Educational Psychology: An International Journal of Experimental Educational Psychology*, *35*(5), 541–556. https://doi.org/10.1080/01443410.2013.849325

Burnette, J. L., O'Boyle, E., VanEpps, E. M., Pollack, J. M., & Finkel, E. J. (2013). Mindsets matter: A meta-analytic review of implicit theories and self-regulation. *Psychological Bulletin*, *139*, 655–701. https://doi.org/10.1037/a0029531

Creswell, J. W. (2003). *Research design: Qualitative, quantitative and mixed methods approaches*. SAGE.

Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., & Hanson, W. E. (2003). Advanced mixed methods research designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 209–240). SAGE.

Diseth, A., Meland, E., & Breidablik, H. J. (2014). Self-beliefs among students: Grade level and gender differences in self-esteem, self-efficacy and implicit theories of intelligence. *Learning and Individual Differences*, *35*, 1–8. https://doi.org/10.1016/j.lindif.2014.06.003

Driessen, G., & Van Langen, A. (2013). Gender differences in primary and secondary education: Are girls really outperforming boys? *International Review of Education*, *59*(1), 67–86. https://doi.org/10.1007/s11159-013-9352-6

Dweck, C. S. (1999). *Self theories: Their role in motivation, personality and development*. Psychology Press.

Dweck, C. S. (2006). *Mindset: The new psychology of success*. Random House.

Dweck, C. S., Chiu, C., & Hong, Y. (1995). Implicit theories and their role in judgments and reactions: A word from two perspectives. *Psychological Inquiry*, *6*(4), 267–285. https://doi.org/10.1207/s15327965pli0604_1

Dweck, C. S., Davidson, W., Nelson, S., & Enna, B. (1978). Sex differences in learned helplessness: II. The contingencies of evaluative feedback in the classroom and III. An experimental analysis. *Developmental Psychology*, *14*, 268–276. https://doi.org/10.1037//0012-1649.14.3.268

Eccles, J. (2011). Gendered educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *International Journal of Behavioural Development*, *35*(3), 195–201. https://doi.org/10.1177/0165025411398185

Eccles, J. S., Vida, M. N., & Barber, B. (2004). The relation of early adolescents' college plans and both academic ability and task-value beliefs to subsequent

college enrolment. *The Journal of Early Adolescence*, *24*(1), 63–77. https://doi.org/10.1177/0272431603260919

Farooq, M. S., Chaudhry, A. H., Shafiq, M., & Berhanu, G. (2011). Factors affecting students' quality of academic performance: A case of secondary school level. *Journal of Quality and Technology Management*, *7*(2), 1–14.

Finch, H., Lewis, J., & Turley, C. (2003). Focus groups. In J. Ritchie, J. Lewis, C. MacNaughton Nicholls, & R. Ormston (Eds.), *Qualitative research practice, a guide for social science students & researchers* (pp. 211–242). SAGE.

Garg, R., Kauppi, C., Urajnik, D., & Lewko, J. (2010). A longitudinal study of the effects of context and experience on the scientific career choices of Canadian adolescents. *Canadian Journal of Career Development/Revue Canadienne de developpement de carriére*, *9*(1), 15–24.

Good, C., Aronson, J., & Inzlicht, M. (2003). Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat. *Applied Developmental Psychology*, *24*, 645–662. https://doi.org/10.1016/j.appdev.2003.09.002

Gottfredson, L. S. (1997). Mainstream science on intelligence: An editorial with 52 signatories, history, and bibliography. *Intelligence*, 24(1), 13–23.

Gottfried, M., Owens, A., Williams, D. N., Kim, H. Y., & Musto, M. (2017). Friends and family: A literature review on how high school social groups influence advanced math and science coursetaking. *Education Policy Analysis Archives*, *25*, Article 62. http://doi.org/10.14507/epaa.25.2857

Gunderson, E. A., Gripshover, S. J., Romero, C., Dweck, C. S., Goldin-Meadow, S., & Levine, S. C. (2013). Parent praise to 1-3 years-olds predicts children's motivational frameworks 5 years later. *Child Development*, *84*(5), 1526–1541. https://doi.org/10.1007/s11199-011-9996-2

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2012). The role of parents and teachers in the development of gender-related math attitudes. *Sex Roles*, *66*, 153–166. https://doi.org/10.1007/s11199-011-9996-2

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, *77*(1), 81–112. https://doi.org/10.3102/003465430298487

Herbert, J., & Stipek, D. (2005). The emergence of gender differences in children's perceptions of their academic competence. *Journal of Applied Developmental Psychology*, *26*(3), 276–295. https://doi.org/10.1016/j.appdev.2005.02.007

Hiteq. (2008). *Kenmerkend VMBO. Een vergelijkend onderzoek naar de kenmerken van vmbo-leerlingen en de generatie Einstein* [*Characteristics of VMBO. A comparative study on vmbo-students and generation Einstein]*.

Hong, Y. Y., Chiu, C. Y., Dweck, C. S., Lin, D. M. S., & Wan, W. (1999). Implicit theories, attributions, and coping: A meaning system approach. *Journal of Personality and Social Psychology*, *77*(3), 588–599.

Jackson, C., & Dempster, S. (2009). "I sat back on my computer . . . with a bottle of whisky next to me": Constructing "cool" masculinity through "effortless" achievement in secondary and higher education. *Journal of Gender Studies*, *18*(4), 341–356. https://doi.org/10.1080/09589230903260019

Jegathesan, M., Vitberg, Y. M., & Pusic, M. V. (2016). A survey of mindset theories of intelligence and medical error self-reporting among pediatric housestaff and faculty. *BMC Medical Education*, *16*, Article 58. https://doi.org/10.1186/s12909-016-0574-8

Jerrim, J., & Sims, S. (2019). How do academically selective school systems affect pupils' social-emotional competencies? New evidence from the millennium cohort study. *American Educational Research Journal*, *56*(5), 1769–1799.

Kidd, P. S., & Parshall, M. B. (2000). Getting the focus and the group: Enhancing analytical rigor in focus group research. *Qualitative Health Research*, *10*, 293–308. https://doi.org/10.1177/104973200129118453

Kitsantas, A., Cheema, J., & Ware, H. W. (2011). Mathematics achievement: The role of homework and self-efficacy beliefs. *Journal of Advanced Academics*, *22*(2), 310–339.

Klem, A. M., & Connell, J. P. (2004). Relationships matter: Linking teacher support to student engagement and achievement. *Journal of School Health*, *74*(7), 262–273.

Korpershoek, H., Guntern, S., & Van der Werf, G. (2014). The impact of significant others on gender-atypical, gender-typical and gender-neutral study choices. *Gruppendynamik Und Organisationsberatung*, *45*(4), 441–463. https://doi.org/10.1007/s11612-014-0263-1

Lauermann, F., Chow, A., & Eccles, J. S. (2015). Differential effects of adolescents' expectancy and value beliefs about math and English on math/science-related and human-services-related career plans. *International Journal of Gender, Science and Technology*, *7*(2), 205–228.

Lazarides, R., & Watt, H. M. G. (2015). Girls' and boys' perceived mathematics teacher beliefs, classroom learning environments and mathematical career intentions. *Contemporary Educational Psychology*, *41*, 51–61. https://doi.org/10.1016/j.cedpsych.2014.11.005

Lee, Y. H., Heeter, C., Magerko, B., & Medler, B. (2012). Gaming mindsets: Implicit theories in serious game learning. *Cyberpsychology, Behavior and Social Netwerking*, *15*(4), 190–194. https://doi.org/10.1089/cyber.2011.0328

Leslie, S., Cimpian, A., Meyer, M., & Freeland, E. (2015). Expectations of brilliance underlie gender distributions across academic disciplines. *Science*, *347*(6219), 262–265. https://doi.org/10.1126/science.1261375

Leung, F. H., & Savithiri, R. (2009). Spotlight on focus groups. *Canadian Family Physician*, *55*(2), 218–219.

Liamputtong, P. (2011). *Focus group methodology: Principle and practice*. SAGE.

Limeri, L. B., Choe, J., Harper, H. G., Martin, H. R., Benton, A., & Dolan, E. L. (2020). Knowledge or abilities? How undergraduates define intelligence. *Cbe—life Sciences Education*, *19*(1), Article 5.

Macnamara, B. N., & Rupani, N. S. (2017). The relationship between intelligence and mindset. *Intelligence*, *64*, 52–59.

Meece, J. L., Anderman, E. M., & Anderman, L. H. (2006). Classroom goal structure, student motivation, and academic achievement. *Annual Review of Psychology*, *57*, 487–503. https://doi.org/10.1146/annurev.psych.56.091103.070258

Morgan, D. L. (1997). *Focus groups as qualitative research*. Sage.

Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. *Journal of Personality and Social Psychology*, *75*(1), 33–52.

Mushtaq, I., & Nawaz Khan, S. (2012). Factors affecting students' academic performance. *Global Journal of Management and Business Research*, *12*(9), 16–22.

Nagy, G., Garrett, J., Trautwein, U., Cortina, K. S., Baumert, J., & Eccles, J. S. (2008). Gendered high school course selection as a precursor of gendered careers: The mediating role of self-concept and intrinsic value. In H. M. G. Watts & J. S. Eccles (Eds.), *Gender and occupational outcomes: Longitudinal assessments of individual, social and cultural influences* (pp. 115–143). American Psychological Association.

Nugent, G., Barker, B., Welch, G., Grandgenett, N., Wu, C., & Nelson, C. (2015). Model of factors contributing to STEM learning and career orientation. *International Journal of Science Education*, *37*(7), 1067–1088. https://doi.org/10.1080/09500693.2015.1017863

OC&W, Inspection of Education. (2016). *De staat van het onderwijs. Onderwijsverslag 2014/2015* [State of education. Educational report 2014/2015]. Xerox/OBT.

OC&W, Inspection of Education. (2017). *De staat van het onderwijs 2015/2016* [State of education, 2015/2016]. Inspectie van het Onderwijs.

OC&W, Ministry of Education, Culture & Sciences. (2013, September). *Ruim baan voor toptalent in het funderend onderwijs* [Make way for top talented students in primary education] (Issue Brief No 530191). S. Dekker.

OC&W, Ministry of Education, Culture & Sciences, Central Office for Statistics CBS, & Office Implementation Education DUO. (2015, June). *Onderwijs in cijfers* [Education in figures]. http://www.Onderwijsincijfers.nl

OECD. (2015). *The ABC of gender equality in education: Aptitude, behaviour, confidence*. PISA, OECD. http://doi.org/10.1787/9789264229945-en

Paunesku, D., Walton, G. M., Romero, C., Smith, E. N., Yeager, D. S., & Dweck, C. S. (2015). Mind-set interventions are a scalable treatment for academic underachievement. *Psychology Science*, *26*(6), 784–793. https://doi.org/10.1177/0956797615571017

Plummer-D'Amato, P. (2008). Focus group methodology Part 2: Considerations for analysis. *International Journal of Therapy and Rehabilitation*, *15*(3), 123–129. https://doi.org/10.12968/ijtr.2008.15.3.28727

Quihuis, G., Bempechat, J., Jimenez, N. V., & Boulay, B. A. (2002). Implicit theories of intelligence across academic domains: A study of meaning making in adolescents of Mexican descent. In J. Bempeacht & J. E. Eliot (Eds.), *Learning in culture and context: Approaching the complexities of achievement motivation in student learning: New directions for child and adolescent development* (pp. 87–100). Wiley Periodicals.

Rabiee, F. (2004). Focus-group interview and data analysis. *Proceedings of the Nutrition Society*, *63*(4), 655–660. https://doi.org/10.1079/PNS2004399

Reuben, E., Sapienza, P., & Zingales, L. (2014). How stereotypes impair women's careers in science. *Proceedings of the National Academy of Science*, *111*(12), 4403–4408. https://doi.org/10.1073/pnas.1314788111

Robnett, R. D., & Leaper, C. (2013). Friendship groups, personal motivation and gender in relation to high school students' STEM career interest. *Journal of Research on Adolescence*, *23*(4), 652–664. https://doi.org/10.1111/jora.12013

Rodrigues, S., Jindal-Snape, D., & Snape, J. B. (2011). Factors that influence student pursuit of science careers; the role of gender, ethnicity, family and friends. *Science Education International*, *22*(Special Issue 4), 266–271.

Rozek, C. S., Hyde, J. S., Svoboda, R. C., Hulleman, C. S., & Harackiewicz, J. M. (2015). Gender differences in the effects of a utility-value intervention to help parents motivate adolescents in mathematics and science. *Journal of Educational Psychology*, *107*(1), 195–206. https://doi.org/10.1037/a0036981

Rozendaal, J. S., Minnaert, A., & Boekaerts, M. (2003). Motivation and self-regulated learning in secondary vocational education: Information-processing type and gender differences. *Learning and Individual Differences*, *13*, 273–289. https://doi.org/10.1016/S1041-6080(03)00016-5

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*, 54–67. https://doi.org/10.1006/ceps.1999.1020

Sáinz, M., & López-Sáez, M. (2010). Gender differences in computer attitudes and the choice of technology-related occupations in a sample of secondary students in Spain. *Computers & Education*, *54*(2), 578–587. https://doi.org/10.1016/j.compedu.2009.09.007

Sisk, V. F., Burgoyne, A. P., Sun, J., Butler, J. L., & Macnamara, B. N. (2018). To what extent and under which circumstances are growth mind0-sets important to academic achievement? Two meta-analyses. *Psychological Science*, *29*(4), 1–23. https://doi.org/10.1177/095679761773970

van Aalderen-Smeets, S. I., & van der Molen, J. H. W. (2016). Modeling the relation between students' implicit beliefs about their abilities and their educational STEM choices. *International Journal of Technology and Design Education*, *28*(1), 1–27.

van Aalderen-Smeets, S. I., van der Molen, J. H. W., & Xenidou-Dervou, I. (2019). Implicit STEM ability beliefs predict secondary school students' STEM self-efficacy beliefs and their intention to opt for a STEM field career. *Journal of Research in Science Teaching*, *56*(4), 465–485.

Van den Bergh, L., Denessen, E., Hornstra, L., Voeten, M., & Holland, R. W. (2010). The implicit prejudiced of teachers: Relations to teacher expectations and the ethnic achievement gap. *American Educational Research Journal*, *47*(2), 497–527. https://doi.org/103102/0002831209353954

Vander Heyden, K. M., Van Atteveldt, N. M., Huizinga, M., & Jolles, J. (2015). Implicit and explicit gender beliefs in spatial ability: Stronger stereotyping in boys than girls. *Frontiers in Psychology*, *7*(1114), 1–12. https://doi.org/10.3389/fpsyg.2016.01114

Wang, M. T., & Degol, J. (2013). Motivational pathways to STEM career choices: Using expectancy-value perspective to understand individual and gender differences in STEM field. *Developmental Review*, *33*(1), 304–340. https://doi.org/10.1016/j.dr.2013.08001

Watt, H. M. G. (2010). Gender and occupational choice. In J. C. Chrisler & D. R. McCreary (Eds.), *Handbook of gender research in psychology* (pp. 379–400). Springer.

Watt, H. M. G., Hyde, J. S., Petersen, J., Morris, Z. A., Rozek, C. S., & Harackiewicz, J. M. (2017). Mathematics—A critical filter for STEM-related career choices? A longitudinal examination among Australian and U.S. adolescents. *Sex Roles*, *77*(3–4), 254–271. https://doi.org/10.1007/s11199-016-0711-1

Westenberg, P. M. (2011). Een zesjescultuur? Leven de zeven [C-culture? Long live the B-score]. In T. Schokker, J. van Katwijk, & T. Arendz (Eds.), *EssaybundelCU@SCHOOL, Jeugdcultuur en Onderwijs* (pp. 29-39). Ministry of Education, Culture and Sciences (OC&W).

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology*, *25*, 68–81. https://doi.org/10.1006/ceps.1999.1015

Xu, J. (2014). Regulation of motivation: Predicting students homework motivation management at the secondary school level. *Research Papers in Education*, *29*(4), 457–478. https://doi.org/10.1080/02671522.2013.775324

Yeager, D. S., & Dweck, C. S. (2012). Mindsets that promote resilience: When students believe that personal characteristics can be developed. *Educational Psychologist*, *47*(4), 302–314. https://doi.org/10.1080/00461520.2012.722805

Yeager, D. S., Hanselman, P., Walton, G. M., Murray, J. S., Crosnoe, R., Muller, C., . . . Paunesku, D. (2019). A national experiment reveals where a growth mindset improves achievement. *Nature*, *573*(7774), 364–369.

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