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The Effect of Parental Involvement on the Use of a Digital Homework Tool and on Math and Language Performance for Secondary Students – A Randomized Field Experiment

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Abstract

In this paper we analyze the effect of parental involvement on the use of a digital homework practice tool and on math and language performance of all students in grade 7 to 9 of two secondary schools in the Netherlands by means of an individually randomized experiment. The experiment consists of the provision of an app which allows parents to follow their child's practice behavior in the digital homework tool.

Using an Instrumental Variable approach, controlling for non-compliance, the results indicate that parental involvement via app-use positively affects the use of the homework tool of 7th and 8th grade students, but negatively affects the use of the tool of 9th grade students. The positive effects are mainly driven by low-SES students and males, whereas the negative effect is driven by high-SES students and no effects are found for medium-SES students. Furthermore, we find positive effects of the use of the app on students' math score, mainly for grade 8 students, but we find no effects on language scores. Correlational analysis of parental and student questionnaire answers shows that 7th and 8th grade students and their parents are more likely to be aligned with respect to the desired amount of parental involvement, whereas there is a clear discrepancy in this for 9th grade students and their parents.

In sum, the provision of a smartphone-based follow-up app for parents proves to foster homework activities as well as performance of students, especially in low-SES families and in the early years of secondary education. This implies that parental involvement can easily be increased for low-SES families as well, using technology and specifically asking for it, resulting in positive effects for those students that could often use an additional help to focus on their school.

JEL-Classification – I21, I29, C93.

Key words – Parental Involvement*;* Randomized Field Experiment; Homework Practice; Math and Language; Secondary Education.

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1. Introduction

Economists' thinking about parental involvement in education mostly refers to a combination of optimal investment in human capital and parents' preferences for a happy and successful offspring. It is assumed and empirically studied that parental involvement can contribute to the educational success of their children.

Yet in practice, the effective time investment of parents regarding their children and, more particularly, their help with homework varies strongly, not least with the socio-economic status of the parents and their educational level (Green, Walker, Hoover-Dempsey, & Sandler, 2007). In both cases lower social positions are related to lower parental involvement. The latter is understood to be an explanatory mechanism of the intergenerational transfer of social status as it functions as a negative vicious circle across generations.

Research in parents' motivations for contributions to homework suggests that the fairly general parental interest in the (future) well-being of their children may fail to translate into effective homework involvement for a variety of reasons, which can be grouped into three categories. First, parents may feel that school work is strictly the responsibility of the teacher (and school). Second, they may feel that they are not capable of helping (their help will be ineffective) and third the school does not want them to interfere (they do not feel invited to play part in the formal education process)(Hoover-Dempsey et al., 2001; Patall, Cooper, & Robinson, 2008).

The experiment we report about in the present contribution touches upon all of the three types of obstacles mentioned above. It offered parents a smartphone app to follow-up on their children's homework behaviour. It thus facilitates parental access to information about the educational process their children are involved in, actively inviting them to get involved, offering a specific template in a contemporary style (smartphone app) and having the school and university researchers communicate the message that parents play an indispensable part in the successful education process of children.

The analyses reveal a positively significant effect on homework effort stemming from the provision of free access to a smartphone app which allows parents to follow-up on their children’s activities in an intelligent tutoring system (ITS). They complement earlier findings regarding the provision of information to parents, suggesting in contrast with the findings of

Bergman (2015) and Mayer et al (2015) that no continuous messaging or prompting is required to have an impact. Rather a one-off invitation to participate and access to an information app proved sufficient for parents to take the lead. More generally, our findings add real-life experimental evidence regarding the relation between parental involvement and teenage homework behaviour, corroborating for example that younger children are more likely to react positively on parental interest in their homework than adolescents. Furthermore, the experiment shows that an app is able to generate supplementary value added even in a school environment that already offers parents access to the electronic learning environment to follow-up on planning and consult grades. Apparently, the more specific invitation, relatively narrow focus of the app (math and language homework in an ITS) and/or convenient method (smartphone app) made a difference.

In the past decades many scholars have experimented with measures to overcome one or several of the hindrances to parental involvement in education. We discuss a few of the most recent examples and refer the reader to three literature reviews for more information and a generally cautious tale about the complexity of the issue and the lack of experimental evidence on the positive impact of parental involvement on educational outcomes (Avvisati, Besbas, & Guyon, 2010; Fan & Chen, 2001; Patall et al., 2008). Note that, although there are many descriptive studies, only few experimental studies have been published.

Balli, Demo and Wedman (1998) experimented in a US middle school with prompting schedules, varying between no invitations to family members, asking the students to invite family members to participate in homework and a direct communication with the family. They observed that both types of prompting led to significant rises in the homework assistance students experienced from various family members.

Avvisati et al. (2014) report on an experiment in French middle schools which consisted of an offer of three parent-school meetings on how to get better involved in children's education. As a result, parents' participation in school life and homework assistance increased significantly, as well as indicators of their children's behaviour at school. Moreover, positive spill-over effects regarding class mates with non-participating parents were also observed.

Bergman (2015) set up an experiment in a US high school[3] which provided parents with various kinds of information regarding the school behaviour and learning progress of their child. Electronic messages (e-mails and texting) were sent and phone calls made during a six month period at an intensity of more than once a month. As a result, parents "contacted the school about this information 83% more often than the control group and parent-teacher conference attendance increased by 53%. " (Bergman, 2015, p. 3).

Mayer et al. (2015) devised an intervention to tackle a potential cognitive bias in parents' decision making which may lead parents to underinvest in children's upbringing when they discount future benefits excessively. Parents with preschool children were stimulated to read for their children during a six weeks intervention, using weekly goal setting, daily prompts (text messages) and congratulations when reaching their goals. They found significant increases in reading time during their intervention, but were unable to statistically confirm longer term gains.

In sum, positive results are found when parents are provided with information on their children's progress at school or otherwise actively invited to take action, which refers to relatively cheap interventions, though the above examples vary widely in the intensity of the communication process, the degree of teacher or school involvement and the degrees of freedom allotted to parents. Moreover, the latter three of the cited examples specifically deal with socially deprived neighbourhoods and parents, which sheds doubt about their wider applicability, even though it should be noted that the interventions studied were explicitly developed to tackle the lack of parental involvement that is often observed in the lower socio-economic strata (Mayer et al., 2015; Patall et al., 2008).

As such, this paper contributes to the literature in a number of ways: First of all, this randomized study with more than 1500 students has sufficient power to show an effect of the intervention if present. Furthermore, this study evaluates an intervention that does not cost a lot of effort or money from the school or the parents. Third, we can not only study the effect of parental involvement on student behaviour, but also on student performance. Lastly, the study includes all students, not only socially deprived students, which makes the external validity higher than some of the previously conducted studies. However, we still study students with a different socio economic status separately, next to the general results.

[3] In effect, he also worked in the middle school, but in that case the experiment got contaminated. We therefore do not go into the results for the middle school.

In the following paragraphs, we continue with a section on context and the experiment research design, followed by descriptive statistics and the used methodology. The results section first focuses on the effect of the app on the use of the homework tool, thereby analysing all students as well as elaborating on the socio-economic heterogeneity of the effect. This is followed by the results on math and language performance and various robustness checks. Lastly, we discuss the descriptive outcomes of both a parental and a student questionnaires, which results we link to the causal effects that we find. We finalise the paper with a discussion of the contributions of our findings to the literature.

2. Context and Field Experiment

a. The schools under study

The two schools under study, Dendron College and Valuascollege, both located in the Southern part of the Netherlands, in the province of Limburg have about 2000 and 2500 students, respectively, and are - to Dutch standards – both mid-sized schools for secondary education (junior high and high school). Both schools offers secondary education in all tracks[4] and are tracking students from 7th grade on in several prevocational, general and pre-university tracks. Compared with the average Dutch secondary school, both schools have a higher graduation percentage (97/95 vs. 92.5 percent). Both schools are doing relatively well performance wise.

b. The broader research context

The randomized field experiment with the parental app was part of a bigger research project that studied the effect of parental involvement on whether students would do their homework in a digital practice tool and the effect of (practicing with) this digital homework tool on math and language performance of secondary students (a so-called ITS, "intelligent tutoring system"). This research project was set out in two secondary schools in the Netherlands, and included all students in grade 7, 8 and 9 of these schools, with a total of 2450 students participating in the study[5]. All students were supposed to practice 30 minutes

[4] Dutch secondary education has a tracking system from 7th grade on, with 3 different tracks: prevocational education (which consists of 4 sub tracks where level 1 is the lowest (mainly practical) track and level 4 the highest (mainly theoretical) track), general higher education and pre-university education.

[5] Technically, this project was set out in three secondary schools. However, the third school was a lot smaller, only participated for Dutch language, and used a different student registration system, to which parents could

per week for math and 30 minutes per week for language with the digital homework tool, during one school year. For each class a specific teacher was assigned to keep an eye on this and motivate students to practice. The students' performance on math and language was measured using digital standardized validated tests. They wrote a pretest in September 2014, a first posttest in January/February 2015 and a second posttest in June 2015.

The relevant policy context of the experiment are new learning goals introduced for the national graduation exam in order to tackle the perceived lack of basic language and math skills in the Dutch population. Schools reacted to these new requirements in a variety of ways, from highly targeted remedial teaching to extended teaching for all students. The schools under study decided to offer a digital homework tool for individual use at home, without specific action at school apart from communication about the new graduation exam and follow-up of the practicing behaviour by (some) teachers. It was assumed that the didactical efficacy of the ITS, combined with the existing teaching of math and language, would suffice to reach the required skill levels. Moreover, the introduction of the new exam requirements was hotly debated in Dutch media, which is likely to have motivated parents to take an interest in the topic and help motivate their children to use the tool effectively.

c. The digital homework practice tool ("Mousework")

The purpose of the interactive digital homework tool is to help students practice their math and language skills, while being able to individualize, and give users direct feedback (Muiswerk, 2013). Although the program is mainly being used in the Netherlands, it also has an international version and is used by several international schools both in Europe and other parts of the world. In the Netherlands, around half of the schools use the program ("Mousework") in some way, although only a small share of the schools use the program in the way it is supposed to work best, namely as a homework tool, next to regular classes that include math and language (e.g. mathematics and Dutch classes).

The program is interactive and person specific. Students work at their own level and get those exercises that will help them improve the sub-aspects of math and language they are not knowledgeable in yet, while some exercises are meant to keep up their already gathered knowledge. Students have a certain set of exercises available, covering all domains of math and language, where they choose from when they log in to the system. A pretest determines

not logon, contrary to the other two schools, implying a completely different control condition for the effect of parental involvement. Therefore, this third school was not comparable (although results were fairly similar when the school was included in the main analysis) and was therefore left out of the analysis for the paper at hand and is consequently not further mentioned in this paper.

students' level of different sub-aspects of math and language, which in turn determines the types of exercises they have to start practicing with at home[6]. At regular intervals (supposedly biweekly, but in practice once every three to four weeks), students make a short computer test at school to determine for which exercises their skills are still lacking and for which exercises their knowledge level is good enough for the moment. After every test, the number, type and level of exercises a student can choose from are adjusted to their new skill level. Apart from that, adjustment is also based on performance while practicing in the tool. The individualization therefore makes sure the right exercises are selected for the student, but in the end, until the next adjustment, the student decides in which order he practices the exercises, and whether he repeats and exercise or not. If he performs badly at an exercise, but does not choose to repeat it, it will remain in his selection of exercises, even after the adjustment.

The schools use this tool to make sure each student achieves the highest possible level of math and language, given his/her abilities, and maintains the level achieved. They offer all students online access to the tool for use after school hours, at home. The program functions in a highly individualized manner, as it starts with explanation screens (digital instruction), offers feed-back and it provides the student with either repetition or new learning modules on the basis of previous performance of the individual student. It works without teacher interventions, but it does offer both teachers and parents an app where they can log on to see the practice/homework behaviour of their class/students, in case of the teacher, or of their son/daughter in case of the parents. Teachers can also use a computer to log on to the system to check upon their class, and may incorporate knowledge of "Mousework" performance in their interaction with the students (but hardly any teacher at the two schools actually used this feature).

d. The randomized experiment with the parental app

Previous studies have shown that students are not necessarily intrinsically motivated to do their homework in the digital practice tool, but students do use it more when they are motivated to do so by for example their teacher (Carla Haelermans & Joris Ghysels, 2015). Therefore, the above described research project also included a parental aspect, asking the question whether parental involvement via an app would increase the amount of homework

[6] An earlier study (Haelermans & Ghysels, 2015) shows that only few students do not have a computer at home to practice with. However, IP address data shows that these students have practiced with the tool at school, where there are computers available for students that do not have one at home.

time students spent in the digital practice tool. The app was free of charge and available for both IOS and Android. The app allowed parents to log on to the Mousework system with their child's login number (student number). Once logged in, they could see the amount of minutes practiced per week, separately for math and language, and go weeks back. They could also see a comparison between their child's practice behaviour and the practice behaviour of its classmates, and compare their child with him/herself over time. Furthermore, there were performance data available, again over time and compared with classmates, and a suggestion which aspects of math and language would still need to be improved. Parents could choose to look at numbers or read a short written story that was generated from the underlying data. It was possible to add multiple children to the app and follow all of them simultaneously.

The app registers the child's login number every time the parent logs in. Unfortunately, it was not possible to register what exactly the parent was looking at when logged in to the app. In case of multiple children, the app does register for which child the parent has logged in though.

As part of the experiment, only about half of the parents could actually log in to the app (as will be explained in the identification strategy in Section 4a), whereas the other half could not (it was created as such that this was technically impossible). However, *all* parents where asked and motivated to download the app, in order to get information on the willingness of parents of using such an app at all, or rather, to get an idea about the selectivity of parental involvement using a digital tool such as this. Only after downloading and logging in (or trying to) parents would find out whether they belonged to the treatment or control group. Parents who belonged to the control group would, upon trying to log on, get a message reminding them of the experiment and clarifying that they would be able to login to the app after January 2015 (i.e. for the second part of the schoolyear).

Parents were informed about this experiment via two ways. First of all, they received a letter via their child's school, explaining the study in plain, non-technical, language, and asking for their cooperation. Furthermore, the parents were informed at the yearly parental information meeting at the start of the school year. In the one school, the researchers presented the research and informed and motivated the parents to participate, whereas at the other school this was done by the personal mentor of each class. Although parents could use the app as

often as they pleased, in both the letter and at this meeting, they were advised and asked to use it at least once a week.

Figure 1 shows the timeline of the parental app experiment. The experiment lasted for 14 to 18 weeks, depending on when exactly the students wrote the pre and posttest (as all students and classes in grades 7 -9 were tested, and the number of computer rooms at the schools were limited, testing took a couple of weeks). In summer, students and teachers were assigned to classes. In week 32 randomisation took place by the university researchers, and in week 35 the school year started. Shortly thereafter, students wrote the pretest. At the same time, the schools organized parent information nights, in which the experiment was introduced. Note that parents also received a letter which explained the experiment in the week before the information nights. The parental questionnaire was handed out in week 48, and collected right after the Christmas break. The student questionnaire was filled out after the posttest was written (it was logistically impossible to do this at the same time). With this, the experiment of the first semester, i.e. the parental app experiment, and the first part of the larger experiment came to an end.

[Figure 1 around here]

3. Data

a. Student background data

The experiment includes all students in grades 7-9 of the two participating schools, given that the school has data on the primary school ability test (not all students have a score on this test, as primary schools can decide whether they use it or not. However, almost 90 percent of primary schools issues this specific test.). This includes 2450 students in total (see Table 1). The average score on the primary school ability test is 536, where the minimum is 501 and the maximum is 550. Note that the scores on this test have a theoretical range from 500 to 550. In total, 56 percent of the students is female, and 97 percent is born in the Netherlands. On average, they were about 13 years old on October 1st 2014, which can be explained by the fact that there are more 7th grade students, who are about 12 years old, than 9th grade students, who are about 14 years old. More than 80 percent of students have a stable situation at home, with both parents still living at home (opposed to parents having divorced or one parent being deceased), and both schools have about the same number of students participating in the study, shown by the average of 1.5, for schools number 1 and number 2.

The Socio Economic Status (SES)-variable is constructed by the Netherlands Institute for Social Research (SCP) and is constructed at the 4-digit postal code level, roughly corresponding to a district. In our data, we have 65 different 4-digit postal codes leading to sufficient variation in this variable. This variable is constructed based on the average income, the share of people with a low income, share of low-educated people and the share of unemployed people in this 4-digit postal code. We use this variable as an approximation of a students' individual SES, based on the 4-digit postal code of the address where the student lives, as we do not have individual SES or anything that can be used as a proxy in our data, unfortunately. The SES-variable ranges from -2.59 until 1.63 with an average of -0.05. Note that this variable was originally constructed to have a mean of 0 and a standard deviation of 1.

[Table 1 around here]

b. Student questionnaire

During our study, students were asked to fill out a questionnaire, with questions on the courses mathematics and Dutch, on the program Mousework, on the time spent on homework, on their opinion on parental involvement and on their work attitude[7]. In the current analysis we draw on the questions on homework time and on parental involvement. The questions on homework time were: "How much time do you on average spend on homework for Dutch/Mathematics?" (1 question per subject) The answer options were: 0-15 minutes, 15-30 minutes, 30-45 minutes, 45-60 minutes or more than 60 minutes. The questions on parental involvement were: "I would like to get more help from my parents with my homework", and "I would like my parents to interfere less regarding me and my school work". The answer options were: No absolutely not, mostly not, neutral, sometimes, yes absolutely (5-point Likert scale).

Filling out the questionnaire took 10 to 15 minutes. The questionnaire was distributed on paper to the mentor (coach) of each class, who was asked to have the class fill it out. Unfortunately, not all mentors have handed out the questionnaire, and not all students were present during that time. Therefore, the response rate of the questionnaire is only 66 percent. This number is a little higher for grade 8, and a little below average for grades 7 and 9 (see

[7] The questionnaire is available upon request from the corresponding author.

Table 2). The second half of Table 2 shows that students that did fill out the questionnaire are on average quite comparable to students who did not, most likely because students were not necessarily the ones to decide whether to fill it out, as it was the teacher who decided whether to hand it out or not. In comparing the two groups, we see that students that did fill out more often have a stable home situation (which might result in students not being present in class when the questionnaire was handed out), a higher SES, and that more students from school 1 filled out the questionnaire.

For the remainder of the paper, only the sub sample of students who filled out the student questionnaire are taken into account, because the students' variables are crucial descriptive characteristics in the analyses[8].

[Table 2 around here]

c. Use of the homework tool

The main purpose of the parental app that is studied in this paper is to stimulate parental involvement and, by doing so, increase students' use of the homework tool. Furthermore, the purpose of a more intensive use of the tool was to increase student performance. The use of the homework tool was measured over the same period as the experiment with the parental app ran, namely between the pretest in September and the posttest in February. The first half of Table 3 shows the average amount of minutes students used the homework tool. Note that some students did not use it all, which influences the average amount of minutes. On average, students practiced 13 minutes during this period, which is not even a minute per week. However, the standard deviation is large, and therefore differences between students are very large. Seventh grade students practiced the most, followed by 9th grade students. The second half of Table 3 shows the same statistics, but only for the students that practiced at least once. Now we see that the students who did use the tool have done so for an average of about 15.5 minutes. This statistic is higher for the 7th and 9th grade students (more than 17 minutes) than for 8th grade students. The distribution of the use of the homework tool in minutes is not normal, but skewed to the left, where there is peak around between 10 and 15 minutes and a declining number of students practicing more than 20 minutes.

[8] However, additional robustness analyses show that the results are fairly similar when these student questionnaire variables are not taken into account in the analyses, giving us a larger sample.

[Table 3 around here]

d. Parental use of school administrative system for student registration

An important element of the context of our experiment regards the pre-existing means of digital follow-up offered to parents. Both schools have an electronic learning management system, where among others students' background information, grades, schedule and homework are registered. Both schools have given parents access to the learning management system as well, such that parents can, for example, check on their child's homework and grades. Both schools have introduced the parental login in 2013/2014, and parents have received a once-only email at the start of that school year with some information and their login name. Parents of new students receive a similar email at the start of the school year when the child enters the school. The parents' email address(es) are also registered in this administrative system, and the schools use this to communicate with parents throughout the school year, additional to paper messages.

For almost all students, only one parent has a login name to enter the system. A few students, most likely with divorced parents, have two parents to login. In almost all cases there is one parent that logs in a lot, and the other parent only logs in very occasionally. The average of having one or two parents logging in is 1.02. Therefore, we only use the number of logins between September and February for the first parent. Table 4 shows that on average, parents log in 34.5 times. Note that this also includes parents that have never logged in during the mentioned time period. This number is the highest for 7^{th} grade students, followed by 8^{th} grade students and lastly 9^{th} grade students. The second half of Table 4 shows that roughly two out of three parents logged in at least one. Among the latter parents the average number of logins is 48, which is on average more than 2 times per week. This is again done the most by parents of 7^{th} grade students.

[Table 4 around here]

The number of logins provides interesting reference information for the parental involvement experiment, because it serves as a signal of involvement and more particularly of the willingness of parents to use an electronic instrument to get involved in the education process of their child. In effect, the number of logins allows for a picture of the control condition of the app experiment. All parents were granted access to the learning management system. Two

out of three effectively used it and, moreover, tended to do so intensely. Apparently, parent have a high willingness to be in touch with the school work of their children and, especially in 7th grade, check upon progress various times per week.

e. Parental questionnaire

During our study, parents were also asked to fill out a questionnaire. The parental questionnaire first of all contained background questions on the parents, for example on their age, ethnicity, labour market situation, and educational level. Furthermore, it contained a few questions on Mousework and the app, and eight statements on parental involvement in general (4-point Likert scale, ranging from 1=never to 4=a lot). In this study, we only use the questions on general parental involvement. These were questions like: Do you make agreements with your child on homework, do you ask your child about its progress, do you help your child with homework, do you talk with your child about school, does your child need a lot of help, do you help your child when it has motivational problems and do you help your child with the computer?

Filling out the questionnaire would take about 10-15 minutes. The questionnaire was first sent via e-mail via the school administrative system of the schools. As that only generated a low response, the questionnaires was also distributed on paper to the mentor (coach) of each class, who was asked to hand it out to students, who were asked to have their parents fill it out and bring the questionnaire back to school. With the two efforts combined (both digital and on paper), the total response rate was about 32 percent. If we only take into account the students that filled out the questionnaire, the response rate for the parental questionnaire was about 35 percent (see Table 5). However, for 7th grade students almost half of the parents filled out the questionnaire, whereas for 9th grade students this is only a little over 25 percent. Students of parents who did fill out the questionnaire are different from students of parents who did not fill it out. As Table 5 shows, children from parents who did fill out have a higher score on the primary school ability test, are a bit younger (most likely because 7th grade students are overly represented in the group that did fill out the parental questionnaire) and have more often a stable home situation and a higher SES. As we only use the parental questionnaire for explaining the mechanisms in our findings, because the answers to the questions are endogenous to the treatment and these variable can therefore not be used in the regression analysis of the effect of the parental app, we do not restrict ourselves to this

subsample but stick to the subsample of students that have filled out the student questionnaire.

[Table 5 around here]

f. Math and language test data

The math and language skills are measured using digital standardized math and language tests, which are written by all students in September 2014 and February 2015. These are standardized validated tests developed by the company of the tool, and these tests are based on other nationally validated tests. The reliability (Cronbach's alpha scores of between .79 and .92) and validity of these tests is analysed yearly by the tool developer, based on norm data of several participating schools (Schijf & Schijf, 2014). Although the pre and posttest are digital tests that are developed by the same company as the tool and are administered in the same digital environment as the tool, the tests themselves are external to the practice exercise tool and do not contain any of the exercise questions. The tests measure whether students have mastered the required national numeracy and language level they are supposed to have, given their age and given the fact that they finished primary school (called 'reference level').

The math test consists of relatively simple multiplication or addition questions, but also contains special understanding questions, where the student sees an unfolded shape and is asked to select the figure that could create the unfolded shape. Or the student is asked to calculate the volume of a sphere, or is asked to quickly make calculations by heart. The test contains multiple choice questions and students were allowed to use scrap paper for their calculations, but no digital calculator. The tests lasted for about 20 minutes. The language tests for example consists of spelling questions, vocabulary questions, text comprehension, grammar questions, and having to listen to some information and answer a question about that. The test lasted for about 90 minutes.

Table 6 describes the average scores for the full experiment population, as well as per grade, highlighting the learning progress students make over time (all posttest averages are

markedly higher than pretest averages for math, with the exception of language for grade 7 students[9]), but also indicating the large variance of all test results.

[Table 6 around here]

4. Methodology

a. Identification strategy

To study the effect of the use of an app for parents on whether students do their digital homework and how much time they spent in the digital environment, a randomized field experiment was set up. As explained above, all students had a login account and were supposed to practice in the digital tool. First, students (and, hence, parents) were individually randomized into a treatment and control group, where treatment status implied that they could login to the app, and control status implied that it was technically impossible for them to log in the app with their child's login number. The randomization was done using a random number generator and classified students ('s parents) based on odd and even numbers. For practical (technical) reasons, siblings were supposed to have the same treatment status, so all children that had a sibling that belonged to the treatment group whereas they themselves did not were also added to the treatment group. This practical arrangement causes the selection likelihoods of students with siblings at school to be slightly higher than other students, but the actual impact of the latter is limited.[10] In effect, 57 percent of children had parents that were able to actually logon to the app. A joint F-test on the available student data, shows no significant differences between students in treatment and control group.[11] As we unfortunately do not have any parental information from registration data, it is not possible to compare parental aspects for the two groups. However, as more than 2000 students are individually randomized (though clustered at the family level if discrepancies arose) we have a high enough number of observations to safely assume randomly divided observed and unobserved characteristics of both students and parents.

b. Compliance with Assignment

[9] Note that the number of observations is also higher for grade 7 students for the pretest, compared with the posttest. This is not the case for the other grades. This is due to a test element that was only included in the pretest, on which almost all students scored very high, that was not included in the posttest.

[10] As a first check, we tested specifications including an indicator regarding the number of children at school. This does not change the effect estimates neither regarding practice behaviour, nor regarding math outcomes.

[11] Results available upon request from the corresponding author.

Evidently, providing parents with access to a tool does not guarantee its effective use. Moreover, parents had to download the app before they could even start using it to get involved. Table 7 describes the first step: the downloading. As explained earlier, the allocation of parents to the control or experimental group was only revealed after downloading[12]. Therefore, Table 7 refers to the full population of students (and their parents) who filled out the student questionnaire (as explained above). Of 1619 students in the dataset, 19% of the parents downloaded the app. Similar to the use of the parents' portal of the learning management system and the response rates of the parent questionnaires, downloading happened more often among parents of 7th grade students (21%), decreasing gradually over parents of 8th grade students (19%) to 17% of the parents of 9th grade students. The lower part of Table 7, however, shows that the observed characteristics of the students do not vary that much between the downloading and non-downloading group, except that parents from one school downloaded more than parents from the other school.

[Table 7 around here]

Tables 8 and 9 reveal some information about the second step: the use of the app. The number of observations is far less than in Table 7, because of a double selection process: only one out of five parents effectively downloaded the app (see Table 7) and only halve of them had access to the tool, because of the randomisation of the experiment (57%, see previous section).

Table 8 distinguishes between three categories: children whose parents were in the control groups (A=0;P=0), children whose parents were given access to the app, but did not download or use it (A=1;P=0) and children whose parents were given access and effectively downloaded and used the app (A=1;P=1). The table shows that, as far as observed characteristics are concerned, the groups do not differ that much between each other, except on the SES-variable. Table 9 focuses on the latter group, the compliers, and highlights that complying parents used the app on average 18 times during the period of the experiment, which is slightly more than once a week. When compared with the data of Table 4 (number of logins to the education management system) this may seem little, but the app is obviously

[12] Note that the vast majority of parents downloaded immediately after the parental information nights, when the research was introduced. Almost all parents that did download did so before autumn break, when students receive their first grade overview.

much narrower in scope, as it refers to voluntary homework assignments in the ITS on math and language, instead of the full schooling process that is being registered in the education management system. We will return below to the association between both.

[Table 8 around here]

[Table 9 around here]

c. Instrumental Variable analysis

To identify the Average Treatment Effect (ATE) of access to the digital practice tool on test scores and growth in test scores we use the notation first used by Rosenbaum and Rubin (1983). We observe a student *i's* total amount of minutes of digital homework y_{ij} and the treatment, a parents' access to the parental app, d_i, which results in the following equation:

$$y_i = d_i y_i(1) + (1 - d_i) y_i(0), \quad (1)$$

Where $y_i(1)$ is the amount of minutes digital homework for students from treated parents and $y_i(0)$ is the amount of minutes digital homework for students from untreated parents. Since the randomization ensures the independence between the treatment and potential outcomes, we identify the ATE as follows:

$$\tau_1 = E[y_i(1) - y_i(0)]. \quad (2)$$

We can estimate the ATE using either simple *t*-statistics or using a linear regression. The linear regression is estimated as follows:

$$y_i = \alpha_0 + \alpha_1 d_i + \alpha_2 X_i + \varepsilon_i, \quad (3)$$

Where d_i is the assignment to treatment of the parent(s) of student *i*, X_i are the students' observable characteristics, such as ability variables, and student characteristics, which are independent of the treatment, ε_i are the residuals at the student level which are assumed to be normally distributed with a mean of zero and a variance of σ^2.

However, the experiment provides parents with access to the app, but can of course not ensure that parents actually download and use the app. As we have seen in the section on

compliance with the assignment, not all parents have downloaded the app and not all parents that have downloaded the app have actually used the app, making it technically an intent-to-treat effect (ITT) instead of an average treatment effect.

In order to control for the actual use of the app, we use a two-stage-least-squares (2SLS) instrumental variable approach to estimate the Local Average Treatment Effect (LATE) or, in other words, the treatment effect of the treated. Here we use the dummy that indicates the random assignment for access to the app as an instrument for the actual use of the app. The assignment to treatment or control group is (highly) correlated with the use of the app, but uncorrelated with the error term, since the assignment was done randomly. The first stage is then estimated as follows:

$$D_i = \beta_0 + \beta_1 d_i + \beta_2 X_i + \varepsilon_i, \quad (4)$$

where D_i is the participation status. In the second stage, we use the predicted participation probability in the regression as follows:

$$y_i = \gamma_0 + \gamma_1 \widehat{D}_i + \gamma_2 X_i + \varepsilon_i, \quad (5)$$

5. Results

a. The effect of the parental app on the use of the homework tool

Full sample

Table 10 compiles the estimates for the immediate goal of the intervention, the practicing behaviour of the students. In upper right corner, the effect of the provision of access to the smartphone app is shown under the heading ITT. In accordance with results reported earlier in the literature (see Introduction), children react differently to the (potential) involvement of their parents depending on their age, which leads to an apparently insignificant overall effect, but highly significant effects when looking at each grade separately. In effect, the parental involvement enabled by the app leads 7th and 8th grade students to increase their practicing time with 2.5 minutes (over an average of 16 and 11, respectively, see Table 3), while 9th grade students reduce their practicing time by almost 4 minutes (over an average of 13).

Given the rather meagre compliance rate we documented above, it is also of interest to look into the working mechanism more directly. To that end, we investigate whether the

effective use of the app can be linked with the practicing intensity of the students. As a (descriptive) reference estimate, we report in the lower left corner of Table 10 a simple OLS result relating the dummy whether a parent used the app to the child's practicing. As could be expected from the ITT results, we obtain highly significant estimates. However, the direction of the relation is surprisingly homogeneous. The OLS suggests a positive relationship even for 9th grade students, although the latter is not signifant. Actually, the difference between the ITT and OLS call for caution regarding selection effects. Therefore, we also elaborate an IV-estimate with "access to the app" (randomised experimental condition) as the first stage instrument. Results regarding the first stage are shown in the upper left corner of Table 10. Obviously the instrument is highly significant for parents of students of all ages, because cross-over was literally technically impossible. The actual effect estimates (second stage estimates, LATE) are reflected in the lower right corner of Table 10. Interestingly, these estimates confirm the earlier ITT. Parents who get involved in their children's homework by getting access to the app make their children engage more in the homework tool and the more the better, at least for children in the 7th and 8th grade students (but with much larger magnitudes). For 9th grade students, the generally negative effect revealed by the ITT-estimate, does not change. App-using by the parents is in this case linked with students who practice less with the homework tool.

[Table 10 around here]

Subsamples

As previous studies have mainly focused on socially deprived students, it is unclear whether their results hold for all students. Our results focus on all students, but in order to make the link to the literature it is important to also study groups of students from different socio economic backgrounds. Therefore, we have split the sample in three groups[13], where we create a low-SES group (lowest tertile), a medium-SES group (middle tertile) and a high-SES group (highest tertile)[14], based on the previously discussed SES-variable from the Netherlands Institute for Social Research (SCP), measured at the 4-digit postal code level.

[13] Note that simply using an interaction term puts too much pressure on the instrumental variable analysis, resulting in very bad first stages. Therefore, this method cannot be used and subgroups have to be constructed, despite the risk of a power problem due to small sample sizes.

[14] Other ways of defining the SES-groups, as well as other proxies for SES, will be tested and discussed in the robustness analyses.

The results of the second stage analyses[15] for all three SES-groups are presented in Table 11. Table 11 shows that the significant positive effects of app use by parents on students' use of the tool in grade 7 and 8 are due to the low-SES students, whereas the negative significant effect (at the 10%-level) of grade 9 students is most strongly observed among the high-SES students.

[Table 11 around here]

Next, we look at subsamples for situation at home (both parents at home vs. only one parent or no biological parent around) and for gender. Table 12 presents the IV-results[16] of the different analyses for both parents at home (upper left columns), not having both parents at home (upper right columns), male students (bottom left columns) and female students (bottom right columns). Table 12 first of all shows a positive effect for the total sample, and for grades 7 and 8. This seems to be mainly driven by student that do not have both parents at home, a result at the 10%-significant level that is visible despite the (very) small number of observations per grade level in this selection. For children that do have both parents at home, there is also a significant results for 8th grade students, however, this is also at the 10%-level, and the magnitude of the coefficient is almost ¼ of the magnitude of the coefficient for students in 8th grade that do not have both parents at home.

Table 12 furthermore shows that the two positive effects of parental app use on students' use of the homework tool in grades 7 and 8 are solely due to the male students. The negative significant effect for grade 9 students is not visible here, neither for male nor for female students. This could a power problem, as we only have few students in grade 9. The lack of a significant effect for female students could of course also be a power problem, given the low number of observations. However, there are fewer males than females in the sample, and the coefficient are much larger for males than for females, whereas the standard errors are much larger (about similar number). Therefore, even if we *do* have a power problem and there potentially is an effect for females as well, we can definitely conclude that the effect is much larger for male students.

[Table 12 around here]

[15] The full tables with first stages, ITT and OLS-results are available in the appendix.
[16] The full tables with first stages, ITT and OLS-results can be found in the appendix.

b. The effect of the parental app on math and language performance

The outcome we discussed so far is the immediate goal of the intervention, but also an instrumental one. Ultimately, the goal of the innovation of the teaching process by using the homework tool and getting parents to help motivate students to use it, is the improvement of skills. Therefore, we repeated the above evaluation procedure with math and language test results as outcomes. It is important to mention that we only register whether parents log on to the app, but that we cannot see whether they look at the math or language performance and use of the homework tool of their child. Therefore, so far, we have focussed on use of the homework tool in general, without making the distinction between math and language, as we cannot say anything about that. However, performance of students is measured for math and language separately and as these are two very different domains of performance, we will analyse them separately here.

Tables 13 summarize the main results. For math, we see that the LATE (IV) estimates suggest that the stimulus to parental involvement given by the app is effective in raising the math performance of students, but the overall results are driven by the strong results of 8th grade students. For language, we do not see any results.[17].

[Table 13 around here]

As for the subsamples by SES, home situation and gender, the previous findings that the results are driven by male students are confirmed by the analyses of the effect of the use of the app on the math performance of students. We find a significant effect of app use on math performance of male students, but not for female students, and we do not find any effect for language[18].

As for the different SES-groups, we only find a significant effect on performance for grade 7 and 9 students from the high SES-group for math, of neither math nor language. This is interesting, as the effect of parental involvement on use of the homework tool was the highest for low-SES students.

6. Robustness analyses

[17] Note that we also hardly found any results for language in the study on the effect of the use of the homework tool by students on their performance, whereas we did find results for math (C. Haelermans & J. Ghysels, 2015 unpublished research report in Dutch). The current findings are in line with these previous findings.
[18] Results available upon request from the corresponding author.

As robustness analyses, of which all the results can be found in Table 14, we first of all check the specification of the use of the app, where we have used a dummy for the use of the app as our indicator. We first checked the logarithm and next linear use of the number of times the parents used the app, where the results are fairly similar in significance (see Table 14).

As another robustness analyses we define the SES-groups differently (results also in Table 14). First, we do not create tertiles but quartiles. In these results, we find that the positive effect of grade 7 and 8 are still driven by the lowest SES-group, whereas the negative effect of grade 9 is still driven by the highest SES-group. We do not find significant results for the middle two groups. Next, we do not create equal SES-groups, but use the mean and standard deviation to create groups. As it generates too small groups for high- and low-SES if we use the mean plus and minus one standard deviation, we decide to work with plus and minus half a standard deviation. Although the groups are still small for low- and high-SES (420, 1263 and 753 for low-, medium- and high-SES, respectively), the number of observations in these groups are acceptable. These analyses confirm the finding of the negative effect in grade 9 for high-SES students. However, the positive findings for grade 7 and 8 are found in the medium-SES group, and not in the lower SES-group. Careful analysis of which students end up in which group, depending on how the groups are defined, can explain this. The group of students that end up in the low-SES group when we make 3 or 4 (relatively) equally sized groups (so the students in the low-SES group that have the relatively highest SES in that group), end up in the medium-SES group when we use the mean plus and minus half a standard deviation (so the students with the lowest SES in the medium group), which derives from a non-symmetric SES-distribution.

If we do not define SES based on the SES-variable created by the SCP, but for example use the average disposable income of the 4-digit postal code as a proxy for SES, we find very similar results as to what we discussed above (see Table 14).

[Table 14 around here]

7. Mechanisms

a. Correlation results between student and parental questionnaires

In order to get an idea about the mechanisms behind the effects that we found above in 5a and 5b, we run correlations between the answers of students in the student questionnaire, about

the (desired level of) parental involvement, and the answers of parents in the parental questionnaire, about their involvement.

Table 15 shows these correlations (and their statistical significance). Note that we only include two questions from the student questionnaire, which are the same questions that were also included in the regression analyses of parts 5a and 5b, namely whether the student would like more help from the parent with homework, and whether the student feels that the parent should interfere less. A third student indicator is the number of minutes the students has worked in the homework tool. Note that this indicator appears twice in the correlation table, both as the first variable in the vertical list and the third variable in the horizontal listing of variables, as the results show that this is also related to the two questions from the student questionnaire. As for the parental questionnaire, we included all questions on parental involvement that are present in the questionnaire. The results are presented for the total sample, but also for the three grades separately. This is done as we also found very different results for the different grades in the previous two sections, and different results on the correlations might help explain or confirm the earlier findings.

As for the first student question, Table 15 first of all shows that overall, students who would like more help from their parents, have significantly less agreements with their parents on homework and have parents that ask significantly less about progress at school (both indicating that they would like more formal involvement than they are receiving at the moment). These results are driven by 8th grade students. Overall parents of students that would like more help, do indicate that they also help their child often with homework and computer use, of which the former is driven by 7th and 8th grade students, and, interestingly, the latter by 9th grade student. Lastly, the parents of students that indicate they would like more help, also indicate that they feel their child needs more help. For the individual grades, this is found for 7th and 9th grade students.

As for the second student question, students who feel their parents should interfere less, spend significantly less time in the homework tool, and have parents that indicate that they do not talk much with the child about school, although the child *does* need much help. That students practice less in the tool is mainly driven by 9th grade students, and to some extent also by 8th grade students. The finding that students who want their parents to interfere less have parents that also talk less with the child about school is driven by 8th grade students, whereas the finding that parents feel that the student needs (much) help, while the students feel that their parents should interfere less is found for both 7th and 9th grade students.

As for the number of minutes spent in the practice tool, this is positively related to the number of times the parents have used the app (found for all three grades), is negatively related to the way parents feel about whether their child needs a lot of help (if parents feel less help is needed, students practice more) and is negatively related to whether the parent helps the child when the motivation is gone, implying that if the parents try to help the child without motivation, the child practices less in the homework tool. The latter two findings are only significant for 9th grade students.

[Table 15 around here]

b. Combined results of regressions and questionnaires

If we now relate the above described findings for the mechanisms with the earlier findings on the effect of the use of the app on both use of the homework tool and math performance, we see a couple of interesting aspects. In Section 5a we first of all found that 7th and 8th grade students were positively and significantly influenced to practice more in the tool if parents used the app more often (only significant at the 10 percent level for 7th grade students), whereas 9th grade students were negatively and significantly influenced. In Section 5b, we found that 8th grade students also have a significantly higher math score if parents check the app more often, whereas we do not find a result for 7th and 9th grade students or for language.

The two positive effects for 8th grade students (and for the effect on the use of the tool also for 7th grade students) can be explained, and are also grounded by the findings from the correlations in Table 15, that these age groups of students are still more inclined to listen to their parents and accept parental involvement. We see this in Table 15, where 7th and 8th grade students that would like more help also get a lot of help from their parents, and where 7th grade students of which parents say they need a lot of help also would like more help. Eighth grade students that get more help when their motivation is gone also would like to have more help. On the other hand, if we look at 9th grade students, where we find a negative effect of parental involvement on using the homework tool, these students are already adolescents that accept less from their parents and are often obstreperous, we also see this in Table 15. Ninth grade students practice less if parents help more with homework or the computer, if parents feel they need more help and if parents try to help them if their motivation is gone. Furthermore, if 9th grade students feel that parents should interfere less they also practice less. They also feel that parents should interfere less if parents feel the

student need a lot of help. These findings indicate the obstreperous behaviour of the 9th grade students that can in turn explain the earlier findings on the effect of the use of the app by parents and is in line with previous findings regarding the link between parental involvement and student behaviour reported on in the literature (Hoover-Dempsey et al., 2001; Patall et al., 2008).

8. Conclusion and Discussion

In this paper we analyzed the effect of parental involvement on the use of a digital homework practice tool and on math performance of all students in grade 7 to 9 of two secondary schools in the Netherlands. The experiment consisted of an app in which parents can follow their child's practice behavior in the digital homework tool, using a randomized field experiment at the individual level. For additional information on parental involvement both students and parents were asked to fill out a questionnaire.

We analyzed the results both from the viewpoint of the provision of access to the tool ("Intent to Treat", ITT) and concerning the intensity of the effective use of the app, controlling for non-compliance via Instrumental Variable-analysis (2SLS-IV). Both analyses show that parental involvement via app-use positively affects practice behavior of 7th and 8th grade students, but negatively affects practice behavior of 9th grade students. Furthermore, we find positive effects of the use of the app on students' math score at the end of the experiment, which is mainly driven by the 8th grade students.

Subgroup analyses shows that the positive and significant effects that are found (both on the use of the homework tool for grades 7 and 8 and on math performance in grade 8) are due to the male students and the low-SES students, whereas the negative effect of the parental app on the use of the homework tool in grade 9 is mainly due to the high-SES students.

As such our results add to the rather limited existing experimental literature on interventions to raise parental involvement. In contrast with intensive interventions like those reported about by Bergman (2015) and Mayer et al. (2015), giving access to a parent app linked to an existing digital homework tool, requires little effort for the school and the teachers. Nevertheless, it proved effective in raising involvement and beneficial to the learning progress of the students.

Both the parental and the student questionnaire shed additional light on how students and parents experience parental involvement and how students feel about that. For first and 8th grader students, parents and students are very much aligned with respect to how they look

at parental involvement and when it might be needed, whereas there is a clear discrepancy in this for 9th grade students and their parents.

The difference in findings between the different grade levels and the different-SES groups is intriguing and one could wonder whether there would be a substitution effect. For example, high-SES parents might use the school administrative system more often and therefore feel that they do not need the app. However, if we check the data, we do not see any correlation between SES-status (neither high nor low SES-status) and use of the school administrative system. The general correlation (not split up by SES) is quite small as well ($r=0.06$; $p=0.00$). Furthermore, one could argue that high-SES parents that use the app are more effective for the use of the homework tool by their children, because high-SES children might already perform quite well, and therefore do not need to practice that often. However, here again the data shows that this is not the case, there does not seem to be a relationship between SES-status and performance levels for math and language.

Another possible substitution effect could possible show in the answers from the parental questionnaire, or the fact that parents filled it out at all. Maybe high-SES involved parents prefer to show their involvement in another way than by using an app. However, we do not find any correlation between the answers to the parental questionnaire and SES-status, and the correlation between filling out the questionnaire and downloading/using the app is significant and positive, although rather small ($r=0.10$).

Lastly, one could argue that more involved, high-SES parents might be less inclined to download the app in the first place, because they realise they only have a 50% chance of belonging to the treatment group, and they rather invest their energy in other involvement with their child's school career. However, again, we do not find a relationship between SES-status and whether the parents downloads or uses the app. The share of parents that downloads is highest for the low-SES group, followed by the high-SES group, with very small differences.

All in all, there does not seem to be a substitution effect that can explain our findings that effects of parental involvement on student homework behaviour are mainly found for low-SES students. It is possible that the specific question of the school to be involved as a parent by using the app on the smartphone has specifically triggered low-SES parents who are not so much involved just by intrinsic motivation, whereas medium and high-SES parents are more intrinsically motivated to be involved anyway, whether the school asks or not.

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Figure 1 – Timeline of the Experiment

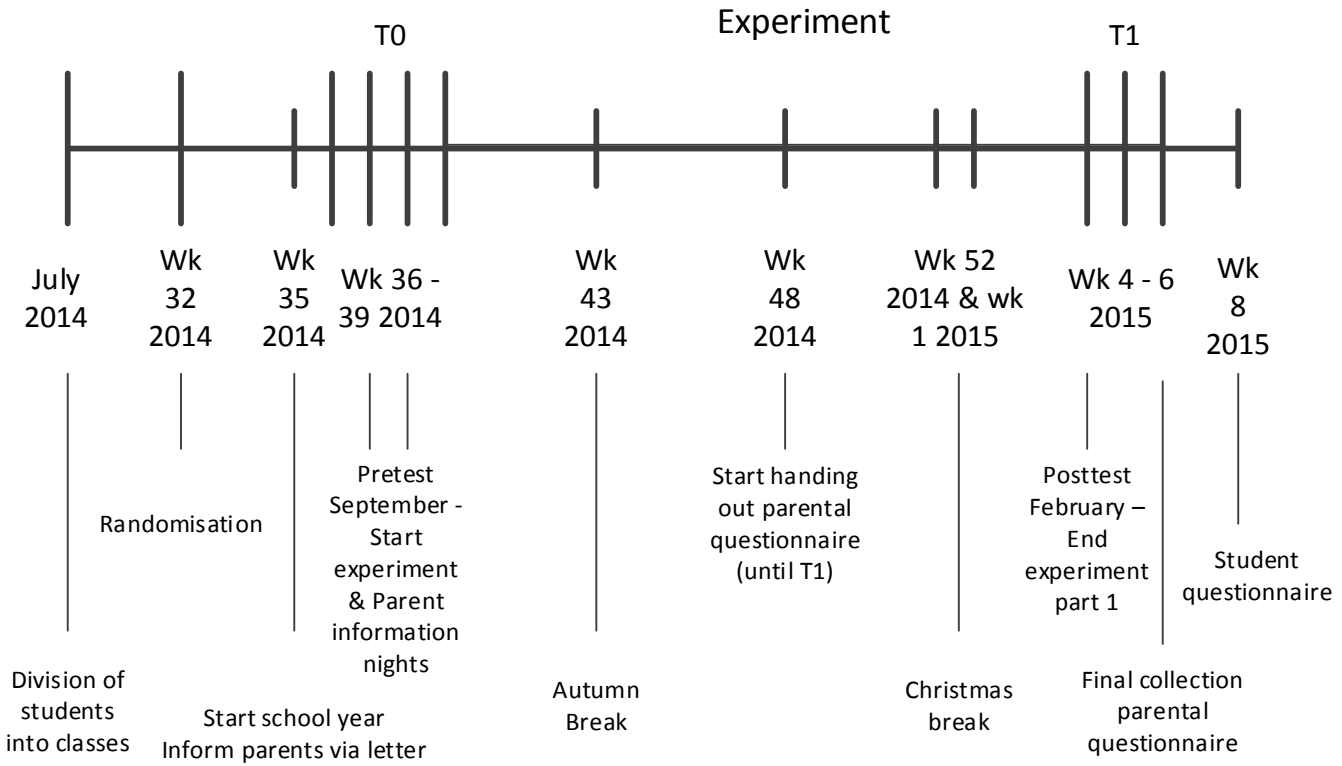

Table 1 – Student characteristics

	Obs	Average	St. Dev	Min	Max
Primary school ability test total score	2,450	536.29	9.02	501	550
Female	2,450	0.56	0.50	0	1
Birth country (1=NL, 0=other)	2,450	0.97	0.17	0	1
Age (in full years)	2,450	12.92	0.98	10	16
Situation at home (1=both parents at home, 0=parents divorced or one parent deceased)	2,450	0.83	0.37	0	1
school	2,450	1.49	0.50	1	2
SES-variable	2,436	-0.05	0.85	-2.59	1.63

Table 2 – Student Questionnaire

	Obs	Average	St. Dev	Min	Max
Filled out student questionnaire	2,450	0.66	0.47	0	1
Filled out student questionnaire (grade 7)	879	0.65	0.48	0	1
Filled out student questionnaire (grade 8)	849	0.70	0.46	0	1
Filled out student questionnaire (grade 9)	722	0.63	0.48	0	1

Student Questionnaire	Filled out			Did not fill out			
	Obs	Average	St. Dev	Obs	Average	St. Dev	T-stat of comparison
Primary school ability test total score	1,619	536.73	8.78	831	535.45	9.42	-3.33
Female	1,619	0.55	0.50	831	0.57	0.50	0.91
Birth country (1=NL, 0=other)	1,619	0.97	0.16	831	0.96	0.20	-1.77
Age (in full years)	1,619	12.90	0.96	831	12.96	1.02	1.41
Situation at home (1=both parents at home, 0=parents divorced or one parent deceased)	1,619	0.86	0.34	831	0.78	0.42	-5.57
School	1,619	1.38	0.48	831	1.71	0.46	16.22
SES-variable	1,612	0.03	0.76	824	-0.20	1.00	-6.54
Grade 7	1,619	0.35	0.48	831	0.37	0.48	0.61
Grade 8	1,619	0.37	0.48	831	0.31	0.46	-2.69
Grade 9	1,619	0.28	0.45	831	0.32	0.47	2.16

Table 3 – Practice time in online homework tool (complete experimental period)

All students					
	Obs	Average	St. Dev	Min	Max
Total minutes practiced	1,619	13.46	15.14	0	93.22
Total minutes practiced (grade 7)	574	16.03	16.87	0	93.22
Total minutes practiced (grade 8)	591	11.18	12.99	0	92.57
Total minutes practiced (grade 9)	454	13.17	14.97	0	85.36

Students who practiced at least once					
	Obs	Average	St. Dev	Min	Max
Total minutes practiced	1,403	15.53	15.25	0.13	93.22
Total minutes practiced (grade 7)	536	17.16	16.89	0.13	93.22
Total minutes practiced (grade 8)	525	12.59	13.12	0.24	92.57
Total minutes practiced (grade 9)	342	17.49	14.90	0.37	85.36

Table 4 – Parental use of online student registration system (complete experimental period)

All parents	Obs	Average	St. Dev	Min	Max
Number of times parents checked online student registration system	1,619	34.50	71.76	0	891
Number of times parents checked online student registration system (grade 7)	574	40.05	67.94	0	470
Number of times parents checked online student registration system (grade 8)	591	33.60	70.84	0	637
Number of times parents checked online student registration system (grade 9)	454	28.65	77.11	0	891

Parents who used at least once	Obs	% of total	Average	St. Dev	Min	Max
Number of times parents checked online student registration system	1,162	72%	48.07	80.77	1	891
Number of times parents checked online student registration system (grade 7)	385	67%	59.71	75.56	1	470
Number of times parents checked online student registration system (grade 8)	427	72%	46.51	79.68	1	637
Number of times parents checked online student registration system (grade 9)	350	77%	37.17	86.03	1	891

Table 5 – Parental Questionnaire

	Obs	Average	St. Dev	Min	Max
Filled out parental questionnaire	1,619	0.35	0.48	0	1
Filled out parental questionnaire (grade 7)	574	0.45	0.50	0	1
Filled out parental questionnaire (grade 8)	591	0.32	0.47	0	1
Filled out parental questionnaire (grade 9)	454	0.27	0.44	0	1

Parental Questionnaire	Filled out			Did not fill out			
	Obs	Average	St. Dev	Obs	Average	St. Dev	T-stat of comparison
Primary school ability test total score	571	538.59	8.03	1,048	535.71	9.00	-6.37
Female	571	0.56	0.50	1,048	0.55	0.50	0.59
Birth country (0=NL, 1=other)	571	0.98	0.15	1,048	0.97	0.17	-0.70
Age (in full years)	571	12.67	0.95	1,048	13.02	0.94	7.16
Situation at home (0=both parents at home, 1=parents divorced or one parent deceased)	571	0.91	0.29	1,048	0.84	0.37	-3.90
school	571	1.35	0.48	1,048	1.39	0.49	1.66
SES-variable	570	0.05	0.74	1,042	0.02	0.77	-0.85
Grade 7	571	0.45	0.50	1,048	0.30	0.46	-6.10
Grade 8	571	0.34	0.47	1,048	0.38	0.49	1.77
Grade 9	571	0.21	0.41	1,048	0.32	0.47	4.55

Table 6 – Math and language tests

	Obs	Average	St. Dev	Min	Max
Score math pretest	1,582	88.79	44.53	7.67	162.33
Score math posttest	1,552	110.35	40.44	10.33	165.33
Score math pretest (grade 7)	559	46.34	11.38	7.67	71.33
Score math posttest (grade 7)	554	61.14	12.21	10.33	86.67
Score math pretest (grade 8)	576	99.14	40.07	19.67	162.33
Score math posttest (grade 8)	566	135.33	21.09	33.33	165.33
Score math pretest (grade 9)	447	128.52	28.61	38.67	162.33
Score math posttest (grade 9)	432	140.74	15.93	84.67	165.33
Score language pretest	1,490	175.33	36.38	40.00	237.00
Score language posttest	1,452	159.10	38.96	36.25	237.00
Score language pretest (year 1)	497	203.12	17.41	53.75	221.00
Score language posttest (year 1)	553	135.65	22.03	36.25	160.50
Score language pretest (year 2)	564	158.89	35.79	40.00	217.50
Score language posttest (year 2)	494	166.01	38.54	55.75	234.50
Score language pretest (year 3)	429	164.73	34.68	93.50	237.00
Score language posttest (year 3)	405	182.70	40.06	96.50	237.00

Table 7 – Download statistics app

	Obs	Average	St. Dev	Min	Max
Downloaded parental app	1,619	0.19	0.39	0	1
Downloaded parental app (grade 7)	574	0.21	0.41	0	1
Downloaded parental app (grade 8)	591	0.19	0.39	0	1
Downloaded parental app (grade 9)	454	0.17	0.37	0	1

Parental app	Downloaded			Not downloaded			
	Obs	Average	St. Dev	Obs	Average	St. Dev	T-stat of comparison
Primary school ability test total score	309	538.10	8.46	1,310	536.40	8.82	-3.07
Female	309	0.54	0.50	1,310	0.55	0.50	0.46
Birth country (0=NL, 1=other)	309	0.98	0.13	1,310	0.97	0.17	-1.26
Age (in full years)	309	12.76	0.94	1,310	12.93	0.96	2.75
Situation at home (0=both parents at home, 1=parents divorced or one parent deceased)	309	0.87	0.34	1,310	0.86	0.34	-0.36
school	309	1.52	0.50	1,310	1.34	0.48	-5.71
SES-Variable	309	-0.05	0.84	1,303	0.05	0.74	2.09
Grade 7	309	0.39	0.49	1,310	0.35	0.47	-1.51
Grade 8	309	0.36	0.48	1,310	0.36	0.48	0.10
Grade 9	309	0.25	0.43	1,310	0.29	0.45	1.49

Table 8 – Compliance in usage app

Use of parental app	A=1;P=1			A=0;P=0			A=1;P=0		
	Obs	Average	St. Dev	Obs	Average	St. Dev	Obs	Average	St. Dev
Primary school ability test total score	181	537.83	8.43	684	536.62	9.21	754	536.56	8.44
Female	181	0.54	0.50	684	0.55	0.50	754	0.56	0.50
Birth country (0=NL, 1=other)	181	0.99	0.10	684	0.97	0.17	754	0.97	0.16
Age (in full years)	181	12.77	0.96	684	12.91	0.96	754	12.92	0.96
Situation at home (0=both parents at home, 1=parents divorced or one parent deceased)	181	0.88	0.32	684	0.84	0.36	754	0.88	0.33
school	181	1.47	0.50	684	1.42	0.49	754	1.32	0.47
SES-Variable	181	-0.06	0.85	680	0.04	0.79	751	0.05	0.71
Grade 7	181	0.39	0.49	684	0.35	0.48	754	0.35	0.48
Grade 8	181	0.33	0.47	684	0.38	0.49	754	0.36	0.48
Grade 9	181	0.28	0.45	684	0.27	0.44	754	0.29	0.45

Table 9 – Usage statistics app

	Obs	Average	St. Dev	Min	Max
Number of times used parental app	181	17.75	21.80	1	133
Number of times used parental app (grade 7)	71	17.07	17.89	1	93
Number of times used parental app (grade 8)	60	20.18	28.12	1	133
Number of times used parental app (grade 9)	50	15.80	18.01	1	77

Table 10 – The effect of parental use of the app on students' use of the homework tool

	First stage								ITT							
	dependent: Log the Dummy whether the parents used the app								dependent: Dummy whether the child used the homework tool							
	Total		Grade 7		Grade 8		Grade 9		Total		Grade 7		Grade 8		Grade 9	
Assignment experiment	0.193	(0.016)***	0.209	(0.027)***	0.183	(0.025)***	0.195	(0.030)***	0.632	(0.761)	2.277	(1.407)	2.442	(1.055)**	-3.379	(1.396)**
Primary school ability test total score	-0.002	(0.001)	-0.001	(0.002)	-0.003	(0.002)*	-0.002	(0.003)	0.030	(0.060)	0.038	(0.114)	0.057	(0.080)	-0.141	(0.116)
Female	-0.019	(0.016)	-0.004	(0.027)	-0.027	(0.025)	-0.033	(0.031)	1.665	(0.776)**	1.062	(1.417)	2.024	(1.087)*	3.138	(1.427)**
Age	-0.030	(0.015)**	-0.018	(0.027)	-0.063	(0.024)***	-0.002	(0.028)	-1.265	(0.734)*	-0.251	(1.373)	-1.559	(1.043)	-2.673	(1.282)**
Dutch	0.046	(0.050)	0.129	(0.102)	0.042	(0.070)	-0.027	(0.096)	-0.716	(2.431)	1.291	(5.275)	-1.489	(3.002)	-0.965	(4.40)
Situation at home	0.002	(0.023)	-0.039	(0.040)	0.015	(0.036)	0.026	(0.044)	2.679	(1.112)**	6.004	(2.075)***	0.614	(1.531)	1.706	(2.030)
Use of admin system	0.000	(0.000)***	0.000	(0.000)**	0.000	-0.0	0.000	(0.000)*	-0.001	(0.005)	0.009	(0.010)	-0.001	(0.007)	-0.006	(0.009)
Constant	1.197	(0.697)*	0.802	(1.252)	2.258	(1.049)**	0.956	(1.481)	10.859	(34.143)	-13.123	(64.813)	-2.173	(45.028)	126.132	(68.009)*
R-squared	0.11		0.12		0.14		0.13		0.04		0.08		0.11		0.15	
N	1585		560		581		444		1585		560		581		444	
F-statistic	13.38		5.70		7.01		5.01		4.60		3.79		5.38		5.81	

	OLS								IV/2SLS							
	dependent: Dummy whether the child used the homework tool								dependent: Dummy whether the child used the homework tool							
	Total		Grade 7		Grade 8		Grade 9		Total		Grade 7		Grade 8		Grade 9	
Dummy app used	8.783	(1.159)***	13.293	(2.032)***	8.222	(1.693)***	3.030	(2.125)	3.273	(3.90)	10.915	(6.517)*	13.324	(5.713)**	-17.286	(7.900)**
Primary school ability test total score	0.043	(0.059)	0.055	(0.110)	0.082	(0.079)	-0.178	(0.115)	0.036	(0.060)	0.053	(0.110)	0.098	(0.081)	-0.174	(0.127)
Female	1.783	(0.762)**	1.116	(1.368)	2.246	(1.071)**	2.619	(1.416)*	1.726	(0.769)**	1.109	(1.369)	2.387	(1.090)**	2.559	(1.560)
Age	-0.987	(0.722)	-0.022	(1.326)	-1.060	(1.032)	-2.612	(1.288)**	-1.166	(0.738)	-0.057	(1.330)	-0.722	(1.101)	-2.714	(1.419)*
Dutch	-1.107	(2.389)	-0.363	(5.094)	-1.823	(2.957)	-1.160	(4.419)	-0.865	(2.411)	-0.114	(5.141)	-2.054	(2.990)	-1.425	(4.866)
Situation at home	2.575	(1.091)**	6.477	(1.999)***	0.482	(1.507)	1.007	(2.031)	2.671	(1.101)**	6.430	(2.005)***	0.414	(1.521)	2.152	(2.276)
Use of admin system	-0.004	(0.005)	0.003	(0.010)	-0.001	(0.007)	-0.007	(0.009)	-0.002	(0.005)	0.004	(0.011)	-0.002	(0.007)	0.000	(0.010)
Constant	1.246	(33.558)	-23.598	(62.579)	-19.872	(44.507)	144.356	(67.902)**	6.941	(34.017)	-21.874	(62.818)	-32.254	(46.773)	142.661	(74.772)*
R-squared	0.08		0.15		0.14		0.14		0.06		0.14		0.12		.	
N	1585		560		581		444		1585		560		581		444	
F-statistic	8.54		7.14		6.94		5.47		4.70		4.06		5.47		4.75	

Controls = math homework time, parental involvement questions student questionnaire, ses, school, type of education, year

standard errors between brackets

* p<0.1; ** p<0.05; *** p<0.01

Table 11 – The effect of parental use of the app on students' use of the homework tool – By SES

	IV/2SLS - Low SES								IV/2SLS - Medium SES							
	dependent: Number of times the child used the homework tool								dependent: Number of times the child used the homework tool							
	Total		Grade 7		Grade 8		Grade 9		Total		Grade 7		Grade 8		Grade 9	
Dummy app used	12.062	(6.027)**	26.680	(11.553)**	12.474	(6.467)*	-28.350	(24.484)	2.564	(8.604)	-3.261	(12.378)	17.358	(16.579)	-5.438	(14.713)
Primary school ability test total score	0.061	(0.102)	0.221	(0.213)	0.080	(0.124)	-0.535	(0.329)	0.086	(0.114)	0.103	(0.249)	0.119	(0.187)	0.043	(0.253)
Female	1.659	(1.252)	1.466	(2.457)	2.708	(1.611)*	3.799	(3.653)	4.545	(1.543)***	2.290	(3.157)	5.706	(2.608)**	2.553	(2.520)
Age	-0.910	(1.166)	-2.582	(2.156)	1.281	(1.590)	-4.477	(3.216)	0.939	(1.434)	3.080	(3.032)	-2.467	(2.356)	2.319	(2.634)
Dutch	-1.686	(3.506)	-14.218	(7.920)*	-1.020	(4.136)	-2.834	(10.104)	1.380	(4.312)	10.123	(10.710)	2.113	(6.228)	-6.851	(6.962)
Situation at home	2.463	(1.631)	2.200	(3.239)	1.093	(2.056)	4.141	(4.249)	5.121	(2.373)**	9.476	(4.749)**	1.052	(4.249)	3.823	(3.970)
Use of admin system	-0.007	(0.010)	-0.001	(0.018)	-0.013	(0.011)	0.027	(0.048)	0.007	(0.012)	0.019	(0.023)	0.007	(0.016)	0.019	(0.038)
Constant	-11.240	(57.362)	-68.550	(117.763)	-53.053	(70.501)	359.686	(198.671)*	-50.906	(65.343)	-98.559	(142.459)	-27.389	(102.894)	-43.887	(159.388)
R-squared	0.07		0.07		0.17		.		0.12		0.12		0.17		0.16	
N	609		205		246		158		460		160		152		148	
F-statistic	2.01		1.71		3.49		1.27		3.50		1.99		1.93		2.55	

IV/2SLS – High SES

	dependent: Number of times the child used the homework tool							
	Total		Grade 7		Grade 8		Grade 9	
Dummy app used	-5.551	(6.592)	4.076	(10.882)	13.085	(10.949)	-22.719	(12.370)*
Primary school ability test total score	-0.065	(0.102)	-0.064	(0.184)	0.119	(0.133)	-0.171	(0.226)
Female	-0.610	(1.366)	1.704	(2.352)	-0.886	(1.848)	-0.761	(3.110)
Age	-3.633	(1.338)***	-0.582	(2.585)	-2.162	(2.068)	-7.622	(2.559)***
Dutch	-7.024	(5.985)	5.328	(11.532)	-11.354	(6.753)*	-0.909	(16.557)
Situation at home	0.553	(2.026)	4.247	(3.926)	0.827	(2.590)	-5.478	(4.573)
Use of admin system	-0.007	(0.008)	-0.009	(0.018)	0.004	(0.014)	-0.006	(0.011)
Constant	99.542	(59.246)*	39.964	(110.491)	-12.484	(80.978)	219.031	(132.733)
R-squared	0.00		0.11		0.14		.	
N	516		195		183		138	
F-statistic	1.67		1.37		2.03		2.40	

Controls = math homework time, parental involvement questions student questionnaire, ses, school, type of education, year

standard errors between brackets

* p<0.1; ** p<0.05; *** p<0.01

Table 12 – The effect of parental use of the app on students' use of the homework tool – By home situation and gender

	IV/2SLS - both parents at home								IV/2SLS - Not both parents at home							
	dependent: Number of times the child used the homework tool								dependent: Number of times the child used the homework tool							
	Total		Grade 7		Grade 8		Grade 9		Total		Grade 7		Grade 8		Grade 9	
Dummy app used	0.230	(4.203)	8.895	(7.543)	10.041	(5.689)*	-16.100	(8.293)*	23.430	(11.120)**	24.274	(13.245)*	37.573	(20.158)*	-46.665	(33.491)
Primary school ability test total score	-0.007	(0.066)	-0.038	(0.128)	0.086	(0.086)	-0.152	(0.140)	0.141	(0.141)	0.442	(0.231)*	-0.060	(0.220)	-0.575	(0.407)
Female	1.723	(0.828)**	0.861	(1.515)	2.932	(1.123)***	2.112	(1.674)	1.144	(2.189)	2.824	(3.685)	0.391	(3.255)	8.216	(5.530)
Age	-0.956	(0.808)	-0.229	(1.494)	-0.313	(1.152)	-2.319	(1.538)	-2.803	(1.933)	-1.467	(3.390)	-1.795	(3.012)	-5.707	(4.530)
Dutch	-1.190	(2.940)	0.066	(5.899)	-4.181	(3.343)	-1.723	(7.087)	-0.252	(4.510)	-3.623	(11.774)	1.599	(6.429)	0.205	(8.197)
Situation at home	0.000	-0.0	0.000	-0.0	0.000	-0.0	0.000	-0.0	0.000	-0.0	0.000	-0.0	0.000	-0.0	0.000	-0.0
Use of admin system	0.002	(0.006)	0.010	(0.011)	0.001	(0.007)	0.001	(0.011)	-0.056	(0.022)**	-0.057	(0.032)*	-0.053	(0.040)	0.012	(0.062)
Constant	31.290	(37.807)	35.039	(73.312)	-27.010	(49.716)	126.954	(82.690)	-40.768	(81.532)	-212.537	(133.539)	47.941	(120.614)	406.350	(238.219)*
R-squared	0.05		0.12		0.12		.		0.12		0.02		0.49		0.09	
N	1371		486		502		383		214		74		79		61	
F-statistic	4.85		2.79		5.84		4.02		1.29		1.12		2.79		1.84	

	IV/2SLS - Males								IV/2SLS - Females							
	dependent: Number of times the child used the homework tool								dependent: Number of times the child used the homework tool							
	Total		Grade 7		Grade 8		Grade 9		Total		Grade 7		Grade 8		Grade 9	
Dummy app used	8.301	(5.365)	23.268	(9.812)**	15.711	(9.137)*	-14.299	(9.175)	-2.172	(5.853)	-1.638	(8.825)	11.384	(7.806)	-18.344	(13.345)
Primary school ability test total score	0.128	(0.087)	0.391	(0.180)**	0.124	(0.126)	-0.305	(0.168)*	-0.042	(0.084)	-0.214	(0.145)	0.082	(0.112)	-0.109	(0.184)
Female	0.000	-0.0	0.000	-0.0	0.000	-0.0	0.000	-0.0	0.000	-0.0	0.000	-0.0	0.000	-0.0	0.000	-0.0
Age	-0.291	(1.055)	1.579	(2.174)	-0.086	(1.484)	-3.130	(1.825)*	-2.103	(1.055)**	-0.978	(1.694)	-2.230	(1.789)	-2.926	(2.084)
Dutch	0.984	(3.716)	5.000	(10.10)	0.213	(4.813)	-4.721	(6.221)	-2.756	(3.245)	-2.920	(5.953)	-4.601	(4.138)	2.212	(7.335)
Situation at home	2.477	(1.691)	7.735	(3.092)**	-2.553	(2.491)	4.181	(3.368)	2.862	(1.483)*	6.121	(2.749)**	2.234	(1.994)	0.631	(3.034)
Use of admin system	-0.003	(0.006)	-0.008	(0.014)	-0.001	(0.009)	-0.003	(0.010)	0.005	(0.010)	0.028	(0.017)*	0.001	(0.014)	0.001	(0.025)
Constant	-52.443	(49.718)	-225.028	(102.013)**	-51.999	(70.418)	216.291	(100.801)**	61.846	(47.736)	133.678	(81.669)	-2.686	(67.085)	113.557	(107.249)
R-squared	0.09		0.17		0.06		0.06		0.02		0.13		0.16		.	
N	704		257		265		182		881		303		316		262	
F-statistic	2.66		2.09		2.64		4.00		2.43		3.89		3.55		2.04	

Controls = math homework time, parental involvement questions student questionnaire, ses, school, type of education, year

standard errors between brackets

* p<0.1; ** p<0.05; *** p<0.01

Table 13 – The effect of parental use of the app on student math and language performance

	IV/2SLS - Math								IV/2SLS - Language							
	dependent: Math Score Posttest								dependent: Language Score Posttest							
	Total		Grade 7		Grade 8		Grade 9		Total		Grade 7		Grade 8		Grade 9	
Dummy app used	0.362	(1.040)	2.026	(1.388)	0.795	(2.070)	-0.910	(1.615)	8.040	(3.450)**	5.117	(4.453)	19.372	(7.232)***	1.421	(5.380)
Math score pretest	0.116	(0.013)***	0.336	(0.049)***	0.179	(0.021)***	0.143	(0.025)***	0.124	(0.014)***	0.345	(0.051)***	0.194	(0.023)***	0.146	(0.026)***
Primary school ability test total score	0.982	(0.054)***	0.484	(0.083)***	1.166	(0.102)***	0.924	(0.089)***	0.987	(0.055)***	0.481	(0.084)***	1.210	(0.111)***	0.922	(0.090)***
Female	-0.344	(0.688)	-0.262	(0.932)	-0.276	(1.312)	-0.532	(1.098)	-0.177	(0.704)	-0.221	(0.938)	0.458	(1.435)	-0.496	(1.104)
Age	-1.225	(0.656)*	0.101	(0.909)	-2.440	(1.271)*	-1.191	(1.010)	-0.966	(0.677)	0.156	(0.917)	-1.137	(1.448)	-1.179	(1.012)
Dutch	-0.931	(2.138)	-1.195	(3.359)	0.337	(3.709)	1.196	(3.323)	-1.213	(2.180)	-1.469	(3.396)	-0.311	(3.990)	1.250	(3.334)
Situation at home	0.373	(0.982)	0.431	(1.339)	-0.092	(1.861)	1.212	(1.593)	0.252	(1.002)	0.473	(1.346)	-0.130	(1.999)	1.047	(1.638)
Use of admin system	-0.002	(0.005)	-0.005	(0.007)	0.001	(0.009)	0.003	(0.007)	-0.004	(0.005)	-0.007	(0.007)	-0.002	(0.010)	0.002	(0.007)
Constant	-458.576	(30.789)***	-212.481	(45.735)***	-481.384	(56.719)***	-366.891	(52.535)***	-464.644	(31.462)***	-211.659	(45.970)***	-522.450	(62.772)***	-366.201	(52.693)***
R-squared	0.90		0.32		(0.51)		0.58		0.90		0.32		(0.43)		0.57	
N	1487		528		542		417		1487		528		542		417	
F-statistic	851.93		17.43		(38.93)		39.10		821.82		17.20		(34.27)		38.88	

Controls = math homework time, parental involvement questions student questionnaire, ses, school, type of education, year

standard errors between brackets

* p<0.1; ** p<0.05; *** p<0.01

Table 14 – Robustness analyses

	IV/2SLS - Robustness analyses dependent: Number of times the child used the homework tool							
	Total		Year 1		Year 2		Year 3	
Log times app used	1.701	(1.587)	5.035	(2.776)*	5.491	(2.142)**	-7.33	(3.445)**
Tmes app used - linear	0.228	(0.211)	0.717	(0.403)*	0.655	(0.258)**	-1.15	(0.605)*
Ses quartiles - ses group 1	12.023	(6.026)**	26.477	(11.538)**	12.294	(6.490)*	-28.445	(24.478)
Ses quartiles - ses group 2	-10.683	(17.728)	-39.572	(42.220)	0.686	(19.117)	30.705	(31.366)
Ses quartiles - ses group 3	3.326	(8.741)	2.494	(12.959)	21.353	(19.606)	-10.685	(13.563)
Ses quartiles - ses group 4	-3.35	(7.038)	8.727	(10.846)	9.856	(11.575)	-33.402	(17.083)*
ses + and - 1/2 st. dev - ses group 1	3.339	(5.857)	-0.635	(13.534)	5.544	(8.062)	-23.209	(21.495)
ses + and - 1/2 st. dev - ses group 2	9.448	(6.605)	18.31	(9.970)*	20.893	(10.492)**	-18.268	(15.598)
ses + and - 1/2 st. dev - ses group 3	-4.011	(6.730)	7.33	(11.478)	12.153	(10.890)	-21.526	(12.535)*
Income instead of ses - group 1	4.006	(4.905)	-0.672	(11.602)	16.239	(6.598)**	-17.667	(10.227)*
Income instead of ses - group 2	12.249	(8.785)	25.395	(11.767)**	25.64	(14.462)*	-36.415	(24.482)
Income instead of ses - group 3	-0.871	(6.982)	4.963	(9.868)	-2.101	(15.054)	-7.686	(11.387)

Controls = primary school ability test, gender, age, ethnicity, situation at home, math homework time, parental involvement questions student questionnaire, number of times parents checked online student registration system, school, type of education, year

standard errors between brackets

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 15 – Correlations parental involvement questions student and parental questionnaires

	Total			**grade 7**			**grade 8**			**grade 9**		
	I would like more homework help from parents	Parents should interfere less	Number of minutes in homework tool by child	I would like more homework help from parents	Parents should interfere less	Number of minutes in homework tool by child	I would like more homework help from parents	Parents should interfere less	Number of minutes in homework tool by child	I would like more homework help from parents	Parents should interfere less	Number of minutes in homework tool by child
Number of minutes in homework tool	0.04	**-0.07**	1	**0.07**	0.02	1	-0.04	*-0.07*	1	0.03	**-0.16**	1
	(0.13)	**(0.00)**		**(0.07)**	(0.65)		(0.24)	*(0.06)*		(0.45)	**(0.00)**	
Number of times app checked	0.02	0.03	**0.20**	-0.02	0.03	**0.25**	0.03	0.02	**0.28**	0.05	0.06	**0.14**
	(0.37)	(0.20)	**(0.00)**	(0.61)	(0.51)	**(0.00)**	(0.41)	(0.66)	**(0.00)**	(0.24)	(0.17)	**(0.00)**
Do you have agreements on homework with child	*-0.07*	0.03	-0.01	-0.07	-0.02	-0.04	*-0.13*	0.10	0.08	0.08	-0.04	0.01
	(0.06)	-(0.85)	(0.85)	(0.21)	-(0.37)	(0.37)	*(0.06)*	-(0.16)	(0.16)	(0.34)	-(0.94)	(0.94)
Do you ask child about progress	**-0.12**	-0.03	0.02	-0.05	-0.09	0.04	**-0.17**	-0.02	**0.13**	-0.10	-0.02	-0.07
	(0.00)	(0.48)	(0.62)	(0.40)	(0.15)	(0.38)	**(0.01)**	(0.75)	**(0.03)**	(0.26)	(0.81)	(0.35)
Do you help child with homework	**0.18**	-0.01	-0.05	**0.18**	0.02	-0.04	**0.18**	0.01	-0.04	0.11	-0.06	**-0.17**
	(0.00)	(0.85)	(0.13)	**(0.00)**	(0.72)	(0.44)	**(0.01)**	(0.85)	(0.48)	(0.22)	(0.50)	**(0.02)**
Do you talk to child about school	0.05	**-0.13**	0.02	0.03	-0.07	0.03	0.09	**-0.25**	0.06	-0.05	-0.05	-0.09
	(0.23)	**(0.00)**	(0.49)	(0.58)	(0.23)	(0.61)	(0.16)	**(0.00)**	(0.31)	(0.57)	(0.54)	(0.23)
Does child need little help	-0.10	**-0.10**	**0.07**	*-0.10*	**-0.14**	0.03	-0.04	-0.04	0.08	-0.14	*-0.16*	**0.18**
	(0.01)	**(0.01)**	**(0.05)**	*(0.09)*	**(0.02)**	(0.50)	(0.54)	(0.58)	(0.20)	(0.10)	*(0.07)*	**(0.02)**
Do you help child if motivation is gone	**0.05**	-0.03	**-0.09**	0.01	-0.03	-0.07	*0.12*	-0.06	-0.08	-0.04	0.08	**-0.24**
	(0.19)	(0.46)	**(0.01)**	(0.84)	(0.64)	(0.20)	*(0.09)*	(0.36)	(0.20)	(0.61)	(0.37)	**(0.00)**
Do you help child with computer	**0.14**	-0.02	-0.02	0.09	-0.01	-0.04	0.10	-0.01	0.02	**0.25**	0.01	*-0.12*
	(0.00)	(0.56)	(0.56)	(0.13)	(0.82)	(0.47)	(0.14)	(0.85)	(0.74)	**(0.00)**	(0.91)	*(0.09)*

P-values between brackets

Bold coefficients have a p-value <0.05, italic coefficients have a p-value <0, N = 571

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