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STEM EDUCATION | RESEARCH ARTICLE

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The effect of tutoring primary school pupils by university students on STEM interest: a pre-registered randomised controlled trial

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ABSTRACT

Science, Technology, Engineering, and Mathematics (STEM) play a prominent role in today's society. At the same time, studies show that the gap in science performance between students from lower socioeconomic background and students from a more advantaged background is wide. Studies further show that role models can have a positive effect and the effect tutoring can have towards the attitudes towards subjects. In this pre-registered randomized controlled trial, we study in a real life setting the effect of tutoring on the STEM interest of Dutch primary school pupils from relatively lower socioeconomic neighborhoods ('tutees') by measuring the influence of the study background of 2nd to 4th study-year Dutch university students ('tutors') on the STEM interest of the tutees. A group of 104 tutees between 9 and 12 years old were tutored by 29 tutors. Nineteen tutors had a background in one of the STEM subjects, the others had a background in another (non-STEM) subject. Using the validated questionnaire STEM-LIT, we measured the interest of the tutees in STEM fields in a pre- and post-test and checked if the background of tutors affected the interest in STEM fields through statistical tests. While our results have found no significant differences in STEM interest between those two groups, our analysis does provide insights into the mechanisms relating to the interest in STEM fields among children from relatively lower socioeconomic neighbourhoods.

IMPACT STATEMENT

Science, Technology, Engineering, and Mathematics (STEM) play an important role in society. However, there is a gap in choosing science-related directions between children with a lower social-economic background and those with a more advantaged background. Tutoring could change their attitudes towards STEM. In this study, we researched the effect of tutoring on the STEM interest of Dutch primary school children between 9 and 12 years old in a real-life setting. We measured the influence of the study background, STEM or non-STEM, of Dutch university students (the tutors), on the STEM interest of their tutees. With a survey before and after tutoring, we also measured the interest of the tutees in STEM. While this study didn't find significant differences in STEM interest between tutees tutored by a tutor with a STEM or non-STEM background, it does gives insights into the mechanisms behind interest in STEM among pupils from lower social-economic background.

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Introduction

The importance of choosing Science, Technology, Engineering, and Mathematics (STEM) as a field has dominated the news and policymakers. For example, the United Nations Educational, Scientific and

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*The research group Science Communication and Society of Leiden University wants to improve the interaction between experts and the general public. With an interdisciplinary team of researchers, we want to understand and increase youth participation in STEM learning, as it is in today's society essential that all children will get the opportunity for learning STEM subjects. STEM activities still unfortunately lack inclusivity and, in many cases, exclude minorities from working in STEM fields.

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Cultural Organization (UNESCO) (Posner et al., 2016) described the steady decline of enrollment of young people in science as a cause for concern and even when students are attracted to STEM-subjects, they often switch subjects mid-career. This is often the case for students from a more diverse background (Handelsman et al., 2022). The common concern is that in a world that is dominated by science and technology, it is key that everyone who is interested—including boys and girls from all layers of society—can opt for STEM subjects. Society has the ethical obligation to strive for equity so all children who have the talent and the interest can participate in STEM (Goldberg et al., 2023). The results of the Programme for International Student Assessment (PISA)—the comparative study of the Organisation for Economic Co-operation and Development (OECD)—showed that in general socio-economically disadvantaged students across the participating countries were almost three times more likely not to attain the baseline level of proficiency in science than advantaged students (OECD, 2016) and a gap for mathematics linked to social economic background remains for mathematics in the most recent PISA-study (OECD, 2023). The 2016 data showed that immigrant students—who often have an overlap with being socio-economically disadvantaged—were more than twice as likely to perform below the baseline level of proficiency in science as their non-immigrant peers while taking their socioeconomic status into account. The trend in most countries is one of decline, but the data for The Netherlands specifically shows that there is an overall decline in performance on all levels, a decline that is even stronger than in other countries (OECD, 2016, also in OECD, 2023).

Although country contexts are important, and some variation is expected between countries, for example as a result of differences in education systems, the gap in performance and interest between students with a socioeconomic advantaged background and disadvantaged background is larger than expected based on differences between individuals. Research has shown that sociocultural, contextual, biological, and psychological factors play a role in the motivations of young children to pursue in STEM (Wang & Degol, 2013, see also Gottlieb et al., 2024). While it is beyond the scope of this article to discuss all factors in depth, one could think of the socializing influence of parental beliefs with the research focusing on the parents' own values and self-efficacy in STEM, their perception of their children's ability in STEM, and parents' expectations for their children's STEM achievement (for an extensive review, check Šimunović & Babarović, 2020). Another influence that has been recently examined extensively in educational research is the way science is being taught, with, for example, a more inquiry-based approach, making the differences in proficiency bigger (a.o. Forbes et al., 2020; Oliver et al., 2019; Sjøberg, 2018).

It is clear that experiences in school, peers, and family contexts can have an impact on children and young adolescents to opt or not to opt for a school career in STEM subjects (Eccles et al., 1993, Wang & Degol, 2013). In this study, we examined tutoring as a possible mean for this challenge, as tutoring is a type of school experience of which it is known that it can have a positive effect on inequality. We, however, theorize that it may also have a positive effect on the attitudes towards STEM, in line with the forementioned studies. Tutoring is here defined as repeated pedagogical support from an instructor, in small groups, over a limited time-period (Dietrichson et al., 2020).

Theoretical framework

Tutoring to increase STEM interest

In a meta-analysis by Dietrichson et al. (2020), tutoring was shown as one of the few effective educational methods to decrease educational differences between pupils with a high socioeconomic status (SES)-background and low SES-background. They studied four approaches that can reduce the gap between children from low SES and high SES families. Their first finding was that no single approach will fully close the gap, but they found a positive effect of tutoring (for recent reviews, check Dietrichson et al., 2020; Nickow et al., 2020), although it often comes at a higher cost as the effect of the training of the tutors plays a dominant role in the learning effects (Pellegrini et al., 2021). Tutoring projects involving students-in-training or (trained) volunteers can, however, partly overcome this obstacle as they are often cheaper than more expensive teachers, although it might be less effective than professional tutors (Pellegrini et al., 2018). Also, earlier research has shown that tutoring can lead to more positive attitudes towards the subject matter (Cohen et al., 1982), with more recent examples showing, e.g. a possible positive effect

of (peer) tutoring towards mathematics with pupils in secondary education (Alegre Ansuategui & Moliner Miravet, 2017) and primary education (Alegre et al., 2019).

Nickow et al. (2020) described possible reasons why tutoring can be effective to reduce the negative consequences on learning of being a member of a family with a lower SES-background. The first possible reason is that tutoring allows more instruction time for pupils who are performing below a threshold decided by the school, as the pupils are often being tutored during breaks or after school. Also, during tutoring there is often a so-called customization of learning, which means that instructional content will probably match the skill deficits of the pupils. A third possible reason is that tutoring often happens in one-on-one and small group settings and this may allow for more engagement and more rapid feedback. These settings may also enable educational activities that would not be possible in the classroom. A last possible reason is the human connection generated by tutor-tutee relationships. An important part of the success of such projects is the bond that can develop between the tutor and the tutee. In addition to substantive support, the tutee studies and learns from the tutor.

This last element may also explain in part the positive results that were found in a so-called high dosage tutoring project in Chicago. In their project *Teach for America* participants were used as trained tutors and the study that examined the effects of the high dosage (intensive and specific) tutoring on mathematics showed that this had positive effects on the results of the tutees on the subject itself (Cook et al., 2014). Also, the tutees performed better in all domains. The project even had a positive impact to reduce the crime rate (Cook et al., 2014). Similar positive results on learning were found in the Netherlands in primary education (De Ree et al., 2023).

Furthermore, other literature shows that the relationship between teacher and pupil can play an important role in learning. Hattie (2009) described how the variables that influence the child-teacher relationship can have the biggest effect on a tutee's performance. Variables, such as empathy, warmth, encouragement, authenticity, and respect for the tutee's backgrounds can play a vital role in learning as they help constitute trust amongst teacher and the child (De Bruyckere, 2018).

Tutors as role models

Pupils with a low SES-background are often less prepared and opt less for STEM majors because of systemic differences in teacher quality, school funding, and course-taking at the high school level (for an overview, check O'Brien et al., 2020). This means that the overall experience of pupils throughout their educational careers must be considered and can play a role in shaping attitudes towards STEM, including, for example, the attitudes of teachers themselves towards both minorities (Glock et al., 2018) and STEM. Factors that could bypass such systemic differences have been examined. For example, role models can be used to influence minorities into STEM education. One of the hypotheses is that connecting to people from similar backgrounds who are studying certain topics or doing certain jobs, but who are not experienced as outliers by society or by colleagues, can show that studying STEM is feasible to achieve (see, e.g. Aish et al., 2018; Burke, 2007; Jong et al., 2020).

A role model is a person who serves as an example by influencing others. A tutor as a role model can be regarded as a requisite for effective tutoring, as a tutor demonstrates the behavior and practice relevant for the tutees' future (Rosenblatt, 2002). Rosenblatt describes that 'an effective tutor acts as a model learner by reading alongside the students' (Rosenblatt, 2002, p. 23) As follows from amongst other De Bruyckere (2017) and Hattie (2009), the relationship between tutors and tutees could play an important role in the learning process, but perhaps this relationship and this type of role model can also influence the interest in STEM.

Research aims

We propose the following research question:

- What is the impact of the study background of a tutor on the STEM-interest of tutees?

Based on the insights from literature, role models can have a positive effect. For the effect tutoring can have towards the attitudes towards subjects, we hypothesize:

- H1: STEM-interest of tutees increases by tutoring, independent of the study background of the tutor.
- H2: STEM-interest of tutees increases more when a tutor has a STEM background.

In our preregistration (Cramer et al., 2019), we also described a third hypothesis:

- H3: While the effect on the tutee will have decreased a year after the tutoring, there will still be an increase in STEM-interest with respect to the pre-test.

In line with the guidelines for Open Science we preregistered our study in advance (Nosek et al., 2018). Unfortunately, due to COVID the whole tutor program has seen major delays. We have piloted the program with 39 tutees and 15 tutors in 2019. Early 2020, the full experiment started but had to be cancelled due to COVID. Due to these delays and limited time in the funding, we could not check the third hypothesis in our study, because the research project finished eventually. In this paper, we follow the preregistered methods and analysis, and point out where we were forced to make other choices than in our preregistration (Cramer et al., 2019).

Materials and methods

Research design

To test our first two hypotheses, we set up the Leiden Tutoring Program (Tutorprogramma, 2020), which we will describe in detail in the following sections. In this program, university students were trained to tutor small groups of primary school pupils in weekly after-school meetings at their schools for a period of 9–11 weeks. The tutors helped the tutees with homework and other school assignments and were free to add other activities, such as music and games to their allocated timeslot. Through validated pre- and post-questionnaires, the effect of the tutoring on the tutees' attitude towards STEM was measured. For this pre- and post-test, we used the STEM-LIT instrument (Grimmon et al., 2020), a validated Dutch version of the STEM Career Interest Survey (Kier et al., 2013).

Recruitment of tutors and tutees

The Leiden Tutoring Program worked with schools in neighbourhoods that rank low on various 'leefbaarheidsindicatoren', i.e. indicators that say something about the liveability of a neighbourhood, including physical environment, type of housing, general facilities, social cohesion, disturbance, and unsafeness (Leidelmeijer & Mandemakers, 2022). Schools in neighbourhoods in The Hague scoring low on these indicators (see p. 54 for an overview of the factors that fall within the scope of the mentioned indicators and pages 69–75 for a list of neighbourhoods that score relatively low compared to the rest of The Netherlands) were selected as a proxy for the socioeconomic background of primary school pupils since our primary contact was with schools and we had no direct data from tutees. Also, schools in The Hague were chosen because of the city's closeness to Leiden University, thereby limiting the travel time for students to a maximum of 1 h. The schools agreed on the participation and organization, but children and their parents or caretakers decided if they would participate in the program. Tutees could at any time opt out from the tutoring and from participating in the studies.

Tutors were recruited at Leiden University through the university's Honours Academy. The program was set up as an extracurricular course within the honours program, which all bachelor and master students from Leiden University could also take voluntarily. Tutors received one full day of training on teaching, intercultural communication, and the practical goals of the tutoring program. During the tutoring period, the tutors participated in peer-to-peer training sessions with all tutors and a primary school teacher with expertise in the target group.

The group of tutees consisted of 104 pupils from grade 7 of the five participating schools. Of this group, 100 filled out their demographics: 41 were boys and 71 were ten years old at the start of the program (Table 1). No significant correlations between age and gender were found.

Both tutees and tutors were not paid for their participation.

Intervention

The participating tutees were divided by their class teacher into tutoring groups of two to five tutees. This was not fully random, as originally intended, as sometimes class teachers chose to put together specific tutees with similar learning challenges in a group and informed the tutors about these challenges. Teachers were not pre-informed about the tutor's study backgrounds. Tutors were assigned to the tutees by the organizers of the Leiden Tutoring Program without background knowledge of the tutee's challenges. In total 29 tutors participated in the program, of which 19 had a STEM background (i.e. Bio-Pharmaceutical Sciences, Astronomy, or Biomedical Sciences) and 10 had other non-STEM background (i.e. Educational Sciences, Psychology, or Cultural Anthropology). Weekly, the same tutor would sit with the tutees and work on their homework and other assignments given by the school. Tutors were free to add activities related to their interests and their tutees' needs, but we did not instruct them to put an emphasis on STEM. The tutors involved were not informed about the detailed research goals of this project, such that they could not influence the results. The tutoring sessions took place at school, after school, and took 1.5–2 h each time, for 9–11 weeks.

Data collection

The tutees were asked to fill out multiple-choice pre- and post-questionnaires by hand (STEM-LIT, see Supplementary Appendix) in their classroom, during school time, all together with one of the researchers and their teacher being present. The paper and pen survey took the tutees between 15 and 30 min to complete. All items were compulsory. The pre-test occurred in the 2 weeks before the start of the tutoring, the post-test at the end of the tutoring period. There was a timespan of nine to eleven weeks of tutoring between the pre- and post-test with one group being tested 2 weeks later because of COVID restrictions. The teachers assigned codes to the tutees to match the pre- and posttests anonymously for the researchers.

Measured variables

To measure the interest of the tutees in the four aspects of STEM—Science, Technology, Engineering, and Mathematics—we used the validated STEM-LIT instrument (Grimmon, 2018, see Supplementary Appendix). The STEM-LIT instruments consist of four scales, each composed of eleven items, to be rated on a Likert-scale of 1–5 (1 being 'totally disagree' and 5 being 'totally agree'), relating to the pupils' interest in the four STEM aspects. Above each scale, the tutees could read some clarification of the item in a language that fits their understanding (Grimmon, 2018). Additionally, we also collected information about tutees' age and gender. As all schools were in low-SES neighborhoods, no further information about SES was collected. We checked if the items were normal distributed in this sample in SPSS. This was the case with the majority of the items within the excellent range of −1/+1 for skewness and kurtosis and three items within the acceptable range of −2/+2. The power of the sample is .858, calculated as G*Power based on the expected effect size of 0.5.

Table 1. Demographics of the pupils participating in this study.

Demographics		
Gender ($n = 100$)	Boys	$n = 41$
	Girls	$n = 59$
Age ($n = 100$)	9 years old	$n = 9$
	10 years old	$n = 71$
	11 years old	$n = 20$

Of the 104 pupils, 100 filled out the demographics questions.

Reliability and validity

We calculated the internal reliability of the scale both in general and for the specific sub scales for the results of both the pre- and post-test (Table 2). The different Cronbach's Alphas were in line with the earlier results for the original and validated STEM-LIT (Grimmon et al., 2020).

Analysis

To analyze the effect of tutoring on the attitudes towards STEM in general and towards each subfield of STEM separately, we calculated the evolution for each item separately, e.g. if in the pretest one item scored a 3 and, in the posttest, a 4, the difference in score for this item was counted as +1. We next calculated the average differences in scores for both the total scale (44 items) and the different subscales (each time 11 items) To check if there was a significant difference in scores in the attitudes towards STEM in general and towards the different subscales, we performed five One-Sample *t*-tests, both for the whole scale and for the four subscales Science, Technology, Engineering, and Mathematics. Next, we performed paired *t*-tests to compare the STEM-background of the tutors for the calculated components on each of the five average evolutions (general and each of the STEM-scales) (Manfei et al., 2017). In all cases, we checked if the assumptions for a paired *t*-test were present. This was the case for all calculated components except for the evolution for Science and for Technology which failed the Shapiro-Wilk-test for normal distribution on the .05 level. One could argue we cannot use the *t*-test for those calculated components, but as the sample is larger than 20, we opted to still use this test (Table 3).

Ethics

Ethical approval for this study was obtained through the Ethics Board of the Faculty of Science at Leiden University.

Results

Results for all tutees combined

This study found that during the run-time of the Leiden Tutoring Program, the attitude towards STEM in general did not change significantly (Table 4).

When we examined the evolutions of the subscales, contrary to what we expected, the overall attitude towards 'Science' decreased statistically significant, independent of the tutor backgrounds, $t = -2.727$, $p = 0.008$, $d = -.355$. No significant effects were found in attitudes towards 'Technology', 'Engineering', or 'Mathematics'.

Table 2. Reliability of the used scale.

Scale	Cronbach's alpha pretest	Cronbach's alpha posttest	Cronbach's alpha original STEM-LIT
Total scale (44 items)	.873	.916	.910
Science scale (11 items)	.768	.802	.782
Technology scale (11 items)	.805	.861	.862
Engineering scale (11 items)	.835	.882	.879
Mathematics scale (11 items)	.708	.821	.830

Table 3. Tests of normality.

	Shapiro-Wilk		
Calculated components for the evolution of…	*W*	*df*	Sig
… Engineering	.978	76	.212
… Science	.955	59	.029*
… Mathematics	.970	68	.094
… Technology	.964	72	.038*
… The total of STEM-attitudes	.982	42	.721

*Significant $p < .05$.

Table 4. One-sample test for the different evolutions.

					95% Confidence interval of the difference	
	t	*df*	Sig. (2-tailed)	Mean difference	Lower	Upper
Evolution for total	−.031	41	.975	−.00162	−.1070	.1037
Evolution for engineering	.762	75	.449	.06699	−.1082	.2422
Evolution for science	−2.727	58	.008	−.20955	−.3634	−.0557
Evolution for mathematics	.107	67	.915	.00802	−.1409	.1570
Evolution for technology	1.552	71	.125	.13258	−.0378	.3029

We examined these results more in depth. Within the 11 questions on the tutees' attitude towards 'Science', we found a statistically significant decrease in the statements: 'my parents would like me to choose a job in which I would use science, Q6'; $t = -3.769$, $p < 0.001$, $d = -.409$, 'I like to learn about science, Q8'; $t = 4.335$, $p < 0.001$, $d = -.470$, 'I perform well in school activities related to science, Q1'; $t = -2.192$, $p = 0.031$, $d = -.245$, 'When I learn a lot about science it will help me in my future job, Q5'; $t = -2.731$, $p = 0.008$, $d = -.300$, and 'I would like to talk to people that use science in their job, Q10'; $t = -1.999$, $p = 0.049$, $d = -.219$.

When we examined the evolutions for girls, the results were more mixed. The general attitude towards STEM also was not significantly different for girls compared to boys, but we found a significant positive evolution for 'Technology' ($t = 3.203$, $p = .003$, $d = .491$) and 'Engineering' ($t = 2.602$, $p = .013$, $d = .390$). For boys, we could not find any significant evolution, although the direction for all evolutions was negative.

Examining the influence of the background of the tutors

To examine our hypotheses by comparing the results of the tutees interest related to the study background of the tutors (STEM *vs.* non-STEM), we found differences in their interest in technology: the attitude towards 'Technology' increased more ($t = 1.997$, $p = 0.05$, $d = -.475$) when a pupil was tutored by a tutor with a STEM background. Within the 11 questions on the tutees' attitude towards 'Technology', we found statistically significant differences dependent on the study background of the tutors in the statements 'I would like to have a job in which I use technology', Q3, $t = -1.993$, $p = 0.050$, $d = -.438$, 'I like to use technology in exercises at school', Q7, $t = -2.092$, $p = 0.040$, $d = -.461$, and 'I admire someone who has a job in which they use technology', Q9, $t = -2.709$, $p = 0.008$, $d = -.595$.

When we look at the effects for girls, we could not find any significant differences both in total and for the different subscales. For boys, the results were not dissimilar to the results of the total sample, but more outspoken. We could not find any significant difference for 'Science', 'Engineering' or 'Mathematics', but we did find a positive effect ($t = 2.121$, $p = .043$, $d = -.746$) for 'Technology' by being tutored by a person with a STEM-background.

Conclusion and discussion

In this real-life experiment, we tested the impact of the study background of a tutor on the STEM-interest of tutees. We ran the Leiden Tutoring program with a group of 104 tutees, tutored by 29 tutors with either a STEM or non-STEM study background for 9–11 weeks. Tutees filled in the STEM-LIT survey to test their interest in the various aspects of STEM. Overall, we did not find that the STEM interest of the tutees increased, and we found small significant effects on small aspects when comparing the study background of the tutors. We will discuss the hypotheses and limitations in this section.

H1—STEM interest of pupils increases by tutoring, independent of the study background of the tutor—disproved.

To our surprise, we noticed a significant decline of the general attitude towards 'Science' by both groups of tutees, independent of the study background of the tutor, although we also found a significant positive evolution for girls for 'Engineering' and 'Technology'.

From our results, one cannot directly conclude that tutoring could have a negative effect on the attitude towards STEM in general, as for ethical reasons this study did not compare pupils who are being tutored with pupils without tutoring. It could be the case that the average decline happened in general

amongst the different groups due to aging or societal effects, even that the decline is smaller amongst the pupils with tutoring compared to pupils without tutoring. The PISA results indicate that there is a steady decline in interest and performance (OECD, 2016, 2023).

Studying the effect of tutoring with respect to no tutoring on attitude towards STEM could especially be relevant as earlier studies have shown that tutoring for, e.g. mathematics can have a positive effect on attitude towards learning both for mathematics and in general (Cook et al., 2014, Guryan et al., 2021). Moreover, a classic meta-analysis already showed that tutoring can result in more positive attitude towards the subjects (Cohen et al., 1982).

H2—STEM-interest of tutees increases more when a tutor has a STEM study background—partially approved.

Regarding our second hypothesis, there was no significant difference found for 'Science', 'Engineering' or 'Mathematics', but a positive effect for 'Technology'. When we examined the results more closely, this showed to be because of the positive evolution for boys. On the one hand, this is good news: the background of tutors does not seem to have a huge impact on the attitudes of pupils toward 'Science', 'Engineering' and 'Mathematics', which means that an organization delivering tutors does not need to take this into account. On the other hand, this also means tutoring might not act to work on the attitudes towards 'Science', 'Engineering' and 'Mathematics', with the possibly exception for 'Technology' for boys. It might be that the effect of role modeling played a more important role here, as also discussed by De Bruyckere (2017) and Hattie (2009).

Limitations

The presented study is the first pre-registered trial that examined this kind of effect in a real-life situation. Because of both COVID and the nature of the study, we were confronted with several limitations, some of them already being mentioned. First, we saw the teachers altering the random selection to benefit the participating tutees. This could mean some tutees who are bad at mathematics were getting a tutor who focused more on mathematics which might have decreased the effect of the program. A second limitation is that there was no control group without tutoring, which would allow us to tell if tutoring caused the decline, which goes against earlier findings in the literature, did not have a general effect, or maybe even compensated for the decline happening with these pupils. Finally, there could be a selection effect in the participating group of tutees, as parents had to give their consent. We encourage further research and replication on the effect of tutoring on specific target groups.

Recommendations for policy and practice

Earlier studies have shown tutoring to be a very effective way to make education and society more equal (Dietrichson et al., 2020; Kohlmoos & Steinberg, 2024). The effect of tutoring on learning has been clear with different meta-analysis showing the benefits (Nickow et al., 2020). In this study, we show the limited effect of the STEM-background of tutors on the attitude towards STEM of pupils in primary education. This study gives reasons for hope, meaning that the interests of the tutors are less contagious than we expected or that it's not that bad if a tutor is less into STEM to become a tutor of a pupil to have an effect on their tutees.

At the same time, it is important to note that being passionate about a topic really can motivate and makes students perceive a teacher or a tutor as more authentic (De Bruyckere & Kirschner, 2017), which also can help in the process of building a relationship with the children.

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Ethical approval

This research involved human participants. Ethical approval was given by the Ethical Board of the Faculty of Science of Leiden University. Written informed consent was obtained from the parents of the tutees. Tutees could at any point decide not to fill out the questionnaires, even if their parents gave consent.

Author contributions

Julia Cramer, Demet Yazilitas, Ionica Smeets, and Pedro De Bruyckere contributed to the study conception and design. Data collection and analysis were performed by Amber Bruijnzeel, Sanne Romp, Julia Cramer, and Pedro De Bruyckere. The first draft of the manuscript was written by Pedro De Bruyckere and Julia Cramer. All authors commented on versions of the manuscript. All authors read and approved the final manuscript.

Preregistration

This study was preregistered at https://osf.io/q7bwd.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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