Master Thesis

The influence of primary school teachers' mindset and self-efficacy on the amount of higher order questions they ask to students.

Researcher: P.E. Schutte

First supervisor: Dr. T.H.S. Eysink

Second supervisor: Dr. A.M. van Dijk

Key words: questions; primary education; mindset; self-efficacy

March 2020

Master Educational Science & Technology

University of Twente, Enschede

UNIVERSITY OF TWENTE.

Table of contents

Acknowledgement

Studying and graduating the master Educational Science and Technology has been quite a journey for me. A journey of working hard, but full of new learning experiences. A journey that started at some realisation point in my career as a primary school teacher. After 10 years of teaching I felt the need to learn new things. All this time I had been stimulating my students to develop an attitude of curiosity and self-confidence and a feeling of ownership in their own learning (or at least, I was trying to). I was telling them that they can always learn new things and that they can always improve themselves, and this kind of pushed myself to take the step of a new education. So, I took the leap and chose this masters education.

I would like to start with thanking my first supervisor, Dr. Tessa Eysink, for taking a lot of time to guide me through the process of writing a master thesis. From the first meetings in which we explored my interests about education to choosing a subject, to writing the thesis and finally to finetuning it. She has helped me maintain my focus and kept me on track by responding to questions and planning meetings really fast. I would also like to thank my second supervisor, Dr. Alieke van Dijk for giving me new insights, so that I could further improve my thesis to come to this final result.

My partner Nick de Waart has supported me throughout my study by listening to my concerns, my uncertainties, and taking them away by asking the right questions and saying the right things that helped me move forward. Thank you for that!

Finally, I would like to thank the teachers that were willing to let me record their lessons. I think it takes courage to let somebody in to the classroom to observe you without knowing what he is observing. Thank you for participating!

Summary

In order to prepare students for their future, students should be equipped with cognitive skills that entail more than only fact recalling. These cognitive skills are often referred to as higher order thinking skills. Previous research indicates that many teachers find it difficult to implement higher order thinking in their teaching practice. One way for teachers to stimulate higher order thinking is by asking questions to students. This study investigated the influence of teachers' mindset and self-efficacy on the amount of higher order questions they ask. 18 participating primary school teachers were observed during a science, geography, or history lesson. The questions they asked to their students were categorized as lower or higher order questions. Results showed that teachers asked mainly lower order questions. Due to very few higher order questions being asked and very little variation in mindset and self-efficacy scores, the expected relationships were not found. Nevertheless, a negative correlation was found between the teachers' mindset score on intelligence (which is a subcategory of the mindset instrument) and questions that invited students to remember, indicating the possible influence of mindset on the types of questions that teachers ask. Most teachers were familiar with higher order thinking, but barely brought it into practice. Practical implications entail the need for teachers' awareness of the value of incorporating higher order thinking in their lessons and for designers of trainings or interventions to focus on practicing teachers' skills to bring teachers' knowledge into practice.

Introduction

The society that we live in is constantly changing. Students are educated and prepared for the future while future professions do not even exist yet. Teachers are expected to coach their students in developing necessary skills that prepare them for their personal and professional life. The Dutch Education Council advises to make changes to the curriculum so that students will be equipped with the necessary skills that prepare them for the future (Een eigentijds curriculum, 2014). These skills are often referred to as 21st century skills and entail for instance working with technology, communicating, creativity, critical thinking, and problem solving (Thijs, Fisser, & Hoeven, 2014). In order to practice 21st century skills, the stimulation of specific cognitive skills (e.g., analysing, evaluating, and creating) is necessary. These cognitive skills are referred to as higher order thinking skills by Anderson et al. (2001).

Stimulating higher order thinking starts by teachers choosing the right activities for their students and asking them the right questions. This means that if teachers want to stimulate higher order thinking, their questions should go beyond fact recalling (Zeegers & Elliott, 2018; Zohar & Dori, 2003). Zeegers and Elliott (2018) emphasize that when teachers ask questions that stimulate higher order thinking, it fosters student engagement and deeper learning. Although there are teachers that think higher order thinking is only feasible for students with high academic achievements, research has shown that students with both high and low academic achievements benefit from a teacher who stimulates higher order thinking through questioning or assignments (Zohar & Dori, 2003). Thijs et al. (2014) reported that in spite of the fact that many teachers find it important to implement higher order thinking skills in their daily teaching, they find it difficult to do this and it rarely takes place during subjects that are taught by teachers. This is confirmed in other research where teachers asked few higher order questions (Wimer, Ridenour, Thomas, & Place, 2001; Khan & Inamullah, 2011). Thijs et al. (2014) further emphasize that teachers need guidance in the form of professionalisation to be able to change their daily practice in order to stimulate higher order thinking.

Research has shown that teachers' classroom behaviour (which includes asking questions) is influenced by teachers' own beliefs (Stipek, Givvin, Salmon, and MacGyvers, 2001; Zee and Koomen, 2016). One element of beliefs in which teachers can differ concerns their beliefs about intelligence. This is referred to by Dweck and Leggett (1988) as teachers' mindset (TM). When teachers view intelligence as an attribute that can be developed, it is plausible to assume that this is visible in the questions they ask. Teachers might ask more challenging questions than only fact recalling questions, as they think their students should be stimulated to develop to their optimal. Another example of a teacher characteristic that can have an influence on teachers' questions is their feeling of competence. Bandura (1977) refers to this feeling as teachers' self-efficacy (TSE). For instance, teachers that feel efficacious in their teaching sooner try new teaching strategies (Holzberger, Philip, & Kunter, 2013; Woolfolk et al., 1990) and show development in their teaching (which includes presumably asking more challenging

questions) than teachers that feel less efficacious. Although teachers might find it difficult to implement higher order thinking in the classroom, both mindset and self-efficacy seem promising teacher characteristics that might positively influence asking higher order questions (and thus fostering higher order thinking).

The aim of this study is to research if teachers' mindset and teachers' self-efficacy have an influence on the amount of higher order questions asked by Dutch primary school teachers. Insight in the possible influence of these characteristics on teaching practice might contribute to the existing scientific knowledge base and the practical relevance of it is that it might make it possible to design necessary effective trainings and interventions in order to help teachers by reducing the difficulty of implementing higher order thinking skills in the classroom. This should lead to more higher order thinking which is necessary for students' development in 21st century skills.

Theoretical Framework

Goals and levels of questions

Throughout a school day, teachers ask their students numerous questions. According to Blosser (1975), the major categories that classroom questions fall into are (a) managerial questions (i.e., questions to manage classroom activities), (b) rhetorical questions (i.e., questions to indicate a point, or to emphasize an idea or statement), (c) closed questions (i.e., questions for checking retention or to emphasize a point), and (d) open questions (i.e., questions to promote classroom discussion or student interaction). Blosser further emphasizes that closed and open questions can be further classified in what type of thinking they can lead to. Closed questions lead to the use of cognitive memory, which is often referred to as lower order thinking. An example of a closed question is: '*How do we calculate the area?*'. A closed question can be useful, for instance when learning and practicing strategies during a math lesson. Open questions can lead to higher order thinking (e.g., '*When you analyse characteristics of one of the planets in our solar system, what technological adaptations can you think of for a human to be able to live on that planet?*'). The levels of questions that teachers use, depend on the goal they have when asking them.

Asking good formulated questions in the classroom can have benefits for learning, curiosity, and the attention of students, especially when asked at the right time (Goodwin, 1983). Teachers use questioning in their classroom as a strategy that serves many purposes, such as activating students' prior knowledge and checking if students understand what has just been taught. According to Goodwin (1983), "Questioning should be used purposefully to achieve well-defined goals. An instructor should ask questions which will require students to use the thinking skills which he is trying to develop." (p. 7). For instance, if a teacher wants to promote critical thinking, a good way would be to pose critical thinking questions (King, 2006). According to King, critical thinking questions trigger high-level cognitive processes, as they require students to take a step further than the point of recalling facts and to think about concepts that are different than what is presented in text or by the teacher. In short, teachers can use different levels of questions to stimulate different levels of thinking.

A commonly used classification of levels of questions is based on Bloom's (1956) taxonomy which describes cognitive thinking on different levels. The taxonomy can be seen as a hierarchical system of ordering thinking from lower to higher. The thinking levels by Bloom were later revised by Anderson et al. (2001) into: remembering (i.e., recalling previously learned information from memory), understanding (i.e., restructuring information obtained from sources), applying (i.e., selecting facts and principles and applying them in a new situation), analysing (i.e., comparing elements or parts of a whole and seek for differences, similarities and correlations), evaluating (i.e., judging based on norms), and creating (i.e., putting elements together to create something new). The levels 'remembering', 'understanding', and 'applying' are categorized as lower order thinking and the levels above applying

(i.e., analysing, evaluating, and creating) are categorized as higher order thinking (Anderson et al., 2001). Likewise, questions can be formulated to stimulate thinking on these levels and can be categorized accordingly.

Teachers' Mindset

In research, the mindset theory has been widely explored and discussed as it seems to be a promising approach for teachers and students to influence student motivation and achievement. As explained by Dweck (2008), the mindset theory, or theory of intelligence, is about one's belief about intelligence. One can believe that intelligence is a given attribute or an attribute that can be developed (Dweck & Leggett, 1988). Dweck (2008) categorizes mindsets in 'fixed' (i.e., believing one's intelligence is a given that cannot be changed) versus 'growth' (i.e., believing one's intelligence can grow with effort and practice).

Several studies showed that when students hold a growth mindset it can have a significant positive effect on their academic performance due to them becoming more persistent, even when things become difficult (e.g., Blackwell, Trzesniewski, & Dweck, 2007; Claro, Paunesku, & Dweck, 2016; Yeager et al., 2016; Zeng, Hou, & Peng, 2016). Likewise, mindsets held by teachers can also influence the academic performance of their students (e.g., Mueller & Dweck, 1998). De Kraker-Pauw, Van Wesel, Krabbendam, and Van Atteveldt (2017) found that teachers having a growth mindset give different (i.e., more 'growth oriented' and focused on process) feedback to students than teachers having a fixed mindset. They also indicate that teachers with a growth mindset provided less feedback, but of higher quality (i.e., feedback that helps the learner to move forward in their learning) rather than feedback provided by teachers with a fixed mindset.

Teachers with a growth mindset seem to value the learning process of their students and strive to help their students to move forward in their learning. They do so, because they expect their students are able to develop through practice and effort. Teachers with a growth mindset expect of every student (independent of the students' current abilities) to show effort. It is assumable that this is noticeable in the questions they ask. They might ask more challenging questions that invite students to take a step further than only fact recalling. On the contrary, teachers with a fixed mindset might let their view about students' (maybe limited) abilities influence the level of questions they ask to their students, which might lead to less higher order questions. Therefore, it is expected that there is a relationship between mindset and asking higher order questions and that teachers with a growth mindset ask more higher order questions than teachers with a fixed mindset.

Teachers' Self-Efficacy

Bandura (1977) introduced the self-efficacy theory, explaining that it is about one's belief in his or her capability to behave in a way that will make them achieve a certain outcome, even when things become

difficult. Bandura stated that people's self-efficacy affects their choice of activities in a way that the activities fit within their perceived competency. Gibson and Dembo (1984) linked the theory to teacher efficacy, depicting it to be about teachers' beliefs about their abilities to influence students' achievements. Moreover, Gibson and Dembo (1984) confirm Bandura's (1977) statement that teachers with a higher perceived self-efficacy will show perseverance in order to achieve a certain outcome (e.g., influencing student learning).

Studies have shown that teachers' self-efficacy (TSE) on their teaching and on student outcomes can have an effect on what happens in the classroom in several ways. First, it can have a positive effect on student achievement (e.g., Caprara, Barbaranelli, Steca, & Malone, 2006; Taştan et al., 2018; Ross, 1992). Second, TSE also seems to have a positive relationship with student motivation as TSE seems to have a positive effect on the feeling of mastery of teachers on a specific subject, resulting in more motivated teachers to teach that subject, which often results in more motivated students (e.g., Kalyar, Ahmad, & Kalyar, 2018; Mahler, Großschedl, & Harms, 2018; Thoonen, Sleegers, Peetsma, & Oort, 2011).

Similar to having an effect on student level, TSE seems to affect teachers' practice expressed in several ways. First, addressing student motivation in an intrinsic or extrinsic way seems to depend on TSE as teachers with a high perceived self-efficacy seem to support students in autonomously solving problems without extrinsic rewards (Woolfolk, Rosoff, & Hoy, 1990). Second, a significant relationship between TSE and instructional quality has been found (Holzberger, Philip, & Kunter, 2013; Woolfolk et al., 1990). An example of what instructional quality entails is students' cognitive activation. Moreover, Deemer (2004) found that teachers with high TSE are more likely to design lessons in which students are asked to show effort and to get the most out of themselves.

As aforementioned, teachers with a high perceived self-efficacy choose activities with greater instructional quality as they have the confidence that they have the skills to do so and believe in the positive effect it has on students. It is expected that there is a relationship between self-efficacy and asking higher order questions. Teachers with a high perceived self-efficacy believe they have the skills to design questions or assignments that require higher order thinking and the skills to ask or give them to their students, whereas teachers with a low perceived self-efficacy might avoid asking or giving higher order questions. This is expected because designing and asking or giving higher order questions or assignments can be perceived as difficult (designing them takes teachers' effort and skills and students are expected to go further than fact recalling; it is not clear in advance what their response will be to a question by a teacher). Teachers with high self-efficacy are motivated to teach a subject well and also believe that their actions will have real influence on student achievement and so purposely have high expectations of their students, thus are assumed to ask more complex questions (i.e. more higher order questions).

Current study

The research question of the current study is:

To what extent do primary school teachers' mindset and self-efficacy influence the amount of higher order questions they ask to students during science, geography, and history lessons?

In order to answer the research question, sub questions are formulated. The literature review led to the according hypotheses.

What is the influence of teachers' mindset on the amount of higher order questions they ask to their students?
H1a: There is a positive correlation between teachers' mindset and the amount of higher order questions they ask.
H1b: Teachers that hold a growth mindset ask more higher order questions to their students than teachers with a fixed mindset.

What is the influence of teachers' self-efficacy on the amount of higher order questions they ask to their students?
H2: There is a positive correlation between teachers' self-efficacy and the amount of higher order questions they ask.

Method

Participants

The group of participants consisted of 18 teachers that worked at ten different primary schools in the eastern part of The Netherlands. Teachers of grade three, four, five, and six (groep vijf, zes, zeven en acht) were chosen. Of the participants, 13 (72.2%) were female and five (27.8%) were male. Their mean age (age range: 23 - 53) was 34.67 years (SD=9.68). Their mean years of experience was 10.83 years (SD=7.97). All of the participants in this study gave informed consent.

Design

In the current study, teachers were observed to identify the questions they asked during their science, geography, and history lessons. Teachers of grade three, four, five, and six were chosen for observation based on the fact that in most Dutch schools these are the age groups in which the subjects science, geography, and history are taught. The content of these subjects provides opportunities for higher order thinking.

Instruments

Dweck mindset instrument

A Dutch translation of The Dweck Mindset Instrument, developed by Dweck (2008), was used to measure teachers' mindset about intelligence and talent (see Appendix A). The instrument consisted of 16 statements which could be answered on a 6-point Likert scale ranging from 1 (i.e., Strongly Agree) to 6 (i.e., Strongly Disagree). Eight statements were phrased to measure mindset about intelligence (e.g., "You can always substantially change how intelligent you are") and eight parallel statements were about talent (e.g., "You can always substantially change how much talent you have"). From the eight statements about intelligence and talent, four were growth statements (e.g., "You can always substantially change how much talent you have") and four were fixed statements (e.g., "Your intelligence is something about you that you can't change very much"). Scores on intelligence and talent were averaged together, providing an overall mindset score. Teachers with a score between 1 and 3 (3 included) were considered to be holding a fixed mindset and teachers with a score between 4 and 6 (4 and up) were considered to be holding a growth mindset. Teachers with a score between 3 and 4 were considered to not hold a clear vision on mindset. Cronbach's' *a* was: .87 for mindset about intelligence, .90 for mindset about talent, and .89 for the entire Dweck mindset instrument.

TSES instrument

An adapted version of the Teachers' Sense of Efficacy scale (TSES), developed by Tschannen-Moran and Woolfolk Hoy (2001), was used to measure teachers' perceived self-efficacy about their teaching (see Appendix B). Mainhard, Brekelmans, Wubbels, and Brok (2008) translated the instrument into Dutch and minor adjustments in wording were made to their version so that some terms fitted better to the context of this study. The instrument consisted of 24 statements which could be answered on a 9-point Likert scale ranging from 1 (i.e., None at all) to 9 (i.e., A Great Deal). A higher score indicates a stronger feeling of efficacy. The instrument provides insight into the self-efficacy of teachers on three factors: (a) instructional strategies (e.g., "How well can you implement alternative strategies in your classroom?"), (b) student engagement (e.g., "To what extent can you craft good questions for your students?"), and (c) classroom management (e.g., "How much can you do to control disruptive behaviour in the classroom?"). For each of these self-efficacy factors there were eight statements. Cronbach's' *a* was: .80 for instructional strategies, .84 for student engagement, .89 for classroom management, and .92 for the entire TSES instrument. A mean score was calculated per factor and an overall self-efficacy (mean) score was calculated.

Procedure

The teachers taught a science, geography, or history lesson that involved instruction. Their lesson was observed and recorded (with the use of video equipment) during 30/40-minutes. Information about the specific topic of the observation was not given to the teachers, as it was expected that this could influence their behaviour. After the observation the teachers filled in the Dweck mindset instrument, the TSES instrument, and answered written questions about their demographic characteristics.

Analysis

A coding scheme was used for the categorisation of questions asked by teachers (see Appendix C). The categories that were mentioned by Blosser (1975) were used. Examples of questions that fall into those categories are mentioned hereinafter. An example of a managerial question is: *"Did you find your notebook yet?"*. An example of a rhetorical question: *"Let me think, did I discuss all of the answers?"*. An example of a closed question: *"How do we call a piece of land, surrounded by sea?"*. An example of an open question: *"Can you tell us what you know about different types of sand?"*.

The level of open and closed questions asked by teachers were further analysed and categorised based on Bloom's (1956) taxonomy that is revised by Anderson et al. (2001). An example of a question that invites to evaluate is: *"Now you know the reasons of the people, would you still make the same decision, and why?"*. An example of a questions that invites to analyse: *"What are the differences between living in the city 'Kampen' in the year 1200 and the year 1250?"*. An example of a question that invites to apply: *"So we learned about the four cardinal directions (north, east, south, and west),*

now can you point a city on the map that is in the eastern part of The Netherlands?". An example of a question that invites to understand: *"Can you explain why that is the correct answer to the question?"*. An example of a question that invites to remember: *"On what date do we celebrate Sinterklaas in The Netherlands?"*. Questions that invite students to analyse, evaluate, and create were categorized as higher order questions. Questions that invite students to remember, understand, and apply were categorized as lower order questions.

Comparable to questions, the assignments given by teachers can stimulate higher or lower order thinking. Assignments were analysed too. If teachers asked questions or gave assignments within the observed time through worksheets or digital media, these were analysed and categorised as well.

The codes derived from the observations were counted per teacher and also added up to obtain an overview of the total amount of questions and assignments categorized per level. Of the total amount of questions and assignments, percentages and means were calculated. A second coder scored 10% (two observations) of the data. The inter-rater reliability coefficient (i.e., Cohen's kappa) reached .82. In order to answer the research question, Pearson Correlations between all the variables (i.e., TM, TSE, and the level of questions asked by teachers) were calculated. In order to test the hypothesis about teachers' mindset, a comparison between groups was made.

Results

Level of questions and assignments

During their lessons, teachers asked different types of questions. Open and closed questions were further categorized using the levels of Bloom's (1956) taxonomy that is revised by Anderson et al. (2001). Of the 538 questions that were categorized, 0 questions (0%) invited students to create, 9 (1.67%) invited students to evaluate, 14 (2.60%) invited students to analyse, 17 (3.16%) invited students to apply, 248 (46.10%) invited students to understand, and 250 (46.47%) invited students to remember. The means and standard deviations of the amount of questions per level are given in Table 1.

Table 1

The amount of questions per level asked by teachers in the classroom.

Level of questions	Mean (n = 18)	*SD*	Min.	Max.
Higher order questions	1.28	1.41	.00	4.00
Create	.00	.00	.00	.00
Evaluate	.50	1.04	.00	4.00
Analyse	.78	1.11	.00	4.00
Lower order questions	28.61	14.80	1.00	52.00
Apply	.94	1.51	.00	5.00
Understand	13.78	6.69	.00	27.00
Remember	13.89	9.11	1.00	33.00
Total	29.89	15.38	1.00	53.00

A Wilcoxon signed-rank test was conducted to compare the mean amount of lower order questions to the mean amount of higher order questions. There was a significant difference between the scores for lower order questions and higher order questions; $T = 171$, $z = 3.73$, $p = <.001$. These results indicate that the teachers in this sample asked more lower order questions than higher order questions. A one-way within-subjects ANOVA was conducted to compare the means of the different levels of questions that were asked by teachers. There was a significant difference in means, Wilks Lambda = .168, F (5,13) = 12.90, $p = <.001$. The pairwise comparison of the levels of questions showed a significant difference between asking questions with the level understand and the levels create, evaluate, analyse, and apply ($p < .001$). There was also a significant difference between remember and create, evaluate, analyse, and apply ($p < .001$). Non-significant differences were found between understand and remember ($p = 1.000$), between create and evaluate ($p = .869$), between create and analyse ($p = .131$), between create and apply

(p = .254), between evaluate and analyse (p = 1.000), between evaluate and apply (p = 1.000), and between analyse and apply (p = 1.000). None of the teachers in this sample asked questions that invited students to create. The results show that teachers mostly asked questions that invite students to remember and to understand.

As well as asking questions, teachers gave assignments. Assignments were also categorized using the levels of Bloom's (1956) taxonomy that is revised by Anderson et al. (2001). Of the 95 assignments that were categorized, 7 assignments (7.37%) invited students to create, 7 (7.37%) invited students to evaluate, 9 (9.47%) invited students to analyse, 10 (10.53%) invited students to apply, 38 (40%) invited students to understand, and 24 (25.26%) invited students to remember. The means and standard deviations of the amount of assignments per level are given in Table 2.

Table 2

The amount of assignments per level given by teachers in the classroom.

Level of assignments	Mean (n = 18)	*SD*	Min.	Max.
Higher order assignments	1.28	1.49	.00	5.00
Create	.39	.85	.00	3.00
Evaluate	.39	.78	.00	2.00
Analyse	.50	.79	.00	3.00
Lower order assignments	3.78	3.64	.00	14.00
Apply	.56	1.04	.00	3.00
Understand	2.11	2.27	.00	7.00
Remember	1.35	1.99	.00	7.00
Total amount of assignments	5.06	4.41	1.00	17.00

A significant difference was found by conducting a Wilcoxon signed-rank test between the scores for lower order assignments and higher order assignments; T = 135.5, z = 2.81, p = .005. These results indicate that the teachers in this sample gave more lower order assignments than higher order assignments. The mean amount of assignments with the level 'understand' was the highest compared to the mean amounts of the other levels. A one-way within-subjects ANOVA was conducted to compare the means of the different levels of assignments that were given by teachers. There was a significant difference in means, Wilks Lambda = .288, F (5,13) = 6.42, p = .003. The pairwise comparison of the levels of assignments showed a significant difference between giving assignments with the level analyse and the level understand (p = .050). Non-significant differences were found between create and evaluate (p = 1.000), between create and analyse (p = 1.000), between create and apply (p = 1.000), between create and understand (p = .184), between create and remember (p = 1.000), between evaluate and analyse (p = 1.000), between evaluate and apply (p = 1.000), between evaluate and understand (p =

.132), between evaluate and remember (p = .833), between analyse and apply (p = 1.000), between analyse and remember (p = .822), between apply and understand (p = .152), between apply and remember (p = .517), and between understand and remember (p = 1.000).

Teachers' Mindset and Teachers' Self-Efficacy scores

Frequencies of the total mindset scores and the mindset scores on intelligence and talent were divided into three groups (i.e., fixed, not a clear vision on mindset, and growth) and are presented in Table 3.

Table 3

Frequencies of Teachers' total Mindset score divided in three groups.

Mindset	*N*	*%*
Total Mindset score		
Fixed mindset (score between 1 and 3)	0	0.0%
No clear vision on mindset (score between 3 and 4)	6	33.3%
Growth mindset (score between 4 and 6)	12	66.7%
Mindset on Intelligence		
Fixed mindset (score between 1 and 3)	2	11.1%
No clear vision on mindset (score between 3 and 4)	5	27.8%
Growth mindset (score between 4 and 6)	11	61.1%
Mindset on Talent		
Fixed mindset (score between 1 and 3)	2	11.1%
No clear vision on mindset (score between 3 and 4)	2	11.1%
Growth mindset (score between 4 and 6)	14	77.8%

Concerning the total mindset score, results show that most of the teachers in the sample were oriented towards a growth mindset (66.7%), a third of the teachers did not have a clear vision on mindset (33.3%) and none of the teachers had a fixed mindset (0.0%). When further analysing the results of the mindset instrument per subcategory (i.e., mindset on intelligence and mindset on talent), the division of teachers in this sample differs slightly as a growth mindset considering intelligence is held by 61.1% and considering talent by 77.8%, an unclear vision on mindset considering intelligence is held by 27.8% and considering talent by 11.1%. Concerning the total mindset score, none of the teachers held a fixed mindset, but when looking at the subcategories intelligence and talent a fixed mindset is held in both by 11.1%.

The means and standard deviations of the independent variables (i.e., TM and TSE) are presented in Table 4.

Table 4

Teachers' Mindset and Teachers' Self-Efficacy scores.

Independent variables	Mean (*n* = 18)	*SD*	Min.	Max.
Mindset score	4.22	.67	3.19	5.63
Mindset on intelligence	4.03	.83	2.38	5.63
Mindset on talent	4.36	.86	2.50	5.63
Self-Efficacy score	7.08	.62	5.63	7.83
Self-Efficacy score on student engagement	6.81	.81	4.50	8.00
Self-Efficacy score on instructional strategies	7.06	.68	5.63	8.00
Self-Efficacy score on classroom management	7.37	.73	5.75	8.75
Self-Efficacy score on designing good questions	6.92	.97	5.00	8.00

Note. Maximum score for Mindset = 6. Maximum score for Self-Efficacy = 9.

The results of the self-efficacy instrument indicate that teachers felt more than sufficiently efficacious in their overall teaching (*M* = 7.08; *SD* = .62). Results showed that, on average, teachers felt somewhat more than sufficiently efficacious in designing good questions for their students (*M* = 6.92; *SD* = .97).

Mindset, questions, and assignments

To see whether there is a relationship between Teachers' Mindset and asking higher or lower order questions, Pearson Correlation tests were conducted. The correlations are presented in Table 5.

Table 5

Correlations between Teachers' Mindset and asking higher or lower order questions.

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Mindset	-									
2. Mindset score on intelligence	.76**	-								
3. Mindset score on talent	.84**	.30	-							
4. Higher order questions	-.11	.05	-.22	-						
5. Evaluate	-.06	.26	-.32	.62**	-					
6. Analyse	-.08	-.18	.02	.68**	-.15	-				
7. Lower order questions	-.19	-.33	-.04	.37	-.03	.49*	-			
8. Apply	.18	.16	.07	.45	-.02	.59*	.36	-		
9. Understand	-.08	-.00	-.14	.49*	.06	.56*	.89**	.46	-	
10. Remember	-.28	-.55*	.03	.17	-.08	.29	.91**	.08	.64**	-

Note. * $p < .05$. ** $p < .01$.

There was a significant negative correlation between Mindset score on intelligence and questions that invited students to remember (r (16) = -.55, n = 18, p = .018). Which means that the higher the teacher's mindset score on intelligence, the lower the amount of questions asked with the level of remember. In Figure 1 the correlation is presented in a scatterplot.

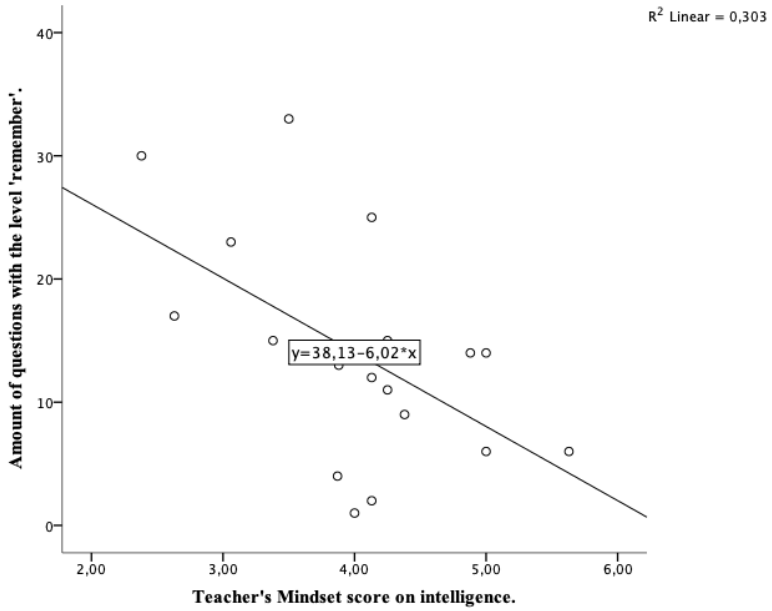

Figure 1. Correlation between teacher's mindset score on intelligence and the amount of questions with the level 'remember'.

Results of the tests showed no significant correlations either between TM and the asking of higher order questions (r (16) = -.11, n = 18, p = .675) nor between TM and the asking of lower order questions (r (16) = -.19, n = 18, p = .448). Also, there were no significant correlations between TM and questions that were categorized with the levels of Bloom (i.e., create, evaluate, analyse, apply, understand, and remember). Which means that, in this sample no relationship was found between TM and the asking of higher or lower order questions.

To see whether there is a relationship between Teachers' Mindset and giving higher or lower order assignments, Pearson Correlation tests were conducted. The correlations are presented in Table 6.

Table 6

Correlations between Teachers' Mindset and giving higher or lower order assignments.

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Mindset	-										
2. Mindset score on intelligence	.76**	-									
3. Mindset score on talent	.84**	.30	-								
4. Higher order assignments	.31	.27	.24	-							
5. Create	.16	.18	.10	.65**	-						
6. Evaluate	.11	.11	.09	.61**	.11	-					
7. Analyse	.30	.20	.26	.58*	.04	.05	-				
8. Lower order assignments	.17	.21	.06	.37	-.26	.22	.76**	-			
9. Apply	.41	.35	.30	.69**	.07	.44	.79**	.78**	-		
10. Understand	-.12	-.05	-.14	.08	-.24	-.09	.49*	.67**	.22	-	
11. Remember	.22	.29	.07	.29	-.15	.21	.49*	.56*	.70**	-.15	-

Note. * $p < .05$. ** $p < .01$.

Results of the tests showed no significant correlations either between TM and giving higher order assignments (r (16) = .31, n = 18, p = .217) nor between TM and giving lower order assignments (r (16) = .17, n = 18, p = .495). Also, there were no significant correlations between TM and assignments that were categorized with the levels of Bloom (i.e., create, evaluate, analyse, apply, understand, and remember). Which means that, in this sample no relationship was found between TM and giving higher or lower order assignments.

The means and standard deviations of the total amount of higher and lower order questions and assignments (i.e., that were categorized by the taxonomy of Bloom) asked and given by teachers with a growth mindset or with not a clear vision on mindset are presented in Table 7.

Table 7

Teachers' Mindset, total amount of higher order questions asked and higher order assignments given.

		Total amount of questions and assignments		Lower order questions and assignments		Higher order questions and assignments	
	N	Mean	*SD*	Mean	*SD*	Mean	*SD*
Mindset							
Not a clear vision on Mindset	6	36.17	6.15	34.17	7.08	2.00	1.67
Growth Mindset	12	35.17	17.20	31.50	17.69	2.83	1.70

The results show that teachers with a fixed (total) mindset were not represented in the sample. Independent-samples t-tests were conducted to compare the mean amount of questions and assignments asked or given by teachers with a growth mindset and teachers that do not have a clear vision on mindset. The results of the tests showed no significant difference in the total mean amount of questions and assignments for teachers with a growth mindset and teachers that hold an unclear vision on mindset; t (16) = .18, p = .86. No significant difference was found in the mean amount of lower order questions and assignments asked or given by teachers with a growth mindset and teachers that do not have a clear vision on mindset t (16) = .45, p = .66. Also, no significant difference was found in the mean amount of higher order questions and assignments asked or given by teachers with a growth mindset and teachers that do not have a clear vision on mindset; t (16) = -.99, p = .34. These results indicate that the teachers with a growth mindset in this sample did not ask or gave more questions and assignments and did not ask more higher order questions or gave more higher order assignments than teachers with an unclear vision on mindset.

TSE, questions, and assignments

To see whether there is a relationship between Self-Efficacy and the asking of higher or lower order questions, Pearson Correlation tests were conducted. The correlations are presented in Table 8.

Table 8

Correlations between TSE and asking higher or lower order questions.

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. TSE	-										
2. TSE student engagement	.91**	-									
3. TSE instructional strategies	.87**	.76**	-								
4. TSE classroom management	.77**	.51*	.48*	-							
5. Higher order questions	.08	.08	.09	.03	-						
6. Evaluate	-.20	-.21	-.10	-.20	.62**	-					
7. Analyse	.29	.29	.21	.22	.68**	-.15	-				
8. Lower order questions	-.03	-.16	-.07	.19	.37	-.03	.49*	-			
9. Apply	.12	.22	.22	-.15	.45	-.02	.59*	.36	-		
10. Understand	-.01	.01	-.05	.03	.49*	.06	.56*	.89**	.46	-	
11. Remember	-.07	-.31	-.11	.30	.17	-.08	.29	.91**	.08	.64**	-

*Note. * $p < .05$. ** $p < .01$.*

Results of the tests showed no significant correlations either between TSE and the asking of higher order questions (r (16) = .08, n = 18, p = .743) nor between TSE and the asking of lower order questions (r (16) = -.03, n = 18, p = .897). Also, there were no significant correlations between TSE and questions that were categorized with the levels of Bloom (i.e., create, evaluate, analyse, apply, understand, and remember).

To determine whether there is a relationship between Self-Efficacy and giving higher or lower order assignments, Pearson Correlation tests were conducted. The correlations are presented in Table 9.

Table 9

Correlations between TSE and giving higher or lower order assignments.

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. TSE	-											
2. TSE student engagement	.91**	-										
3. TSE instructional strategies	.87**	.76**	-									
4. TSE classroom management	.77**	.51*	.48*	-								
5. Higher order assignments	.14	.29	.28	-.24	-							
6. Create	.18	.25	.36	-.16	.65**	-						
7. Evaluate	-.09	.05	.08	-.37	.61**	.11	-					
8. Analyse	.16	.23	.05	.10	.58*	.04	.05	-				
9. Lower order assignments	-.17	-.13	-.24	-.09	.37	-.26	.22	.76**	-			
10. Apply	.08	.14	.15	-.09	.69**	.07	.44	.79**	.78**	-		
11. Understand	-.32	-.27	-.39	-.14	.08	-.24	-.09	.49*	.67**	.22	-	
12. Remember	.15	.19	.06	.12	.29	-.15	.21	.49*	.56*	.70**	-.15	-

Note. * $p < .05$. ** $p < .01$.

Results of the tests showed no significant correlations either between TSE and giving higher order assignments (r (16) = .14, n = 18, p = .579) nor between TSE and giving lower order assignments (r (16) = -.17, n = 18, p = .491). Also, there were no significant correlations between TSE and assignments that were categorized with the levels of Bloom (i.e., create, evaluate, analyse, apply, understand, and remember). Which means that in this sample no relationship was found between TSE, asking higher or lower order questions, and giving higher or lower order assignments.

The teachers were asked if they were familiar with the term ‘higher order thinking skills’. 14 Teachers (77.8%) indicated that they were and four indicated that they were not (22.2%). The teachers were also asked if they received training in asking (including higher order thinking-) questions. The frequencies and means and standard deviations of the amount of questions and assignments (i.e., that were categorized by the taxonomy of Bloom) asked and given by the teachers are presented in Table 10.

Table 10

Frequencies of Teachers that received training or not and the amount of lower or higher order questions and assignments they asked or gave.

			Total amount of questions and assignments		Lower order questions and assignments		Higher order questions and assignments	
Trained in asking questions	N	%	Mean	SD	Mean	SD	Mean	SD
Yes	6	33.33%	26.33	13.14	23.17	12.53	3.17	1.33
No	12	66.67%	40.08	12.89	37.00	14.05	2.25	1.82

An independent-samples t-test was conducted to compare the mean amount of higher order questions and assignments asked or given by teachers that reported that they did have training in asking questions and teachers that reported that they did not have training in asking questions. There was no significant difference in the scores; t (16) = 2.04, p = .06. These results indicate that the teachers that reported that they did have training in asking questions in this sample do not ask more higher order questions or give more higher order assignments than teachers that reported that they did not have training in asking questions.

Discussion and conclusion

The aim of this study was to research if teachers' mindset and teachers' self-efficacy have an influence on the amount of higher order questions that were asked in the classroom. A sample of Dutch primary school teachers was observed during a history, geography, or science lesson.

The results showed a statistically significant difference between the asking and giving of higher and lower order questions and assignments. The teachers asked or gave more lower order questions and assignments than higher order questions and assignments. This finding is in line with previous research that showed that teachers asked mainly lower order questions instead of higher order questions (Wimer, Ridenour, Thomas, & Place, 2001; Khan & Inamullah, 2011). The fact that there were few higher order questions and assignments asked or given affects the current study and its research questions. Both hypotheses concerning mindset and self-efficacy cannot be confirmed. The fact that few higher order questions or assignments were asked or given might contribute to the absence of correlations between the dependent variable (i.e., the level of questions and assignments) and the independent variables (i.e., mindset and self-efficacy). The results show that in comparison to questions asked, more higher order assignments were given, but in proportion the amount is still limited. Teachers that asked less open and closed questions during their instruction asked rhetorical or managerial questions, gave explanations, direct instruction, assignments, or feedback to students that were working on assignments. They engaged with their students in a way that is different than stimulating higher order thinking through the use of questioning, possibly influencing the amount of higher order questions or assignments and thus making it difficult to compare differences in relationship with teachers' mindset and self-efficacy.

The first hypothesis (H1a) was that there is a positive correlation between teachers' mindset and the amount of higher order questions or assignments they ask or give. This hypothesis cannot be confirmed as results from this study showed no significant relationship between mindset and asking higher order questions. It was also expected that teachers that hold a growth mindset ask more higher order questions to their students than teachers with a fixed mindset (H1b). Teachers with a fixed mindset were not present in the sample, so a comparison is made between teachers with a growth mindset and teachers that do not have a clear vision on mindset. The results showed no significant differences in the amount of questions and assignments between those two groups and therefore the hypothesis cannot be confirmed. However, there was a significant negative correlation between teachers' mindset score on intelligence and the questions asked that invited students to remember. This result indicates that the higher the mindset of teachers, the lower the amount of questions that invite students to remember. Considering this, it might be possible to conclude that teachers with a growth mindset on intelligence feel less need to check the recalling of information by students than teachers with a fixed or no clear vision on mindset. It seems that teachers with a growth mindset asking less fact recalling questions is in line with the expectations about them expecting more of their students than only fact-recalling and therefore they ask more of them then teachers with a fixed mindset. However, because the mindset score

on intelligence is only a subcategory of the total mindset score this conclusion should be taken cautiously. A possible explanation for the fact that in this study mindset is not really affecting the level of questions is that mindset is not all it takes to implement higher order thinking, it also takes knowledge, skills, and (intrinsic or extrinsic) motivation. It seems that with most of the teachers, skills or motivation for asking higher order questions were not fully present. There might be two explanations for that. First, implementing higher order thinking in their lessons requires teachers to teach in a way that is different than solely transferring knowledge through lectures or textbook assignments. This requires teachers to invest time into (re-) designing instruction and to work more student-centred, which could increase their workload or even feel like a loss of control for some teachers. Second, Zeegers and Elliott (2018) mentioned that pedagogical changes, (i.e., switching from knowledge transfer by teachers to stimulating higher order thinking by students) take continuing effort of implementing by teachers. Pedagogical changes ask for teachers to reflect on their daily practice and adapt where necessary. The results of this study show that teachers asked and gave few higher order questions and assignments. Four out of 18 (22%) of the teachers were not familiar with the term 'higher order thinking skills', and 12 out of 18 (67%) of the teachers did not have training in asking questions. So, it might be that for mindset to have an effect on the questions that are asked in the classroom, knowledge, skills, and motivation (whether or not acquired through training) are a prerequisite. Even after acquiring knowledge, skills and motivation (whether or not through trainings), the implementation of higher order thinking has to stay as an ongoing process in which mindset could play a role of maintaining that process. Future research could focus on teachers that did have trainings/professionalisation specifically in teaching higher order thinking and then focus on the influence of mindset. A limitation of this study is the small sample size (n=18) working at 10 different primary schools. Due to the small sample size, little variation in mindset scores occurred, resulting in a sample without teachers that hold a fixed mindset. It may be that a sample with more diversity in mindset scores provides different insights in the effect of mindset on the level of teacher questions. Further research, using a bigger sample size and more variation in mindset scores is needed to research the influence of teachers' mindset on the level of questions that are asked in the classroom.

The second hypothesis was that there is a positive correlation between teachers' self-efficacy and the amount of higher order questions or assignments they ask or give (H2). This hypothesis cannot be confirmed, as results from this study showed no significant relationship between self-efficacy and the asking of higher order questions. There was not very much variation in the results of the instrument that measured teachers' self-efficacy and this might be due to the fact that it measures self-perceived efficacy on overall teaching skills. Teachers scored their own self-efficacy about their teaching skills relatively high, although they did not perform very well when looking at how much higher order thinking their lessons contained. Therefore, it can be concluded that teaching higher order thinking is such a specific skill, that the instrument that is used in this study does not cover the essence or complexity of it. For instance, an example of an item that seemed to be useful for analysis: '*How well can you design*

good questions for your students?', might not be that useful because it does not entail what a 'good question' is. Whether a question is good depends on the goal teachers want to achieve. Future research could focus on the design of a self-efficacy instrument on teaching higher order thinking. Items could focus possibly on the same factors (i.e., student engagement, classroom management, and instructional strategies) but then connected better to higher order thinking. Zohar and Dori (2003) stated that many teachers think that higher order thinking is not feasible for students with low academic achievements. In this study, that statement is not very plausible as the results showed that the mindset score of the teachers was relatively high. A limitation in the current research is the chance of social desirability. The instrument that was used to measure self-efficacy focused on self-evaluation. There is a risk of participants filling in socially desirable answers (Holtgraves, 2004). In this case, even though teachers were not asked to fill in their names, it could be that teachers were afraid of filling in lower grades on the self-efficacy instrument than they actually did as it concerns sensitive personal information. Teachers knew that the results were combined with the observation by the researcher so they were not completely anonymous. In future research this could be done differently; the instrument could be conducted online and results could be digitally connected to the results of the observation. The connecting of both results could be done without a researcher intervening, ensuring anonymity.

The data from this study reveals practical implications. First, as most teachers (78%) stated they are familiar with higher order thinking but the results showed they rarely implement it in their teaching, teachers should consider the possibilities and the importance of it. Raising awareness about higher order thinking, discussing the value of it, and how to implement it could be a step in the right direction. For those who are not familiar with higher order thinking (22%) the school principle and the school board should play a role in vision development. Also, the question arises if the Dutch teacher education (PABO) devotes enough attention to higher order thinking in their curriculum. The PABO should consider implementing the stimulation of 21st century skills and thus also higher order thinking skills in their curriculum in a way that pre-service teachers can experiment with in the lessons they give during their internship and that by the time they are in-service teachers they feel efficacious enough to implement them in their daily teaching.

Second, the results of this study showed no significant difference in asking higher order questions between teachers that received training in asking questions and teachers that did not receive training in asking questions. This indicates that teachers that have the knowledge about higher order thinking do not necessarily bring it into practice. This could be because it is difficult to implement in their daily teaching (Thijs et al., 2014). Also, it could be that the trainings they had were not effective in assisting teachers to bring what has been learned into practice, as it could be possible that they were not living up to guidelines on effective trainings. A few possible shortcomings could be that the trainings were short-term, did not provide enough possibilities to exchange knowledge with colleagues, or were not adapted to teacher engagement for valued student outcomes (Timperley, 2008). Designers of trainings or interventions should consider these guidelines for effective trainings in order to design

effective trainings or interventions. Furthermore, results from this study show that teachers had the knowledge about what higher order thinking skills are, but seem to have a lack of skills to implement them in their daily practice. An example of this is that the level 'understand' was most present in the assignments that were given. This might be because many teachers did not deviate from workbooks. In the workbooks they used, students were asked to perform assignments in which they had to prove their understanding of what had just been taught. Teachers should think of ways of testing the understanding of their students about what has just been taught in different ways. Designers of interventions or trainings should focus on helping teachers with developing knowledge and skills on testing students' understanding through higher order questions/assignments. Interventions or trainings should focus more on practicing skills with designing and identifying questions for each of the levels of Bloom's (1956) taxonomy, on practicing teachers' skills in their classroom while receiving guidance and feedback and on exchanging tips on how to implement them in their teaching.

In conclusion, it would have been expected that changes are visible in the daily practice of teachers after the advice of The Dutch Education Council (Een eigentijds curriculum, 2014) to make changes to the curriculum and after the recommendations of Thijs et al. (2014) to emphasize teaching on the development of 21st century skills. These changes could entail for instance the stimulation of students' thinking across the different levels of Bloom's taxonomy (1956), including higher order thinking. This study provides no evidence for answering the research question of whether primary school teachers' mindset and self-efficacy influence the amount of higher order questions asked by the teachers. Nevertheless, due to the aforementioned limitations and the explanation about the absence of correlations it is still expected that these teacher characteristics might influence the amount of higher order questions and assignments asked and given by teachers. The negative correlation that was found between teachers' mindset score on intelligence and questions that invited students to remember, forms additional basis for this expectation. Therefore, the research question is still relevant for future research. Most of the teachers had a growth mindset and a positive self-efficacy towards their teaching. However, teachers asked mainly lower order questions. Despite the recommendations made by Thijs et al. (2014) the implementation of higher order thinking could still be improved, and it is still interesting to research if teachers' mindset and self-efficacy could have an influence on that.

References

Anderson, L.W. (Ed.), Krathwohl, D.R. (Ed.), Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., & Wittrock, M.C., (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of Educational Objectives: Complete edition.* New York, NY: Longman.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191-215. doi:10.1037/0033-295X.84.2.191

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*, 246-263. doi:10.1111/j.1467-8624.2007.00995.x

Bloom, B. S. (1956). *Bloom's taxonomy of educational objectives, handbook 1: Cognitive domain:* New York, NY: David McKay Company.

Blosser, P. E. (1975). *How to ask the right questions.* National Science Teacher Association (Arlington: NSTA Press)

Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of school psychology*, *44*(6), 473-490. doi:10.1016/j.jsp.2006.09.001

Claro, S., Paunesku, D., & Dweck, C. S. (2016). Growth mindset tempers the effects of poverty on academic achievement. *Proceedings of the National Academy of Sciences of the United States of America, 113*(31), 8664-8. doi:10.1073/pnas.1608207113

Deemer, S. (2004). Classroom goal orientation in high school classrooms: Revealing links between teacher beliefs and classroom environments. *Educational research*, *46*(1), 73-90. doi: 10.1080/0013188042000178836

Dweck, C. (2008). *Mindset: The new psychology of success*: Random House Digital, Inc

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256–273. doi:10.1037/0033-295X.95.2.256

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: a construct validation. *Journal of Educational Psychology, 76*, 569-582. doi:10.1037/0022-0663.76.4.569

Goodwin, & Stephanie, S. (1983). *Effective Classroom Questioning.* Retrieved from https://eric.ed.gov/?id=ED285497

Holtgraves, T. (2004). Social desirability and self-reports: Testing models of socially desirable responding. *Personality and Social Psychology Bulletin*, *30*(2), 161-172. doi:10.1177/0146167203259930

Holzberger, D., Philipp, A., & Kunter, M. (2013). How teachers' self-efficacy is related to instructional quality: A longitudinal analysis. *Journal of Educational Psychology*, *105*(3), 774. doi: 10.1037/a0032198

Kalyar, M. N., Ahmad, B., & Kalyar, H. (2018). Does Teacher Motivation Lead to Student Motivation? The Mediating Role of Teaching Behavior. *Educational Studies Mosco*w, 3, 91-119. doi:10.17323/1814-9545-2018-3-91-119

Khan, W. B., & Inamullah, H. M. (2011). A study of lower-order and higher-order questions at secondary level. *Asian Social Science, 7*(9), 149. doi: 10.5539/ass.v7n9p149

King, A. (2006). Designing the Instructional Process to Enhance Critical Thinking across the Curriculum. *Teaching of Psychology*, *22*, 13–17. doi:10.1207/s15328023top2201_5

De Kraker-Pauw, E., Van Wesel, F., Krabbendam, L., & Van Atteveldt, N. (2017). Teacher Mindsets Concerning the Malleability of Intelligence and the Appraisal of Achievement in the Context of Feedback. *Frontiers in Psychology, 8*, 1594-1594. doi:10.3389/fpsyg.2017.01594

Mahler, D., Großschedl, J., & Harms, U. (2018). Does motivation matter?–The relationship between teachers' self-efficacy and enthusiasm and students' performance. *PloS one*, *13*(11). doi:10.1371/journal.pone.0207252

Mainhard, M. T., Brekelmans, M., Wubbels, T., & Brok, d. P. (2008). Leraren in een nieuwe klas: de eerste maanden van een nieuw schooljaar [Teachers in new classes: the first month of the school year]. *Pedagogische Studiën, 85*(3), 157-173. Retrieved from http://www.pedagogischestudien.nl/search?identifier=616840

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. doi: 10.1037/0022-3514.75.1.33

Onderwijsraad. (2014). Een eigentijds curriculum. Retrieved from https://www.onderwijsraad.nl/publicaties/2014/een-eigentijds-curriculum/volledig/item7128

Ross, J. A. (1992). Teacher efficacy and the effects of coaching on student achievement. *Canadian Journal of Education/Revue canadienne de l'education*, 51-65. doi:10.2307/1495395

Stipek, D. J., Givvin, K. B., Salmon, J. M., & MacGyvers, V. L. (2001). Teachers' beliefs and practices related to mathematics instruction. *Teaching and teacher education, 17*(2), 213-226. doi: 10.1016/S0742-051X(00)00052-4

Taştan, S. B., Davoudi, S. M. M., Masalimova, A. R., Bersanov, A. S., Kurbanov, R. A., Boiarchuk, A. V., & Pavlushin, A. A. (2018). The impacts of teacher's efficacy and motivation on student's academic achievement in science education among secondary and high school students. *EURASIA Journal of Mathematics Science and Technology Education*, *14*(6), 2353-2366. doi:10.29333/ejmste/89579

Thijs, A., Fisser, P., & Hoeven, M. van der (2014). *21e eeuwse vaardigheden in het curriculum van het funderend onderwijs. Enschede: SLO.*

Thoonen, E. E., Sleegers, P. J., Peetsma, T. T., & Oort, F. J. (2011). Can teachers motivate students to learn?. *Educational studies*, *37*(3), 345-360. doi:10.1080/03055698.2010.507008

Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2008). Teacher professional learning and development. International Academy of Education. Retrieved from http://www.ibe.unesco.org/fileadmin/user_upload/Publications/Educational_Practices/EdPractices_18.pdf

Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17*, 783-805. doi:10.1016/S0742-051X(01)00036-1

Wimer, J. W., Ridenour, C. S., Thomas, K., & Place, A. W. (2001). Higher order teacher questioning of boys and girls in elementary mathematics classrooms. *The Journal of Educational Research, 95*(2), 84-92. doi: 10.1080/00220670109596576

Woolfolk, A. E., Rosoff, B., & Hoy, W. K. (1990). Teachers' sense of efficacy and their beliefs about managing students. *Teaching and teacher Education*, *6*(2), 137-148. doi:10.1016/0742-051X(90)90031-Y

Yeager, D. S., Romero, C., Paunesku, D., Hulleman, C. S., Schneider, B., Hinojosa, C., ... & Trott, J. (2016). Using design thinking to improve psychological interventions: The case of the growth mindset during the transition to high school. *Journal of educational psychology*, *108*(3), 374-391. doi:10.1037/edu0000098

Zee, M., & Koomen, H. M. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational research*, *86*(4), 981-1015. doi:10.3102/0034654315626801

Zeegers, Y., & Elliott, K. (2018). Who's asking the questions in classrooms? Exploring teacher practice and student engagement in generating engaging and intellectually challenging questions. *Pedagogies: An International Journal*, *14*(1), 17-32. doi: 10.1080/1554480X.2018.1537186

Zeng, G., Hou, H., & Peng, K. (2016). Effect of Growth Mindset on School Engagement and Psychological Well-Being of Chinese Primary and Middle School Students: The Mediating Role of Resilience. *Frontiers in Psychology, 7*:1873. doi:10.3389/fpsyg.2016.01873

Zohar, A., & Dori, Y.J. (2003). Higher order thinking skills and low-achieving students: Are they mutually exclusive? *Journal of the Learning Sciences, 12,* 145-181. doi: 10.1207/S15327809JLS1202_1

Appendices

Appendix A
Dutch translation of the mindset instrument

Uitleg: U ziet zo dadelijk 16 stellingen. De eerste 8 stellingen gaan over intelligentie en de tweede 8 stellingen gaan over talent. Lees elke stelling en kies dan het antwoord dat het beste past bij hoeveel u het eens bent bij elke zin. Er zijn geen goede of foute antwoorden.
U kunt een getal kiezen van 1 (helemaal mee eens) tot 6 (helemaal mee oneens).

	1 Helemaal mee eens	2 Mee eens	3 Meestal mee eens	4 Meestal mee oneens	5 Mee oneens	6 Helemaal mee oneens
1) Je hebt een bepaalde hoeveelheid intelligentie en daar kun je niet echt veel aan veranderen.						
2) Je intelligentie is iets van jou waar je niet echt veel aan kunt veranderen.						
3) Wie je ook bent, je kunt je intelligentieniveau aanzienlijk veranderen.						
4) Om eerlijk te zijn, je kunt niet echt veranderen hoe intelligent je bent.						
5) Je kunt altijd je intelligentie substantieel veranderen.						
6) Je kunt nieuwe dingen leren, maar je kunt de hoeveelheid intelligentie waarmee je geboren bent niet echt veranderen.						
7) Hoeveel intelligentie je ook hebt, je kunt het altijd behoorlijk veranderen.						
8) Je kunt zelfs de hoeveelheid intelligentie waarmee je geboren bent veranderen.						

	1 Helemaal mee eens	2 Mee eens	3 Meestal mee eens	4 Meestal mee oneens	5 Mee oneens	6 Helemaal mee oneens
9) Je hebt een bepaalde hoeveelheid talent en daar kan je niet echt veel aan veranderen.						
10) Je talent op een bepaald gebied is iets van jou dat je niet echt kunt veranderen.						
11) Wie je ook bent, je kunt je hoeveelheid talent aanzienlijk veranderen.						
12) Om eerlijk te zijn, je kunt niet veel veranderen aan je hoeveelheid talent.						
13) Je kunt altijd je hoeveelheid talent substantieel veranderen.						
14) Je kunt nieuwe dingen leren, maar je kunt de hoeveelheid talent waarmee je geboren bent niet echt veranderen.						
15) Het maakt niet uit hoeveel talent je hebt, je kunt het altijd behoorlijk veranderen.						
16) Je kunt zelfs de hoeveelheid talent waarmee je geboren bent flink wat veranderen.						

Appendix B
Dutch translation of the TSES instrument

Uitleg: Lees elke vraag hieronder en geef uw reactie door het antwoord te kiezen dat het beste past bij hoe vaardig u uzelf vindt, waarbij (1) betekent "Helemaal niet goed" en (9) "Heel erg goed". Probeer zo eerlijk mogelijk te antwoorden, ook als u een van de aspecten beter zou willen beheersen.

Hoe goed kunt u…

	Helemaal niet goed		**Niet goed**		**Gemiddeld**		**Behoorlijk goed**		**Heel erg goed**
1. … de moeilijke leerlingen bereiken?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2. … leerlingen helpen om kritisch te denken?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. … een einde maken aan storend gedrag in de klas?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
4. … leerlingen motiveren die weinig interesse in school hebben?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5. … duidelijk maken welk gedrag u van uw leerlingen verwacht?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6. … leerlingen ervan overtuigen dat zij goed kunnen zijn in hun schoolwerk?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
7. … antwoord geven op moeilijke vragen van leerlingen?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
8. … routines gebruiken om activiteiten soepel te laten verlopen?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
9. … bij leerlingen een positieve houding ten opzichte van leren ontwikkelen?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10. … peilen of leerlingen begrijpen wat u onderwijst?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
11. … goede vragen voor leerlingen formuleren?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
12. … de creativiteit van leerlingen stimuleren?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Hoe goed kunt u…

	Helemaal niet goed		**Niet goed**		**Gemiddeld**		**Behoorlijk goed**		**Heel erg goed**
13. … leerlingen de regels na laten leven?	1	2	3	4	5	6	7	8	9
14. … het begrip vergroten van een leerling die vastloopt?	1	2	3	4	5	6	7	8	9
15. … een leerling kalmeren die de les verstoort of onrustig is?	1	2	3	4	5	6	7	8	9
16. … in verschillende klassen effectief lesgeven?	1	2	3	4	5	6	7	8	9
17. … uw lessen afstemmen op het niveau van individuele leerlingen?	1	2	3	4	5	6	7	8	9
18. … variëren in vormen van toetsing?	1	2	3	4	5	6	7	8	9
19. … voorkómen dat een paar lastige leerlingen de hele les verstoren?	1	2	3	4	5	6	7	8	9
20. … alternatieve uitleg of voorbeelden geven als leerlingen iets niet snappen?	1	2	3	4	5	6	7	8	9
21. … anticiperen op opstandige leerlingen?	1	2	3	4	5	6	7	8	9
22. … ouders stimuleren hun kinderen goed te laten presteren op school?	1	2	3	4	5	6	7	8	9
23. … verschillende werkvormen in uw lessen toepassen?	1	2	3	4	5	6	7	8	9
24. … passende uitdagingen bieden aan zeer bekwame leerlingen?	1	2	3	4	5	6	7	8	9

Appendix C

Coding scheme
Bij de observatie wordt een onderscheid gemaakt tussen vragen en opdrachten. Beiden dragen bij aan een rijke leeromgeving waarin hogere orde denken gestimuleerd kunnen worden en zijn daarom beiden interessant.

Vragen:
Tijdens een instructie worden vaak 'korte' vragen gesteld en kleine denkopdrachten gegeven waarbij de leerkracht verwacht dat er tijdens de instructie over nagedacht wordt en al dan niet antwoord op gegeven wordt. Deze vallen binnen het eerste observatieschema. Daarvoor volgt nu een stappenplan:

1. **De vraag noteren.**
2. **Vraag analyseren. Noteer binnen welke categorie de vraag valt.**
   Wanneer de vraag binnen categorie 3 of 4 valt (gesloten of open vraag), ga door naar de volgende stap.
3. **Verder categoriseren aan de hand van taxonomie van Bloom. Hierbij kijken naar een model (zie volgende pagina), dat het makkelijker maakt om de categorieën te herkennen. Noteer het niveau van de vraag.**
4. **Noteer of het een lagere (onderste 3 niveaus) of hogere orde denkvraag is (bovenste 3 niveaus).**
5. **Overzicht maken van aantal lagere en hogere orde denkvragen per observatie.**

Stap 2: Categorie van de vraag:
(1) Managerial question (i.e., questions to manage classroom activities)
(2) Rhetorical question (i.e., questions to indicate a point, or to emphasize an idea or statement) vragen waar de leerkracht geen echt antwoord op verwacht, maar ze meer stelt om een punt te maken
(3) Closed question (i.e., questions for checking retention or to emphasize a point) om het gesprek te sturen, de leerkracht wil 1 antwoord horen
(4) Open question (i.e., questions to promote classroom discussion or student interaction) de leerkracht wil aanzetten tot nadenken en uitgebreide antwoorden

Stap 3: Niveau van de vraag:
(1) Creëren (create)
(2) Evalueren (evaluate)
(3) Analyseren (analyse)
(4) Toepassen (apply)
(5) Begrijpen (understand)
(6) Onthouden (remember)

Opdrachten:
Wanneer de leerkracht een (grotere) opdracht geeft, waar de leerlingen langer aan mogen werken en dingen moeten opschrijven of tekenen (maar wel binnen de observatietijd van maximaal 40 minuten) wordt deze genoteerd in het tweede observatieschema. Daarvoor volgt nu een stappenplan:

1. **De opdracht noteren.**
2. **De opdracht analyseren. Noteer of het een open of gesloten opdracht is. Wanneer de opdracht een open opdracht is, ga door naar de volgende stap.**
3. **Verder categoriseren aan de hand van de taxonomie van Bloom. Hierbij kijken naar een model (zie volgende pagina), dat het makkelijker maakt om de categorieën te herkennen. Noteer het niveau van de opdracht.**
4. **Noteer of het een lagere (onderste 3 niveaus) of hogere orde denk opdracht is (bovenste 3 niveaus).**
5. **Overzicht maken van aantal lagere en hogere orde denk opdrachten per observatie.**

BLOOM'S DIGITAL TAXONOMY

Bloom's digitale taxonomie is erop gericht de meest adequate leertechnologie te kiezen horende bij het niveau van leren. Diverse actieve werkwoorden beschrijven het gedrag van studenten.

De werkwoorden sluiten aan bij LOTS (Lower Order of Thinking) zoals onthouden en bij HOTS (Higher Order of Thinking) zoals creëren.

Retrieved from: https://digitaledidactiek.zuyd.nl/leerdoelen/

Tijdsduur observatie:			
Observatieschema 1 vragen Noteer vraag:	Categorie: (1) Managerial (2) Rhetorical (3) Closed (4) Open	Niveau van de vraag, a.d.h.v. taxonomie van Bloom **(1) Creëren (create)** **(2) Evalueren (evaluate)** **(3) Analyseren (analyse)** (4) Toepassen (apply) (5) Begrijpen (understand) (6) Onthouden (remember)	Lagere (4,5,6) of hogere orde denkvraag (1,2,3)
	Totaal aantal: Managerial: Rhetorical: Closed: Open:	**Totaal aantal:** Create: Evaluate: Analyse: Apply: Understand: Remember:	**Totaal aantal:** Lower: Higher:

Observatieschema 2 opdrachten Noteer opdracht:	Categorie: Closed Open	Niveau van de opdracht, a.d.h.v. taxonomie van Bloom **(1) Creëren (create)** **(2) Evalueren (evaluate)** **(3) Analyseren (analyse)** (4) Toepassen (apply) (5) Begrijpen (understand) (6) Onthouden (remember)	Lagere (4,5,6) of hogere orde denk opdracht (1,2,3)
	Totaal aantal: Closed: Open:	**Totaal aantal:** Create: Evaluate: Analyse: Apply: Understand: Remember:	**Totaal aantal:** Lower: Higher: