Can mentorship improve students' study skills and academic performance?

Erik Liss

Linköping University

Ratio

Karl Wennberg

Stockholm School of Economics

Abstract: Research suggest that tutoring initiatives sometimes, but not always, improve academic performance and help induce interest in the pursuit of higher education. We investigate whether mentorship can improve academic performance and aspirations among lower secondary school students from underprivileged backgrounds by evaluating a collaborative project where three cohorts of ninth graders engaged in weekly meetings with university students during a one-year period. The purpose of the Mentorship Project was to offer study support and to inspire students to pursue higher education. The results indicate that participation in the project led to higher grades in the subjects English, social studies, science, and 'Swedish as a second language' relative to a control group of ninth-graders who did not participate in the project. The participants also accumulated higher grade point averages and were more likely to choose university prep high school programs. Our statistical analysis combined with survey data and interviews with project participants and organizers indicate that clear expectations, which encourage students to commit to regular attendance, coupled with a direct connection to the school, seem to have contributed to the Mentorship Project's success.

Notes:

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Summary

Previous research has explored and evaluated various types of in-school and after-school tutoring activities, but the effectiveness of such projects remain inconclusive. This study examines whether mentorship can improve study skills and academic performance in lower secondary school[1] students from families with limited previous academic experience. We evaluate a collaborative project between a Swedish university and a municipality where three cohorts of ninth-graders from a school with drastically declining study results took part in weekly meetings with university students over a one-year period. The project's main objectives were to offer academic support and to inspire students to pursue higher education.

This study evaluates the effectiveness of the mentorship project by comparing how the students' *grades, choice of high school track* and *school attendance* were affected by project participation. We compare the students who attended the program (the mentorship group) with those who did not participate (the control group). Furthermore, survey responses, attendance at the Mentorship Project's study sessions and comparisons with previous similar projects are taken into consideration. The results show that participation in the Mentorship Project led to higher grades in the subjects English, social studies (SO), science (NO), and 'Swedish as a second language' relative to the control group. The participants also exhibit higher grade point averages.[2] However, we do not find that an increase in grades in either mathematics or any of the practical subjects relative to the control group.

The mentorship group shows higher attendance throughout the semester compared to the control group, but since there is no noticeable variation between the groups during the semester, we are unable to show that the mentorship project has led to higher attendance. Since one of the objectives was to inspire to the pursuit of higher education, we follow up on the progress of students who previously graduated from the school to find out if the mentorship group were more likely to choose university prep programs in high school compared to the control group. We found that students in the mentorship group were twice as likely to choose university prep programs compared to students in the control group.

Since the Mentorship Project is something that the students – about half of the three cohorts – voluntarily chose to participate in, there may be an issue with so-called 'self-selection'. In this case, it infers that the most ambitious students were perhaps also the most likely to participate in the project, so the relative increase in grades and the choice of high school programs would have taken place even without the mentorship activities. This issue is mitigated by controlling for differences in student

[1] Swedish lower secondary school includes grade 7-9 (in other countries often called middle school or Junior high school).
[2] The Swedish grade point average scale is from 10 - 22.5. The better your previous grades, the higher the grade point average.

composition between the mentorship group and the control group, using supplementary statistical models, and by comparing the *estimated effects* with the creation of a variable for *expected effect* per subject. Our analysis indicates that the Mentorship Project most likely contributed to the relative difference in grades between the mentorship group and the control group.

The difference in probability between students in the mentorship and control group to choose a university prep high school program is subject to more uncertainty because the available data does not allow us to use the same comprehensive statistical models we can use for the grades. However, if we compensate for grades before the Mentorship Project, along with students' gender, and whether or not students moved to Sweden during primary school, there remains a fairly large difference in the likelihood of choosing a university prep program (9 percent) between the mentorship group and the control group.

The effect study is supplemented with an analysis of survey responses from participating students, attendance at the mentorship project's tutoring sessions and comparisons with similar projects studied in previous research. The answers from the surveys do not indicate that students apply to the Mentorship Project due to shortcomings in the home environment, but rather because they find the Mentorship Project stimulating. The students also report that they receive a lot of study support in the Mentorship Project compared to at home. However, the students have mixed opinions about the study environment. Some express concern that the environment where the mentor meetings take place - a nearby mall - is a bit too noisy, while other students appreciate the change from school to a 'more relaxed' environment.

Previous research done on tutoring projects indicates that older students often have a lower attendance and are more difficult to attract to tutoring projects. However, attendance at the ongoing mentorship project is generally high. Previous research also shows inconclusive results regarding the effect of tutoring projects on students' academic performance. Our analysis of the effect study, together with survey data and interviews with project participants and organizers, indicates that the Mentorship Project's clear structure where students commit to high attendance, along with the clear connection to school, contributes to that this type of mentorship project can actually affect students' study results and interest in further studies.

Background

2.1 Mentorship Project design

Purpose and background. The Mentorship Project was started in the fall of 2015 as a pilot project at a school in a medium-sized Swedish town. Students from a lower secondary school with deteriorating academic performance were offered to meet regularly with student mentors from various programs at

the nearby university. The purpose of the project was to provide study support and inspire to the pursuit of higher education. The university holding company was responsible for recruiting mentors. The holding company aims to be a link between students and working life. The recruitment process of mentors (university students) was based on gaining as much diversity as possible of the students' academic subject background, as well as their social background, and it was a priority to recruit mentors raised in the same city as the mentees. Similar initiatives that inspired the mentorship project was 'Line 14' in the city of Örebro and 'Good neighbors' in the city of Linköping.

Participants. All students who wished to participate were accommodated in the project. The number of students who participated increased from 21 during the first year, to around 29 students in the second year and 45 students in the third year. In order to meet the growing demand, the number of tutoring sessions was increased from once to twice a week. A teacher at the school was responsible for presenting the project to colleagues and students during all three years.

Project scope. The bulk of the mentorship project's activities consisted of tutoring, where the students went to a nearby mall once a week after school. They did homework, prepared for exams and received academic support from the mentors in two-hour intervals. In addition to helping the students with school work, the mentors must also act as good role models for the students. Besides tutoring, certain other activities that will encourage students' academic motivation and prospects have been organized, such as a visit to the nearby university. The mentors have also accompanied the students who so wished to the yearly high school fair before they have to apply to high school. The mentorship project's activities are thus broader than just study support. 'Tutoring' is an overly narrow theoretical concept to describe the Mentorship Project. In the United States, the terms 'after-school program' or 'out-of-school program' are used for such activities. Since such concepts are not common in Sweden, we use the term 'tutoring' in the article as a term for the activity, even though the Mentorship Project has a somewhat broader span of activities than just tutoring.

Project design. Tutoring programs can take on different forms and layouts. The Swedish National Agency for Education (Skolverket 2014) divides the following between three different forms of tutoring: open study workshop, continuous study support and mandatory tutoring. Open study workshop refers to a form of drop-in activity where students are allowed to come and go as they wish. Swedish examples of tutoring programs with open study workshops are "Linje14" in Örebro and "Good neighbors" in Linköping. 'Continuous student support' means that students commit to participate in tutoring sessions and receive help from the same mentor or tutor every time. A Swedish example of this form of tutoring is 'Läxhjälpen' (the Swedish Homework Help Foundation).[3]

[3] It should be mentioned that the Läxhjälpen tutoring does not include one-on-one sessions. A group usually consists of 15 students, where each tutor has direct responsibility for five students (Läxhjälpen, 2017).

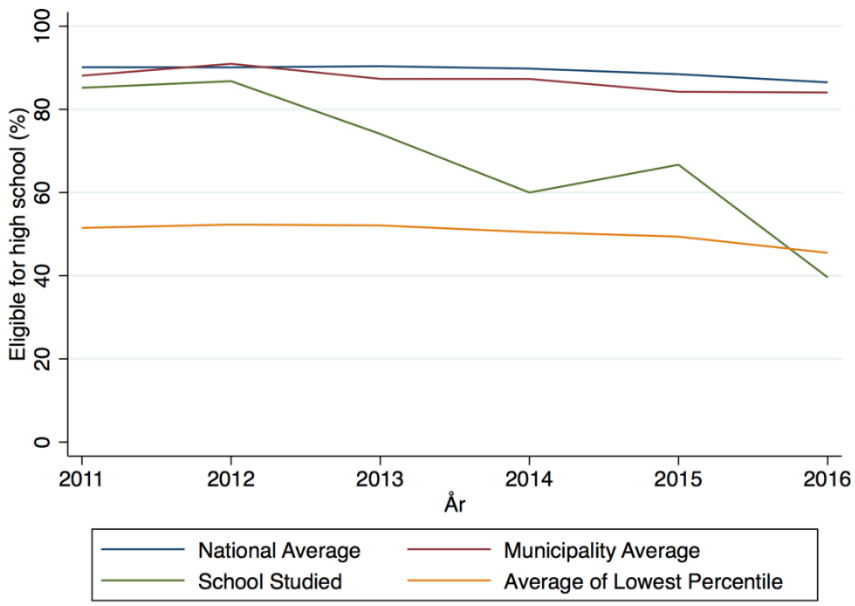
‘Mandatory homework help' means that tutoring is arranged in-house during school hours. The mentorship project can be described as a hybrid between the first two categories. The program run by the Läxhjälpen foundation throughout Sweden is similar to more open study activities in that each student has the opportunity to receive help from different mentors (Läxhjälpen, 2017). The justification has been that students should be able to get impressions and inspiration from various sources. Therefore, as far as possible, the mentors are recruited from diverse educational programs. However, the mentors participate on a regular basis, which gives the students a chance to meet the same mentor repeatedly if they wish, which many students choose to do. According to the project manager, a continuous relationship between the student and one or more mentors during the program was seen as an important part of the mentorship project. However, as a high attendance is required of the students in order for them to continue to participate in the program, the actual participation in the program is more similar to the homework help form continuous study support.

Premises. Tthe mentorship project was based on a 'neutral place' outside the school environment, after school hours. For this purpose, a cafe at a local mall 10 minutes from the school has provided space every week. The cafe is located on an elevated level above the walkway in the mall.

2.3 A school with drastically declining results

The school being studied has previously exhibited fairly stable student results similar to the average for all high schools as well as the municipality in general, but has from 2012 suffered declining student performance resulting in a decreasing proportion of students eligible for high school. Figure 1 below shows how the proportion of high school-qualified graduates has fallen from just below the national and municipal average in 2011 to the lowest percentile in Sweden in 2016.

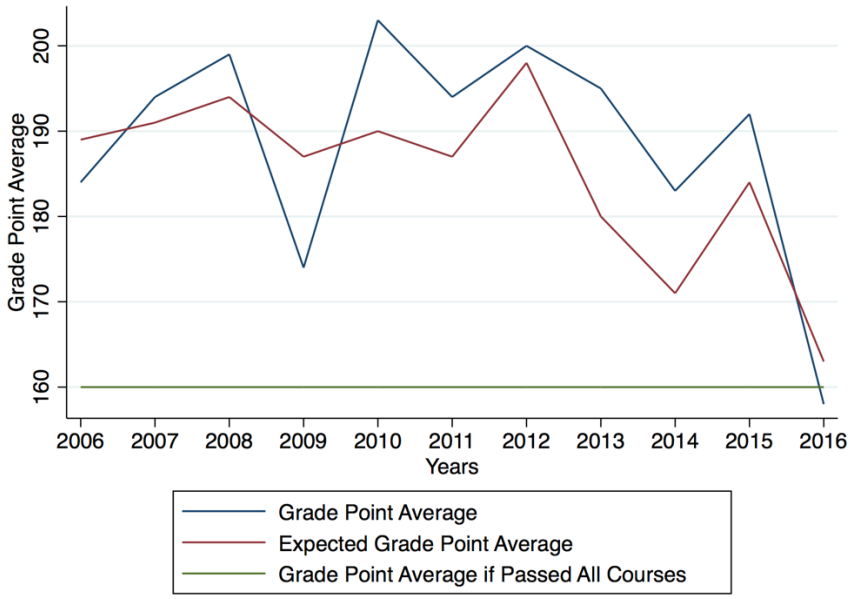
Figure 1. Proportion of those eligible for high school after completing grade school



The proportion of students eligible for high school is not strictly comparable between schools unless the respective student composition is considered. This also applies to the cumulative grade point averages (‘meritvärde’) of the schools. The National Agency for Education has long used the SALSA model to adjust the average grade point average for the graduating cohorts’ socio-economic background.

Figure 2 shows the average grade point average (Swe ‘Meritvärde’) of school graduates (blue line), as well as the calculated grade point average according to SALSA (red line). The green horizontal line shows the grade point average if a student has an E (pass) in all subjects. As we see, the school's actual grades (blue line) follow expected grades (red line) closely. The decline in grades and the proportion of eligible students thus follow what can be expected according to the socio-economic composition of the graduating classes.

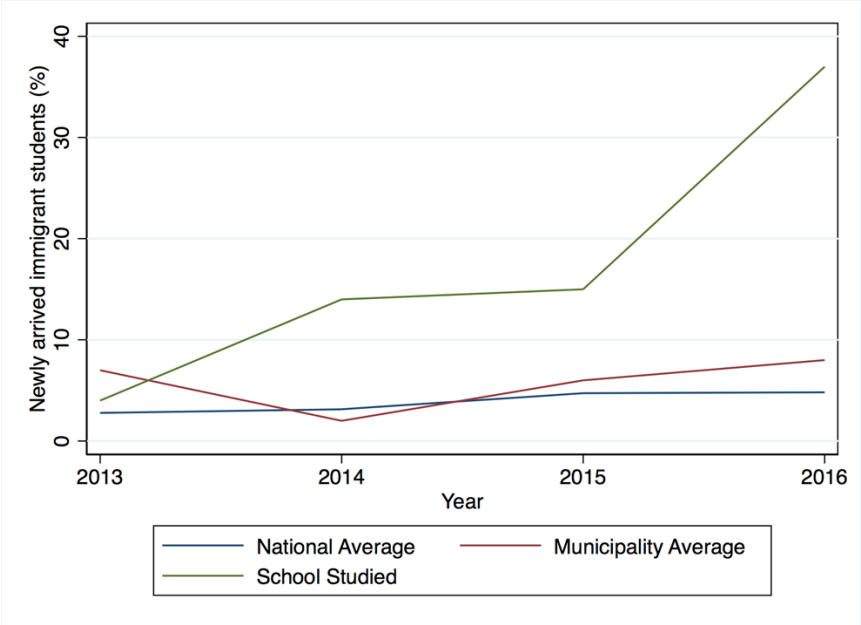
Figure 2. Average grade point averages (‘meritvärde’) school year 9



A notable change in the school's student base is the proportion of newly arrived immigrant students which increased from 4 percent in 2013 to 37 percent in 2016 (figure 3). Data from Statistics Sweden show that only 30 percent of all school age Swedish immigrants become eligible for high school (SOU 2017: 54). In addition to learning a completely new language, there are often other challenges for newly arrived immigrant students, such as the fact that the student may not yet have received a residence permit and therefore does not know if he or she can stay. Bunar (2010) concludes that not only do language skills improve with the number of years of schooling in Sweden, but other socio-economic aspects also affect academic performance. Socio-economic background is not something that is completely transferable between countries but should be regarded as highly contextual. A key factor, however, is that there are big differences in newly arrived immigrant students' school results

depending on when they arrived in Sweden. Students who have come to Sweden during lower secondary school or later often find it difficult to get over 160 credit points, which corresponds to E (passed) in all subjects. For students who have attended Swedish school since primary school or the beginning of lower secondary school, the study results are on average considerably better. Böhlmark (2007) identifies 9 years of age as the 'critical age' for immigrant students to avoid the imminent risk of low final grades

Figure 3. Proportion of newly arrived immigrant students



Note: In 2014-2016, newly arrived immigrant students without social security number are excluded. Students arriving in Sweden before 2014 are regarded as natives.

2.4 Purpose and issues

The study's two issues are *how the mentorship project affected the study results among the participating students*, and *how the mentorship project affected the students' willingness to pursue higher education*. To evaluate the effects of the Mentorship Project, we examined how it affected the students' grades, attendance, and their progress after high school. Using a survey, we also attempted to get a broader picture of the Mentorship Project and the students' impressions of the project. The most comprehensive part of the evaluation consists of studying how the Mentorship Project has affected the participating students' grades because here we have a good data set to analyze. Grades are of utmost importance in the Swedish education system because they are crucial for high school eligibility and as a selection instrument for high school admission. If high school eligibility is not achieved, the student ends up in the 'introductory program', where on average only just over 20 percent receive a final grade from high school at the age of 23 (Nordström Skans et al. 2017). Many newcomers who do not achieve the goals end up in language introduction, a program within the

introductory program at the high school where students get to practice the necessary language skills to then be able to start one of the national high school programs. According to Bunar (2015), there is often an experience among newcomers that language introduction is like "starting over again" in the introductory classes in primary school that many newcomers go before they can start in the regular classes. Nordström Skans et al. (2017) state that compulsory school grades provide “a very good forecast for those who will not succeed in high school” (p. 92). This will be particularly relevant for the present school where only 40 percent of the graduating students were eligible for high school in 2016. The grades are thus important measures to examine in order to determine the effect of a tutoring program that the Mentorship Project has both in the short and long term.

Previous research

3.1 Effects of homework reading projects

In order to get an idea of the potential effects of tutoring programs, it needs to be explained how such programs are likely to affect students' general development of subject knowledge as well as so-called cognitive and non-cognitive skills. Research shows that it is primarily the first years of a child's development that have the greatest impact on these skills. During this period, children learn important skills that later become self-reinforcing for the child's further development (Heckman 2006). This means that early contributions from society generally provide greater returns. According to Gustafsson and Myrberg (2002), the knowledge and motivation that students have developed during the previous years (including support from parents) accounts for close to 80 percent of the variation between schools' average grade level in high school. This, of course, puts limits on the potential of a homework program aimed at ninth graders. Furthermore, there are already other initiatives from society for students who do not receive satisfactory grades. The National Agency for Education states: *“about a quarter of the students with F in one subject and half of the students with F in several subjects [...] [have] received special support during year 8 and / or 9. Despite the special support, a large proportion of these students are still receiving failing grades when they finish year 9. ”* (National Agency for Education 2018). From this perspective, one should not expect a homework support program such as the Mentorship Project to achieve radically different results than what special support during school hours does not succeed with.

Even though support measures in early years generally have a greater effect than similar efforts later in life, it is justified to offer support measures throughout their upbringing for several groups of students. Efforts aimed at younger children can probably be handled more effectively by the school itself. Non-profit support programs for younger students who, among other things, provide homework support, are also already available in the studied municipality (Söderberg 2017). The studied mentorship project has been discussed by the municipality and the school as a compensatory effort to

even out conditions in the school in general and in homework specifically. This is because students from homes with established good study habits often perform better in school, partly as an effect of the parents having an understanding of the importance of homework, more frequently helping with homework and having better knowledge of many of the subjects than the students have (Aikens 2008).

Tutoring projects have a relatively short history in Sweden compared to many other countries. Most of the empirical research on its effects have been performed in the US. Different types of tutoring programs became common in the United States after 2001 with the introduction of the "No Child Left Behind" school reform. In order to receive support, the American programs have had to show they are scientifically substantiated, which means there is a considerable amount of research available. Lauer (2006) shows in a meta-study that the effects of such summer courses and tutoring programs are somewhat greater for students during the latter part of lower secondary school and during high school. There also seems to be great variation between different tutoring programs where some show statistically significant improvements in both writing and arithmetic skills and others do not show any effect at all. The average effect of all the homework reading programs that Lauer (2006) examines is combined in John Hattie's large meta-analysis which compares different school initiatives. Hattie (2009) concludes that the effect of these programs is positive but generally relatively small. Hattie also shows that homework generally has a limited effect on reading and numeracy skills in younger children, but a greater effect on teens, and particularly in high-achieving students.

A specific study with a sample of more than 1000 students with randomly selected control and study groups of the comprehensive US program 'Big Brother Big Sister' showed that the program reduced the likelihood of drug use, improved students' sense of academic preparedness, and increased attendance and school results among the study group. The program also improved students' relationships with parents and schoolmates (Grossman & Tierney 1998).

However, studies on the effect of tutoring programs in Sweden are few in number. In a statistical evaluation of the *Linje14* program in Örebro, Trumberg and Lindberg (2014) examine the extent to which former students in schools where Linje14 operates go on to higher education compared to other schools with similar student compositions. The authors come to the conclusion that students at the schools where *Linje14* has been active are more likely to pursue higher education compared to other schools with similar socio-economic student demographics. However, it is not possible to causally demonstrate that it is Linje14 that has caused this difference as *Linje14* assumes the tutoring category ‘open study workshop’ and it is thus not possible to see who visited the tutoring session and to what extent.

A Norwegian study of the reform that in 2010 made tutoring mandatory in all primary school grades in Norway shows that the national test scores increased more in the schools where a large proportion

of students participated in the tutoring sessions being offered compared to schools with lower participation (Backe-Hansen et. al. 2013). However, introduction of tutoring sessions seems to have led to lower Norwegian national test scores among weaker students in the surveyed schools, while the average scores generally increased. One possible explanation is that a 'stronger study culture' may have formed among the ambitious students who visited the tutoring sessions, which in turn increased the pace of classroom teaching in general, to the detriment of the weaker students. However, it is important to point out that the more people who participated in the tutoring sessions, the less the deterioration in school results for the weak groups in the study. The results are based on so-called panel-data for each school, as opposed to individual data, which makes precise explanations difficult (Backe-Hansen et al. 2013). It should also be added that the survey was conducted on students from preschool classes up to and including third grade, which means that the results are not necessarily relevant to students in grade 9 in Sweden.

Grossman and Tierney (1998) notes that the effects of various tutoring programs cannot be generalized as they differ from program to program. A research review by Fashola (2002) argues that the programs that successfully increase academic performance are those that have a fixed structure, a strong connection to the class curriculum, managed by well-trained staff and where opportunities for students to receive individual mentorship are particularly promising. This is more in line with the form of tutoring that was previously described as 'continuous study support'.

3.3 Students' goal to pursue higher education

One of the objectives of the Mentorship Project is to inspire students to pursue higher education. Since the students in the survey have not yet started high school, we can not find out with certainty whether they will continue their studies at the university level in the future. For example, it is uncertain if students who state their intentions to pursue higher education actually will do so. For example, a study by Statistics Sweden showed that only 6 out of 10 high schoolers who had expressed desire to further their education had actually done so within three years (Statistics Sweden 2015a).

The fact that the Mentorship Project tried to recruit mentors from a similar upbringing environment as the school studied, as well as mentors with different linguistic and cultural backgrounds can affect the receptivity among the participating students. This is important considering that the Mentorship Project operates at a multilingual school. Previous research has shown that a high proportion of immigrants in students' neighborhood is generally negatively related to students' study results, but that the proportion of highly educated people from the *same country* in students' neighborhood is positively related to study results. The connection is strongest for boys from a socio-economically weak background (Åslund et al. 2009). This points to the importance of role models that students can identify with, and that boys are particularly receptive to these motivators. In Sweden, high school-eligible students from a foreign country (or with parents from a foreign country) tend to apply for university prep high

school programs to a greater extent than domestic-born students when controlling for grade point averages from year nine (SCB 2015b). Thus, it seems to be a clear aspiration among both first and second generation immigrant students to pursue higher education. The fact that immigrant minority groups, to a greater extent than natives, strive to pursue higher education has previously been established in both Swedish (Jonsson and Rudolphi 2011) and international research (Teney et al. 2013). A variety of underlying reasons have been suggested and tested. Above all, it can be mentioned that immigrants represent a self-selected group where migration is in itself a choice for an improved life for themselves and their children. If immigrants are generally a group with a strong desire to improve their lives, education is an important step in achieving this goal. Tutoring programs such as the Mentorship Project, which operates in schools with a large proportion of multilingual people, should therefore take into account that lack of motivation for higher education is not necessarily the main issue, but rather a daunting prerequisite for high school eligibility.

Another emerging pattern is that students from a foreign country often aspire to apply for prestigious university programs with a clear connection to a profession such as doctor or lawyer (Bunar 2015). An objective of the Mentorship Project has been to signal that many alternative educational paths do exist, e.g. via high school, Komvux, or a science base-year at the university. A more multifaceted view of education can reduce the risk of students losing their motivation for school work and higher education. Giota (2002) emphasizes that some students with difficulties in school simply give up to protect their self-esteem. Instead, they engage in " *self-destructive learning, such as not taking exams or doing their homework. They then attribute their failure to not being prepared properly anyway "(p. 284).* If parents put high expectations of their children with the goal to be able to attend prestigious university programs, and the children feel that they are unable to live up to these demands, it is quite possible that they instead give up. In the worst case scenario, they might turn to criminal or antisocial environments. If the Mentorship Project's mentors instead succeed in contributing to a more multifaceted view of education, the risk of the worst case scenarios can possibly be reduced.

4. Effect study

4.1 Method

To measure the effects of the Mentorship Project, we use a survey to probe participating students on their grades, post-high school plans, high school attendance, and overall perception of the project. Since method and model differ depending on which of these aspects we examine, we will broach them separately in our presentation of the results. For all aspects examined, we compare the change for the participating students those who did not complete the project. This method is similar to what in medical research is called a *treatment group* and a *control group.* In order for the results to be

reliable using this approach, the treatment group and the control group must be homogeneous in terms of relevant background factors. If they differ in student composition, the outcome of what was investigated would be different even without the treatment group having passed the Mentorship Project, and the project effects might be overestimated. To the extent possible, we try to control for background factors in our study. However, it is difficult to check for *all* possible differences between the two groups. It would have been ideal to randomly select a treatment group and control group based on a large selection. In the present study, this was not possible because students at the school voluntarily joined the project. Consequently, highly motivated students are likely to be overrepresented in the mentorship group, which we discuss below.

4.2 Impact on grades

To investigate whether the Mentorship Project had an effect on students' grades, we compare the variation in grades between the mentorship and control groups. We thus compare whether the mentorship group has raised its grades relative to the control group in year 9 (during the project duration). As stated, the student base's knowledge developed during previous years accounts for close to 80 percent of the variation in high schools' average grades (Gustafsson and Myrberg 2002). It is very challenging, especially for a tutoring program offered during after-school hours, to significantly influence grades towards the end of high school. Any measurable effects are therefore expected to be weak. In order to obtain a sufficiently large student base for this type of statistical analysis, we use the grades from the entire student population spanning the project duration. Hence, we examine the grades for all ninth-graders enrolled during the years 2016-2018 simultaneously.

Since the mentorship and control groups are not randomly selected, we might see differences in student composition that are unrelated to the project but still affect the high school grades. In order for these differences to not influence the results, we keep the students' grades, as well as the variation in grades, *before* year 9 in our statistical model.[4] This way, the model's dependent variable "Mentorship Project" only *captures differences in grade movement* between the mentorship and control *groups* . For this to be feasible approach, we need data on each individual student as far back as possible. Luckily, we have data for all semesters from the fall term in the seventh grade to the spring term in the ninth grade. In order to be able to examine the grades quantitatively, we translate them into numbers where A is coded as '6' and F is coded as '1'. Dashes are also coded as '1'.[5] If a student is not registered for a particular semester, and grades are therefore missing for all subjects, the student is excluded from the analysis. Due to the lack of data points in the subjects modern languages

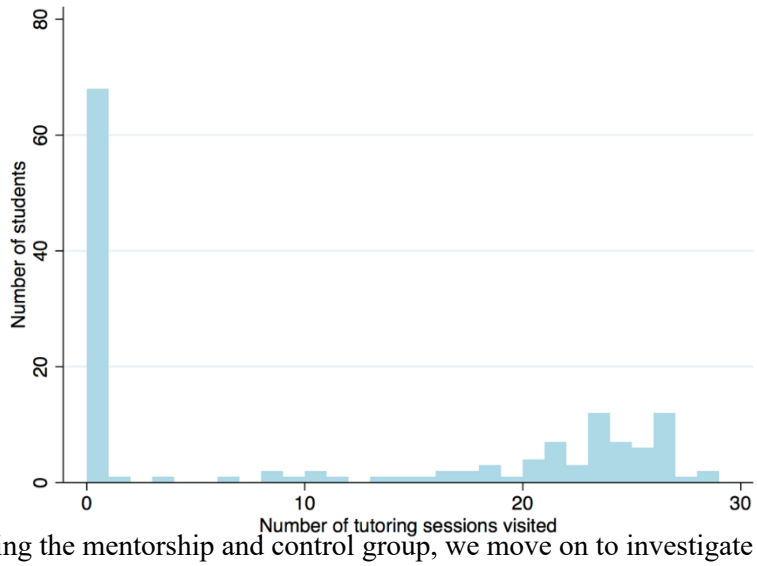
[4] Specifically, examine variation between the groups (so-called "fixed student effects") and trend differences before students can start the mentoring project (before year 9) among the study group and the control group by using grades from all semesters in 7th and 8th as control variables.

[5] This linear operationalization simplifies interpretation of the results, but is formally incorrect as the relative distance between two grading steps, e.g. F and E or C and B, are not necessarily equal.

and native languages, these have been excluded from the analysis. Since most of the students at the school are multilingual, they read 'Swedish as a second language' rather than Swedish. We have therefore chosen to only include 'Swedish as a second language'.

Data on grades from the municipality only includes grades for those who have completed high school, not those who have dropped out or changed schools. Since only students with grade data for each semester dating back to year 7 are included, the student base for the project includes a total of 142 students (71 in each of the mentorship and control groups). In the statistical model, it is important to distinguish between students who have registered for the project but have not participated in any tutoring session, students who have only participated on one or two occasions, and those who have a particularly high attendance in project activities. Figure 4 shows a histogram of the number of Mentorship Project opportunities in which the entire student population participated, where we have data on grades all the way back to 7th grade. The figure thus includes both students who have registered for the project and those who have not. The largest bar consists of students who have never participated (mostly students who did not even register for the project). The remaining students are divided between 1 to 28 Mentorship Project opportunities. Most students who participated in the project have been present between 20 and 28 times. The total number of opportunities offered per student during the initial three years has been around 28. We will later analyze the attendance in more detail. Here we are content to choose three occasions as a threshold for when a student is counted as having completed the Mentorship Project. *Therefore, if a student has been present on two or fewer occasions, they are counted in the control group.* If they have been present on three or more occasions, they are counted in the mentorship group

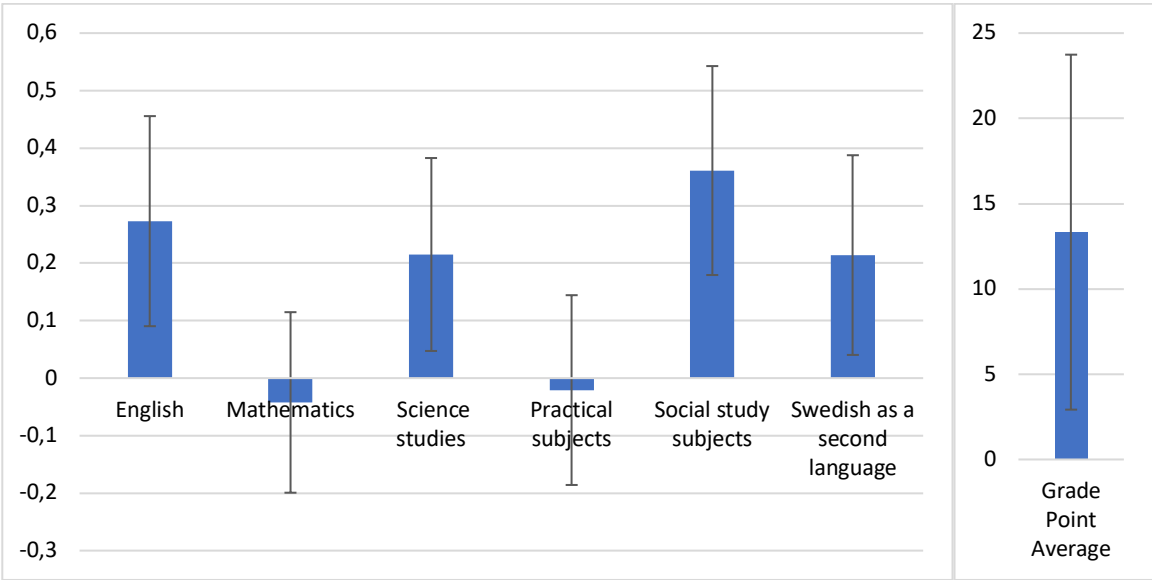
Figure 4: Attendance in the Mentorship Project's tutoring sessions



After defining the mentorship and control group, we move on to investigate the effect the project have had on participating students' grades. Figure 5 below summarizes the estimated results from our basic

statistical model. After a descriptive summary of the results, we will provide an explanation of how the results can be interpreted. To the left of the figure, we show the effects of participating in the project on students' grades in various subjects. To the right of the figure, the effect on the students' average grade point averages in grade 9 is shown. The blue bars show the extent to which student participation improved the results compared to the control group. A bar that reaches to 1.0 means that those who participated in the project on average increased their grades by the equivalent of a full grade level, relative to those who did not participate. For example, the blue bar for the subject 'English' shows a relative increase of just under 0.3, which means that on average just under a third of the students who participated in the project increased their grades in English by one grade level, relative to the control group. The black line runs parallel to the blue bars and shows a 95% confidence interval, which constitutes the margin of uncertainty of the estimated effects. If the confidence interval crosses 0, we cannot say with certainty that the Mentorship Project had an effect on the students' grades of the subject in question. If, on the other hand, the confidence interval does *not* cross 0, the probability that the Mentorship Project had an effect on students' grades in the subject in question is higher than 95 percent, which is the customary limit used in estimating such effects in social science studies.

Figure 5. The effects of project participation on students' grades in different subjects



We find the strongest effect of the Mentorship Project for the subjects Social Science and English, followed by Science Studies (Swe: Naturvetenskap) and 'Swedish as a second language'. In practical subjects (an average of the subjects music, handicraft, sports, home economics, and art) and mathematics, we find no effect of the Mentorship Project. Finally, we find at the far right in Figure 5 that those who participated in the project increased their cumulative grade point average by almost 15 grade points relative to the control group. However, this increase is not entirely easy to interpret as grades and grade point averages do not have a linear relationship. A grade level rise from F to E gives

10 credit points, but each step thereafter in the grading scale gives only 2.5 extra credit points. To interpret the relative difference in the effect of the Mentorship Project between the different school subjects observed in Figure 5, we therefore introduce two concepts: *grade mobility* (see below) and *project frequency* (how often a student brings a particular subject to a session with a mentor).

4.2.1 Grade mobility

Grade mobility measures the degree to which student grades generally rise or fall in a particular school subject during lower secondary school.[6] Before we describe this in more detail, we will explain why grading mobility is relevant for interpreting the effect of the project. The subject mathematics, for example, has proven to be a subject where significant grade increases have been difficult to achieve. The National Agency for Education's first follow-up of how it went for the first student cohort who received grades in both grades 6 and 9 shows that only 17 percent increased their grades in mathematics between grades 6 and 9 (National Agency for Education 2017). Only half of the students who had grade F in year 6 managed to increase the final grade to at least pass. Practical subjects such as home and consumer knowledge, handicraft, and art, on the other hand, have a significantly higher proportion of students who increase their grades between year 6 and year 9. *The degree to which students move between grades thus differs between the particular subjects*. This has implications for what we can expect the statistical model to generate in terms of results. Subjects where students move less between grades are not as "sensitive" to initiatives such as the Mentorship Project. For example, if a student improves his / her knowledge in mathematics due to the Mentorship Project, it is not certain that it will have a statistical effect because the student continues to have the same grade despite the improvement. The *marginal knowledge improvements* in this case are not sufficient to raise the grade one level. In other subjects, a similar effort might have led to one or even two grade levels upwards. In this study, we therefore use the term grade mobility to describe the degree to which students move between grades within a particular subject. We calculate grade mobility in the following way: As before, all grades are recoded into numbers where 1 is F and 6 is A for each subject. We then calculate each student's average grade for all semesters in a subject and then the standard deviation from this average. Based on this, we finally calculate an aggregate average for all students per subject. Table 1 below shows grade mobility per subject. As expected, mathematics has the lowest grade mobility. We then find in ascending order ‘Swedish as a second language’, English, Science Studies, social science, and practical subjects.

Table 1: Grade mobility among the Mentorship Project and Control Group

[6] We have borrowed the term *social mobility* from the field of sociology

Subject	Grade mobility
Practical subjects	0.51
Social Science	0.46
Science Studies	0.41
English	0.38
Swedish as a second language	0.32
Mathematics	0.27

4.2.2 Mentoring Project Frequency

The next variable that we should keep in mind when we analyze the effects of the mentorship project is the degree to which students bring homework in a certain subject to the tutoring sessions. The term we use for this is '*project frequency*' . Grades should reasonably increase more in subjects that students bring more frequently to tutoring sessions. Although we can estimate how many times a student brings a certain subject to the project, we must also consider the fact that students are more likely to bring the subjects in which they have more teaching hours per semester. The actual measure of how much a student brings a subject to the tutoring sessions is therefore divided by the total number of teaching hours in the subject in order for us to obtain the expected effect. However, dividing survey responses (ordinal scale) by teaching hours (absolute numbers) is awkward. The only definitive distinction we can make is between the practical subjects and the theoretical subjects where the practical subjects are *not* included in the tutoring sessions, while the theoretical subjects are included to varying degrees.

Therefore, mentors who participated during the academic year when the data collection was done had to answer surveys about how often students brought different subjects to the Mentorship project. The specific question the mentors were asked to answer for each topic was " *Most of the students work with [topic] on the Mentorship Project…* " where [*topic]* is replaced with the topic asked in each topic. 11 mentors out of 15 responded to the survey, which is a representative sample of the project's mentors, but it is statistically a small sample. The estimated "project frequency" shown in Figure 6 should therefore be interpreted with caution.

Figure 6: "Project frequency": How often the students bring different subjects to the project

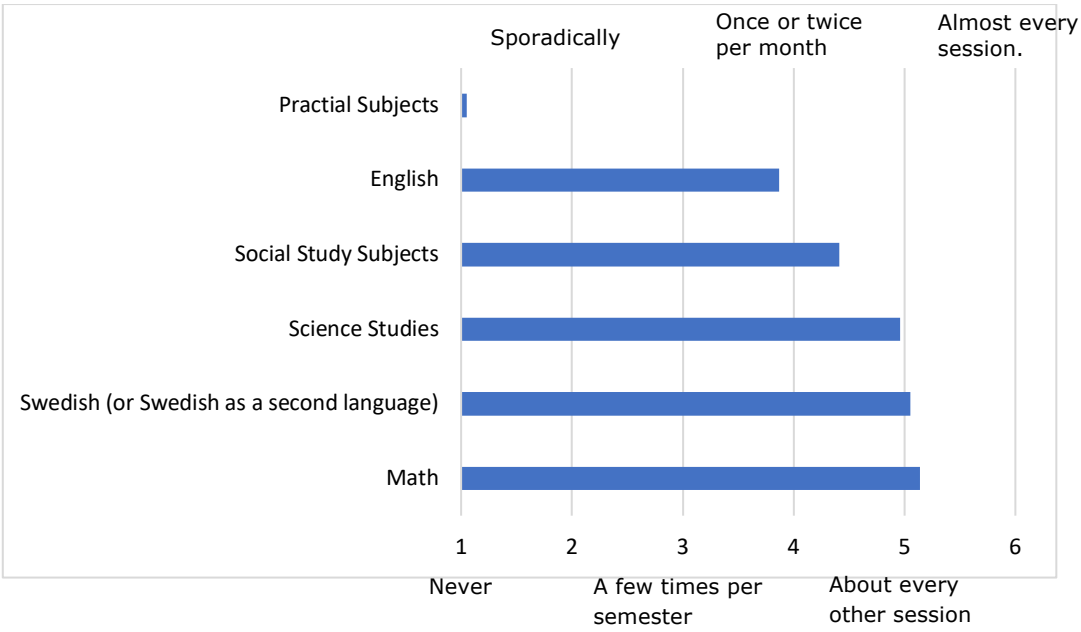


Figure 6 above shows that Mathematics is the subject with the highest Mentorship Project frequency, followed by Swedish (or 'Swedish as a second language') and Science Studies. With these subjects, most students work with approximately every other Mentorship project opportunity. Interestingly, Social Science and especially English have a slightly lower Mentorship Project frequency. According to the mentors, *most* students only work with English once a month (which means every fourth project opportunity).

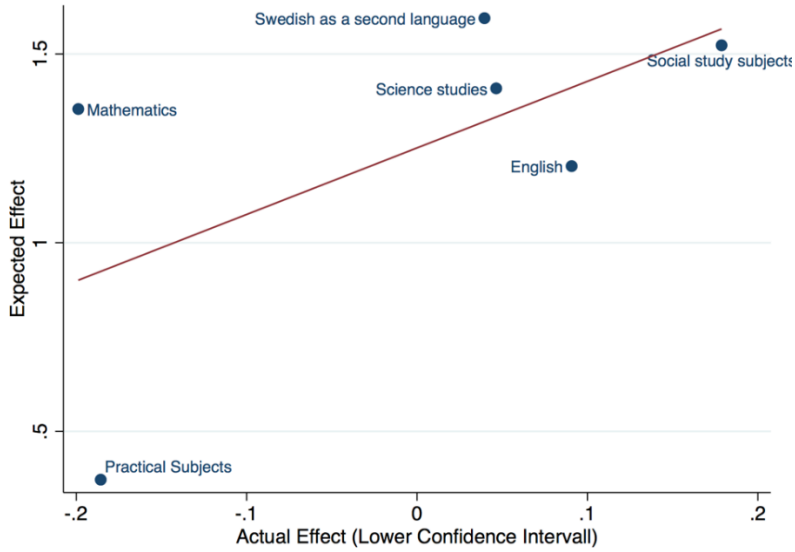
We summarize grade mobility and the extent to which students include a topic for the Mentorship project in Table 2 below. Variable " *expected project* effect" is based on us multiplying the grading mobility by the project frequency, ie how often the students bring different subjects to the mentorship project's tutoring sessions. The subjects with the highest expected effect should be those where the mentoring group rises the most compared to the control group if their help from the mentors to do homework in these particular subjects affects the grades. It is important to point out here that 'expected effect' should not be interpreted in terms of actual grades. Instead, it is only a measure to get an idea of a mutual order for which subjects we expect the highest effect of the mentorship project. When comparing the column with expected effect and actual effect, one should therefore compare the mutual order within the column, not the actual values. In Table 3 below, we can very well see a pattern where the subjects that are estimated to have a higher 'expected effect' (Social Science, English, 'Swedish as a second language', and Science Studies) are also the subjects where we can measure a higher actual effect according to the the statistical model that follows. Practical subjects and mathematics are both lower in expected effect, but for different reasons. Practical subjects because the students work with these subjects to a lesser extent in the project (project frequency). Mathematics because this subject is more difficult to raise (grade mobility).

Table 2: Expected project effect on students' results in different school subjects

Subject	Project frequency	Grade mobility	Expected project effect	Actual project effect
Social Science	4.36	0.46	2.01	0.38
English	3.18	0.38	1.21	0.27
Swedish (or 'Swedish as a second language')	5.00	0.32	1.60	0.23
Science Studies	4.91	0.41	2.01	0.2
Practical subjects	1.00	0.51	0.51	-0.02
Mathematics	5.09	0.27	1.37	-0.05

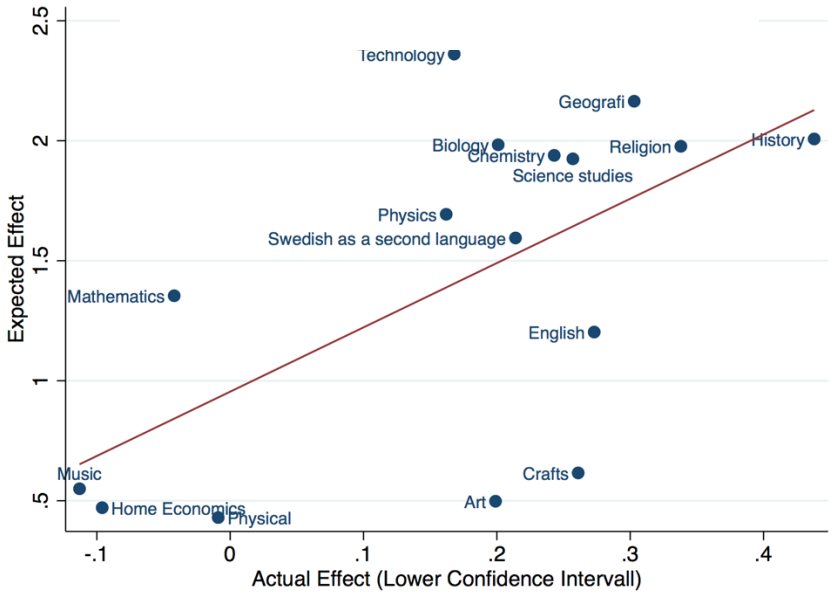
A way to systematically show the relationship between expected effect and actual effect is to see through a scatter plot whether the relationship between the variables is positive or not. This is illustrated in Figures 7a and 7b below. In the figures, the actual effect is measured as the 95% confidence interval instead of the estimated effect, as we would otherwise disregard the standard deviation within each subject. In Figure 7a, Science Studies, Social Science and practical subjects are combined as before. In Figure 7b, we separate the Social Science subjects, the Social Science subjects and the practical subjects to obtain more observations.[7] The positive relationship between project participation and grades in each subject or subject group remains consistent in both figures.

7a. Relationship between expected and actual effect of the mentorship project per subject



7b. Relationship between expected and actual effect of the Mentorship Project per subject

[7] It should be added that since we do not have questionnaire responses on participant frequency for homework within the separate Social Science and Science subjects, we have given these subjects the same frequency. As an example, geography has the same frequency as history.



We would like to emphasize again that the variable *expected project effect* should be interpreted with caution as it is based on (i) a relatively small data base (11 of 20 mentors) from the mentors' survey responses about which homework is most often studied at the tutoring sessions, and (ii) that we have multiplied the measures of grade mobility and project frequency without standardizing so they have the same weight.[8]

However, the measured relationship between 'expected' and 'actual' effect is important in two respects: First, we get a clue as to why the effects in mathematics are lower, even though the mentors have stated this topic is what students most often want help with.[9] About a quarter of students with failing grades have received special support during year 8 and / or 9, but still have failing or incomplete grades when they finish year 9. The variable 'grade mobility' also shows the lowest value in the subject mathematics, which indicates that this subject is the least positively affected by participation in the project. Secondly, the relationship between expected and actual effect provides support for the fact that the measured effects from the statistical model probably depend on the mentorship project and not on anything else that differs between the project and control groups. We have previously speculated it may be the more study-motivated students who apply for the Mentorship Project and that the measured differences between the mentorship and control group could therefore have taken place even without the Mentorship Project. If this was true, the subjects the control group improves in

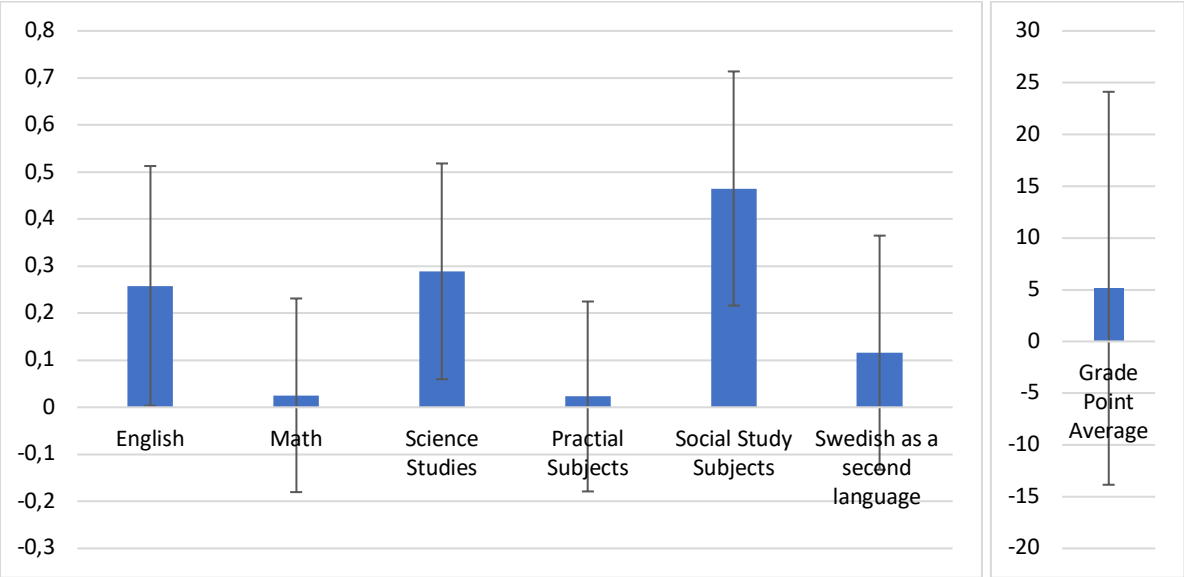
[8] Ideally, these two constituent variables would be weighted based on how well they explain the effect of the project. This has not been possible as it requires a more robust data base for the variable project frequency.
[9] The fact that mathematics is the subject that students usually bring to the mentorship meetings is not only based on the results from the questionnaires but has also been confirmed in interviews with the mentors.

would be random. Figures 7a and 7b show us this is not the case.[10] While this does not necessarily show a causal relationship (that the estimated results depend on the mentorship project), the relationship between expected and actual effect, coupled with the fact that we controlled for data bias in our statistical model, allow us to conclude with high certainty that the mentorship project has contributed to raising the study results for students who participated in the program.

4.2.3 Results for boys and girls

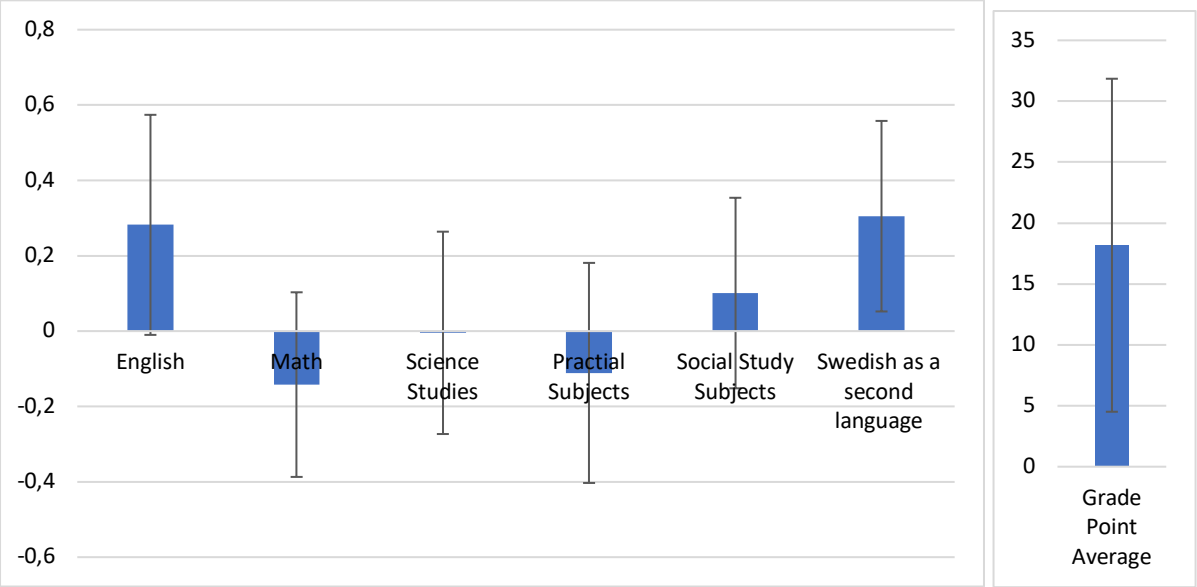
We examine the results separately for boys (Figure 8a) and girls (Figure 8b). We note in the figures below that the mentorship project seems to have somewhat greater positive effects for boys' study results, especially in social science (Swe: 'Samhällsorientering'), but also in overall grade point average. The latter is of particular interest as grade point average is based on all the subjects studied and therefore has higher statistical precision. However, we choose not to speculate on the cause because the number of students studied is too small to enable more robust analyzes when they are separated by gender (84 boys, of which 35 participants and 49 in the control group, and 58 girls, of which 36 participants and 22 in the control group).

Figure 8a. Effects of project participation for boys' grades in various subjects



[10] However, it had not been entirely random but rather had a greater effect for the subjects with higher grade mobility. In appendix 8.1, however, we show that there is no correlation between only grade mobility and actual effect (it is rather a negative correlation).

Figure 8b. The effects of project participation for girls' grades in various subjects



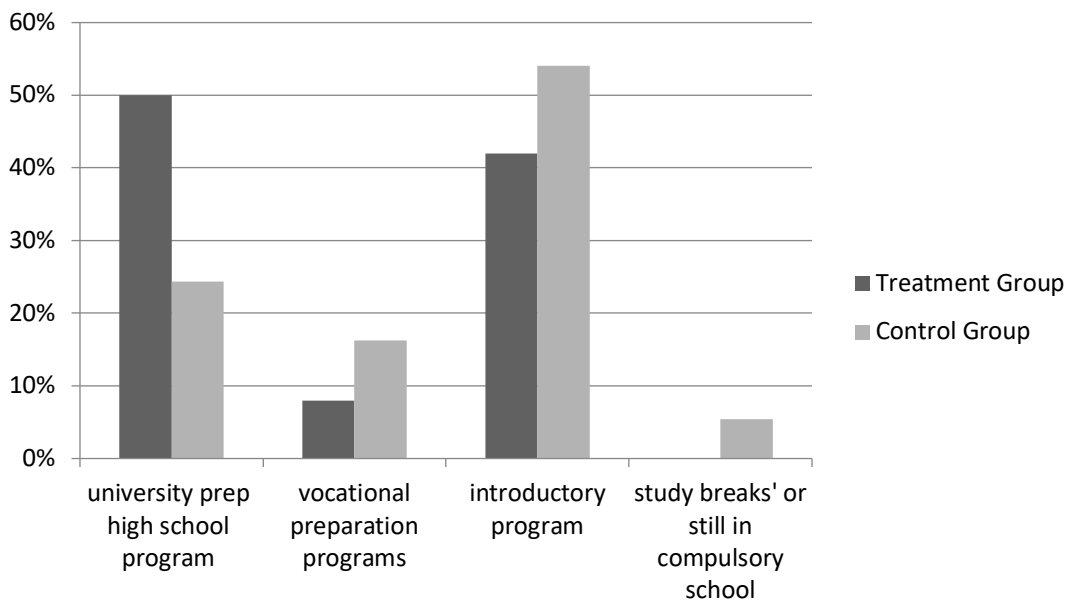
4.3 Student progress after lower secondary school and project completion

As previously mentioned, an important goal of the mentorship project was to increase interest in higher education. Since none of the participating cohorts have graduated from high school, we have investigated the extent to which students choose to attend a pre-university high school program, which is a good approximation of the probability that a student will continue their studies. Of all Swedish children born in 1981, almost 90 percent of those graduating from the science program, almost 70 percent of those graduating from the social sciences program, and half of those who graduated from the aesthetics program attended university (SKL 2009). However, this number is much lower for students who attended vocational high school programs. From the care and nursing program, 36 percent of Swedish students choose to continue their studies, and 30 percent from the children and leisure program. For the rest of the vocational preparation programs, the proportion of students who continue their studies is just under 20 percent. In addition to college and vocational preparation programs, there is also the introductory program for students who have not yet achieved high school eligibility. The purpose of the introductory program is to help students achieve competency so they can then transfer to a national high school program. A follow-up of the National Agency for Education (2015) showed, however, that four years later only 8 percent of the students who started an introductory program had switched to a national program and graduated from high school with a degree or diploma. Attending a university prep program can thus be seen as a good approximation for students' probability to attend university. In the statistical survey, we will therefore compare the extent to which the mentorship and control group choose to attend higher education preparatory programs.

We followed up the students from the graduation classes in 2016 and 2017 where data could be obtained from the municipality. The analysis is based here on examining at which high school program - if any - the students are registered during the month of January when, according to the expected study plan, they attend the first year of high school. If the student is missing, he or she may have moved from the municipality or for other reasons may not be in the municipality's register. However, we have no reason to believe that this loss would systematically distort the results. The municipality's register also shows whether students have 'study breaks' or whether they are still in compulsory school. A total of 109 students are included from the two graduating classes, of which 49 in the study group and 60 in the control group.

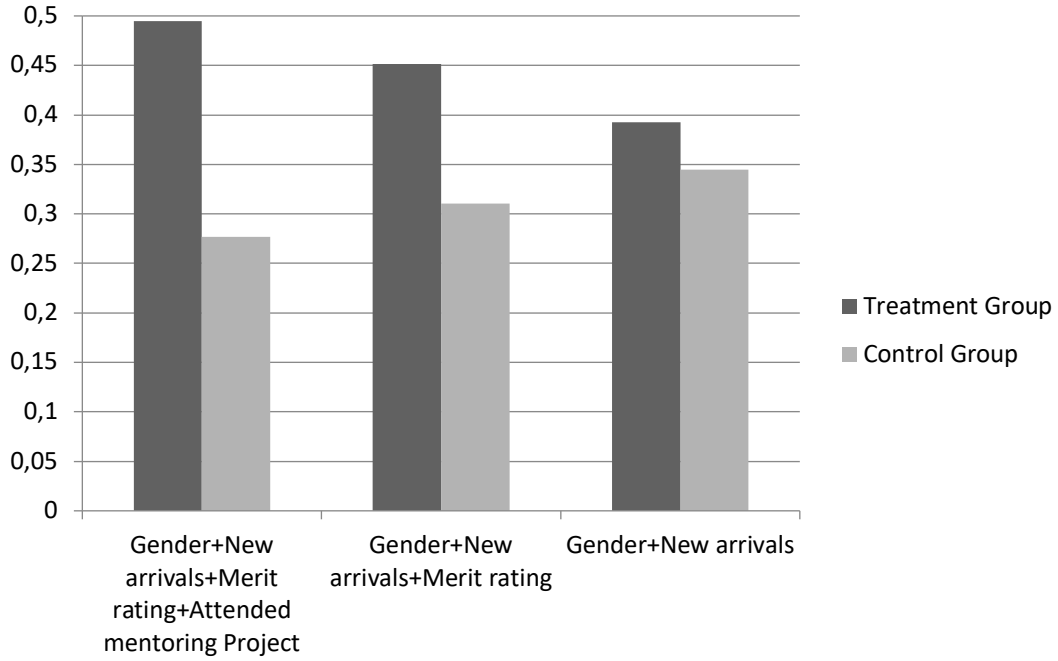
Figure 9 shows the distribution of students between the university prep, vocational prep and introductory programs, separately for the mentorship and control groups. As before, the mentorship group is defined as those who have participated at least three times in the project's tutoring sessions. The figure shows that the proportion in the mentorship group who are registered for a university prep high school program is 49 percent, compared with 24 percent in the control group. 8 percent of the students who participated in the project are registered for vocational preparation programs, and 16 percent in the control group. 41 percent of the students who participated in the project are registered in the introductory program, 53 percent in the control group. We can thus state that almost twice as many students in the mentorship group have chosen to study a university prep high school program, compared with the control group.

Figure 9: Distribution of students between high school programs for the mentorship project and the control group



Since the study and control groups are not randomly selected, the difference in the composition between the groups could explain the variation between the two groups. To investigate this, we use a so-called probit model where the proportion who apply for high school preparatory programs is the dependent variable and the Mentorship Project participation together with control variables constitute the independent variables. For example, we need to check for the fact that girls apply for college preparatory programs to a greater degree than boys. The proportion of newly arrived immigrant students in each group is an additional compositional difference that may explain the variation in the proportion applying for higher education preparatory programs. Figure 10 shows how the gap between the study and control groups decreases when we continuously remove the effect of different variables.

Figure 10: Proportion of students who apply for university prep for the Mentorship Project and control group by explanatory variables



To explain the gap between the study and control groups in Figure 10, one can start from two hypothetical groups that are completely identical, which would mean that there would be no difference between the groups in how many percent apply for higher education preparatory programs. This would mean that there is no gap between the two bars. When we add the fact that there are more girls and fewer newcomers in the study group (who apply to higher education preparatory programs to a greater extent), an expected difference arises between the study and control groups, which can be seen in the two bars at the far right of Figure 10. The gap is further increased in the middle bars when we also add the fact that the groups have different amounts of credit points *before* the Mentorship Project (grades after the spring semester in eighth grade). Grade point averages govern both eligibility and selection for high school programs. Since those who participated in the project on

average have higher grade point averages than the control group *before* the project started, it is not surprising that the gap between the bars increases. When we finally add the measured effect on the proportion of students who go to university prep programs in the bars on the far left, the gap increases by another nine percentage points. The estimate thus shows that the project has increased the proportion who go to university preparatory programs by nine percentage points. This estimate includes both the fact that the project is assumed to increase the participants' grade points and thus eligibility for high school, but also seems to affect their interest in applying for a university prep program.

Since we have been able to study only 109 individuals at high school level who have participated in or had a chance to participate in the Mentorship Project, there is a risk that the differences may be due to coincidences in the sample. We seek to investigate this in Table 4 below. We see that the marginal effect of the estimates from the probit model is just under 0.09 (nine percent), with a relatively large standard error and a high P-value. Although in this case we have difficulty demonstrating a strong effect size for the Mentorship Project due to the statistical uncertainty, the effect of the project seems to be quite robust.

Table 3: Regression analysis of the proportion of students applying for university preparation for the Mentorship Project and control group (probit model)

	Marginal effect	Standard error	P-value
University preparatory program			
Mentorship Project dummy	0.09	0.07	0.19
Gender (boy = 1)	-0.06	0.07	0.38
Newly arrived immigrant students	0.03	0.06	0.55
Grade point average	0.01	0.00	0.00

4.4 Attendance

4.4.1 How well attended are the tutoring sessions?

A crucial factor for a tutoring program to have a decisive effect on the set goals is that the students actually participate in the program. In the case of the Mentorship Project, this means high attendance at tutoring sessions, but also at other activities offered, such as the yearly tours of the university's campus. It has been emphasized in previous studies that it can be difficult to get a high attendance at the Mentorship Project-like program aimed at older school children (Lauer 2006). It is also well known that attendance is worse in the latter part of primary school. In attendance statistics that Sweden's municipalities collect, for example, the proportion of students with more than 10 percent absenteeism is 8.3 percent in the intermediate stage but 16.9 percent in year nine at the national level

(Orbe et al. 2016). It would therefore be a success factor for the Mentorship Project if it were to be characterized by high attendance.

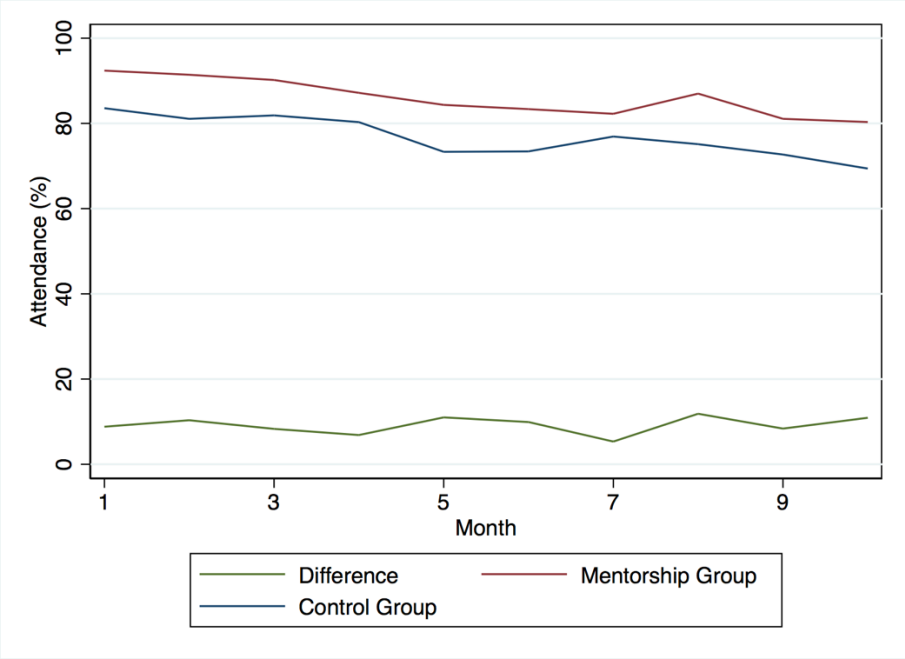
Since a few students jump on or off the Mentorship Project during the academic year, and all participating students must have a certain minimum level of attendance to continue, some students will be added or drop out of the project during the academic year. According to the above, we define participation in the project as the student having been present on more than two tutoring sessions. The average student in the project participates in 21 sessions, which corresponds to 75 percent attendance. Attendance is slightly lower for the last mentorship group (graduated 2018) of around 67 percent. This can be partly explained by the fact that the project that school year grew rapidly in terms of number of students, which the project did not fully adapt to. As the project has become more popular at school, the likelihood that it will attract students who choose to go increases because their peers attend rather than them having a strong internal drive to do so. This is of course positive in the sense that these students probably do not have the same inner motivation for studies, but it also means that they are unlikely to have as high attendance. There may be a trade-off between trying to get as many people as possible to participate versus striving for high attendance and more active participation from the students. In the case examined, however, this balance (not yet) seems to have been forced as we can observe both a high proportion of students who choose to participate (more than half of the 9th graders) and high attendance among participating students (around 75 percent).

4.4.2 Does the Mentorship Project affect school attendance?

As previously mentioned, there are tutoring programs in the United States that have been shown to increase school attendance in a randomized control study (Grossman and Tierney 1998). We have therefore chosen to see if we can find the same effect from the Mentorship Project. Attendance data must, however, be interpreted with caution as it may differ from teacher to teacher to the extent they acknowledge attendance and absence. Furthermore, there are no attendance statistics for graduating class of 2017, which reduces the number of students studied to 120. Finally, student relocations and similar events can make the statistics unreliable. Given that we make the assumption that these statistical errors apply to the same extent to both the mentorship and control groups, attendance data needs to be examined with caution.

Figure 11 illustrates monthly attendance in the mentorship and control groups during year 9 for graduation class 2016 and 2018. When the semester begins in August, the month is one August. Since students do not go to school in July and only go a few days in June, we have chosen to clear away June and July completely. The mentorship group shows higher attendance throughout the academic year and we can also see a certain increase in the difference between the mentorship and control groups from 8.8 in May to 10.9 in August. The difference fluctuates too much for us to be able to draw any conclusions as to whether this indicates a trend increase.

Figure 11: Attendance among Mentorship Project students, August to May



5. Survey data from Mentorship students and tutors

A survey with the aim of evaluating the Mentorship Project's activities was distributed to the students who participated in 2018. 36 students answered the survey, which in statistical contexts is a low sample but as it corresponds to more than 80 percent of all participating students, the results represent the surveyed group well unless the respondents are thought to be the ones that are specifically satisfied with or specifically dissatisfied with the project.

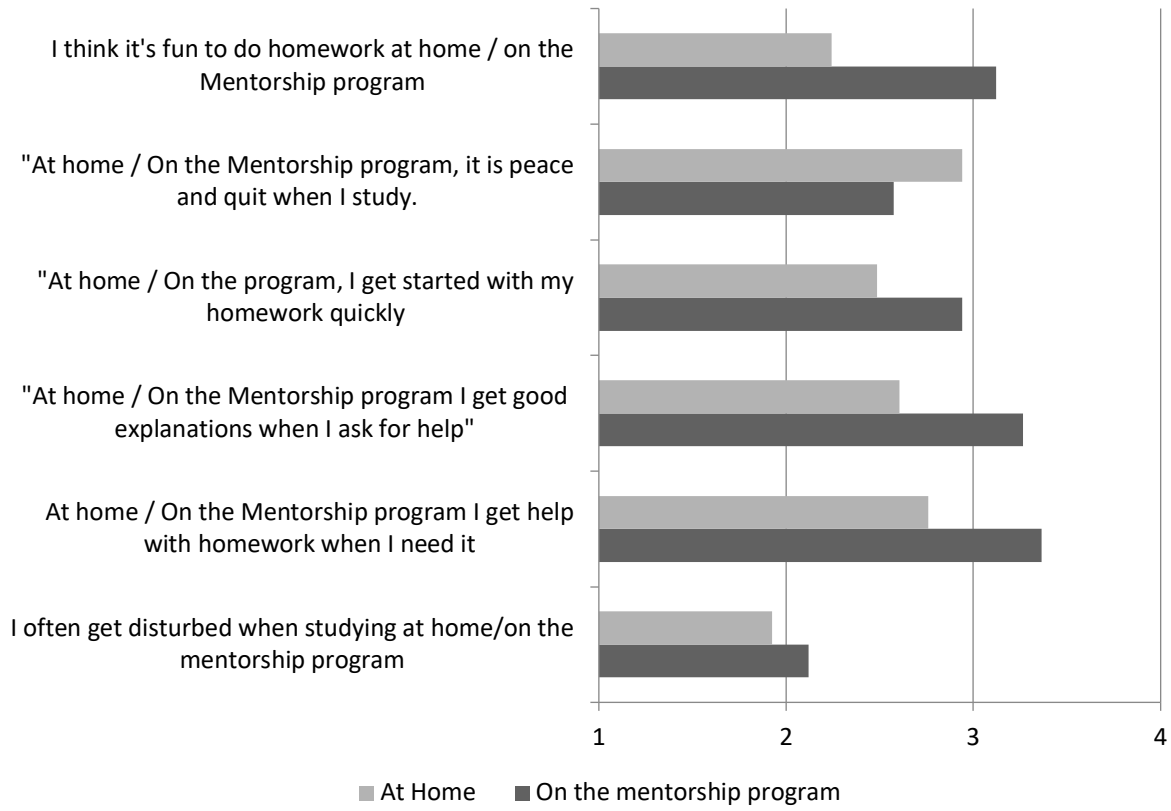
Figure 12 shows a bar chart with questions about the study environment at the project's tutoring sessions and the study environment at home. By comparing the study experience at home with the study experience at the project's tutoring sessions, it becomes easier to interpret the differences between the questions as "at home" serves as a reference point. Without such a reference point, a single digit or a survey response can easily appear arbitrary or taken out of thin air.

The questions "*I think it's fun to do homework at home / on the Mentorship Project*" aim to measure the general desire to study that students experience at the project's tutoring sessions compared to at home. Each student has thus first answered to what extent they think it is fun to do homework at the project's tutoring sessions and then in a new question answered to what extent they think it is fun to do homework at home. The answers show that the students experience a relatively large difference between doing homework on the Mentorship project compared to at home. On average, students experience that it is "usually fun" to do homework at the project's tutoring sessions. On average, students experience that it is " *only sometimes"* fun to do homework at home.

The questions *"At home / On the Mentorship Project I get help with homework when I need it"* and *"At home / On the Mentorship project I get good explanations when I ask for help"* aim to compare how the students feel that they get help at the project tutoring sessions compared to home. Here, too, the students experience that they get more help and better explanations on the Mentorship Project compared to at home with an average just above *"Yes, most often"*.

For two of the questions in Figure 12, the average is higher for the home compared to for the project. Both questions relate to how the calm study environment is experienced, and it indicates that an open public environment, such as a secluded place in an occasionally quite loud mall, is not an optimal place for studying.

Figure 12: Student survey responses regarding the Mentorship Project



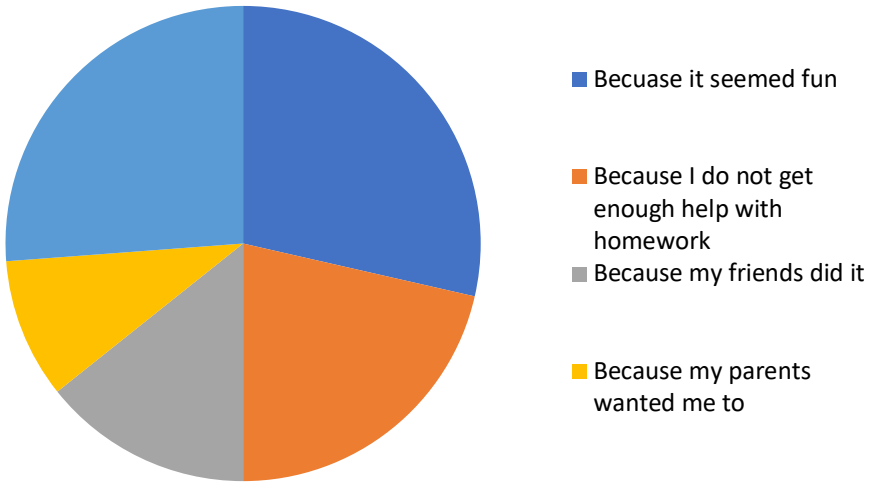
The survey also contained three open-ended questions. In question 1, the students were asked to answer "*What is the best thing about the Mentorship Project?* "And question 2" *What is it like to study with the Mentorship Project's mentors compared to at school?* ". These questions aim to examine what the students appreciated about the study environment. Interestingly, 18 out of 30 on open-ended question 1 emphasize that the best thing about the project is all the help they receive during the tutoring sessions. Several students also emphasize that you get *more* help on these sessions than at school and that the mentors explain well and differently compared to at school. This is not

entirely surprising given that the mentor density in the project is higher than the teacher density in general at the school. The mentors have more opportunities to sit down and help individual students, and also follow up with the same students later.

Some students write that they think the project is calmer than school while others think the opposite. This can be explained by the fact that students react differently to different types of disturbances. For some students, it is nice to get away from the school environment because it can be experienced as more demanding compared to the more relaxed atmosphere at the tutoring sessions. For other students, disturbing sounds are perceived as problematic. This is shown not least in the answers to question 3; " *Is there anything you think could be changed with the Mentorship Project to make it better?* ", Where several students stated that it could be a calmer environment at the project's tutoring sessions.

Finally, students were asked why they chose to participate in the project (Figure 15). Most students have stated that they participated in the project because "it seemed fun" (12 students), that they have difficulty concentrating at home (11 students) or that they feel that they "do not get enough help with homework" (9 students). A small number of students stated that their friends' choice to attend the Mentorship Project was their main reason (6 students) or that their parents wanted them to go (4 students). In response to the open-ended questions, several students stated that they chose to participate in the project because they wanted extra help with subjects outside of regular classes. The Mentorship Project thus plays an important role in ensuring that students receive help that they may not receive during regular in-school class sessions.

Figure 15. Why did you choose to participate in the Mentorship Project?



6. Discussion

In this report we have sought to quantitatively evaluate the effect of a mentorship project focused on tutoring lower secondary school students. Data on graduates from the participating school have been used to examine whether grades, choices after high school completion, and school attendance have been affected.

The statistical model showed that participating students had higher grades in the subjects English, Social Science subjects, Science subjects, 'Swedish as a second language', and higher grade point averages, relative to the control group. However, the model did not show any relative grade increase in mathematics or practical subjects.

The study's biggest methodological challenge has been to get around the fact that, on average, the study group seems to have had higher study results than the control group even before the project. It is therefore possible that the relative increase in grades could have occurred even without the project. We have tried to control for this issue in the statistical model, but it cannot be ruled out that the 'project effect' is still overestimated. We have also created a new variable measuring how many times students generally bring a particular subject to the Mentorship Project (project frequency) and how much the grades generally move between the semesters (grade mobility). We have then combined these into another variable in order to estimate an 'expected effect'. As the expected effect correlates with the actual effect, the analysis supports our conclusion that the Mentorship Project most likely contributed to the relative difference in grades between the mentorship and control groups.

To investigate whether the project succeeds in inspiring the pursuit of higher education, we followed up with students who had graduated from the school. We found that students who had participate dint he project were twice as likely to choose university prep programs compared with the control group. This difference could be partly explained by the fact that participating students had higher grade point averages even before the project and that the proportion of boys is higher and the proportion of immigrants is lower in the mentorship group compared to the control group, but also because the project seems to increase the probability that students choose a university prep program.

Furthermore, survey responses, attendance at the project's tutoring sessions and previous research have been studied to supplement the results from the tutoring study. The survey answers do not indicate that the main reason for participation was due to shortcomings in the home environment, but because they actually found the project to be stimulating.

As mentioned earlier, statistics on general school attendance and prior research on tutoring projects have shown that older students often have lower school attendance and are more reluctant to participate in tutoring projects. A strength of the project studied is the high attendance at the tutoring sessions. We have also investigated whether the project may have increased school attendance among

the participating students. The mentorship group has a higher school attendance than the control group throughout the semester, but since there is no noticeable difference between the groups during the semester, we can not show that the project has led to higher school attendance. We also observe that the project seems to have had a greater positive effect on the grades for boys than for girls.

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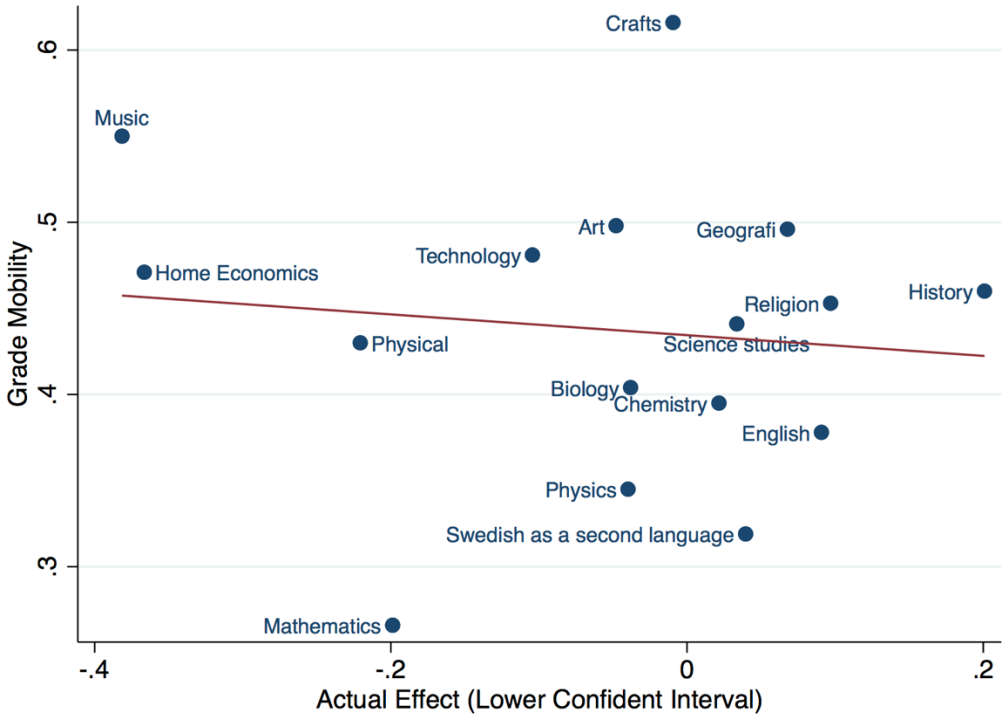
8. Appendix: Sensitivity tests

8.1 No correlation between grade mobility and actual effect



8.2 Robustness tests with synthetic control group

In the basic model, we checked for differences in the student base between the mentorship and control groups that could distort the results. As Vlachos (2018) shows, however, it is possible that if a group has a larger proportion of students with the lowest grade, it means that a higher proportion in that group can only increase their grades. Another group with a lower proportion with the lowest grade will then probably have a worse grade trend (everything else being equal). To control for this issue, but also to check the results with a supplementary statistical model, we do an extra test where we use a so-called "synthetic control group". The procedures and results for the synthetic control group are explained below. We should mention there is more technical language in this part. Here, too, a mentorship group that has completed the tutoring program is compared with a control group. We have grade data at the individual level for six semesters in high school (from year 7 to year 9). "Treatment" begins at term 5 (the fall term in ninth grade). It is thus 4 time periods before treatment and 2 time periods after treatment. In a graph with the grading trend for the project and the control group, the trends should therefore diverge after 4 time periods. Since program participation is not random, there is a risk of self-selection where more study-motivated students choose to join the program. This means that the mentorship group may have a stronger positive grade trend even before the project.

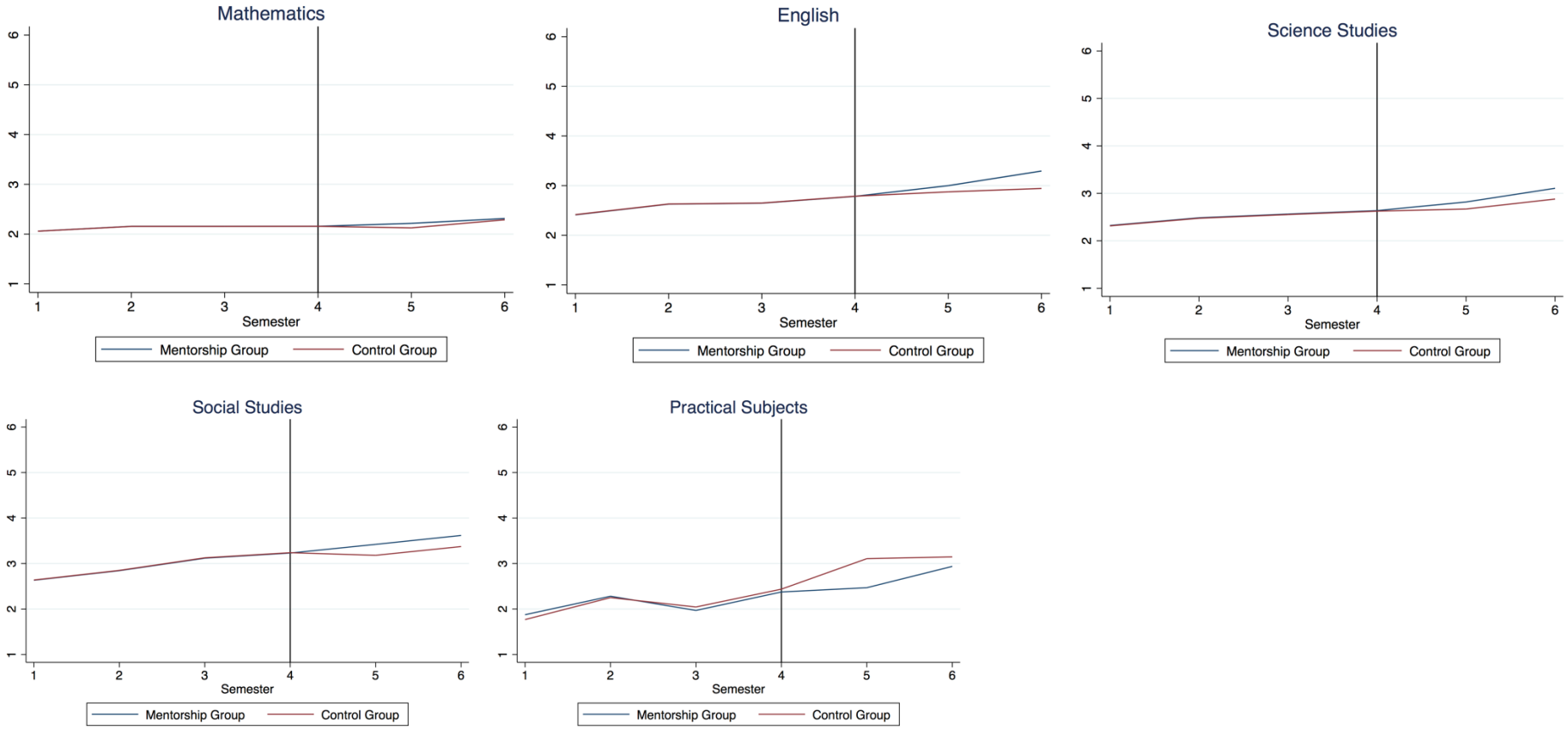
Our data contains 74 students in the control group and 70 in the mentorship group.[11] We can not use matching of similar students to the control group that was part of the mentorship group because a larger control group is needed to find "control group twins" to match with the study group. Coupled with the fact that there are plausibly no important unobservable factors that affect both group affiliation and outcome – constitute the model's assumption (called the Conditional Independence Assumption, CIA). The statistical problem is (i) a limited number of participants in the control group and thus does not match the mentorship group against similar individuals, and (ii) different grade trends in the mentorship and control groups and therefore a so-called "unadjusted difference-in-difference model" does not work. A synthetic control group could solve the problem as it uses "bits" from the control group and not whole individuals in a more efficient way. These pieces are then put together using variables that covariate with the dependent variable ("covariates") and / or the actual values that the mentorship group assumes before treatment (the project). According to Kaul (2015), however, it is problematic to include both covariates and actual values at the same time when creating the synthetic control group. We have therefore used all actual values before the project without covariates to create the synthetic control group. The results are shown below when the mentorship group is compared with the synthetic control group.

Results for each subject from the analysis with synthetic control group

Figure 8.2 shows before-and-after analysis among mentorship and control group students after the 'Synthetic control group' was created. Note that the project (treatment) starts from term 5. The possible trend difference must therefore start in term 4, hence the black lines in the figures are set to term 4. All five analyses of the project's effect on mentorship students (treatment group) indicate a rising trend in terms of grades after the project, however we also note a slight increase even before the project was initiated among the mentorship students. This could indicate sample selectivity bias.

[11] The number of observations has decreased compared to the basic model because we removed students who do not have grades in all subjects every semester. In the basic model, the dataset was balanced because there was enough data for grade point averages for the entire lower secondary school period.

Figure 8.2. Synthetic control group analysis of mentorship and control group



8.3 Placebo test

Since the results of the analysis using the synthetic control group give similar results as the basic model, we can consider the results being robust for this alternative method.

In Figure 8.3, we examine how robust the synthetic analysis is by performing a placebo test for the mentorship group where we move 'treatment' (project participation) one semester backwards. Previously, treatment was t = 5, so the effect should be visible after t = 4. In the placebo test, placebo treatment was set to t = 4. If the results are not robust, the trends should diverge after t = 3. The figure below very accurately shows that the trend difference was moved back as far as after t = 3. The same effect is observed in runs for all subjects (except NO) (not show in the figures below). This is probably due to the fact that we have too few time periods before treatment for it to be a well-calibrated model. We thus have too few observations for matching and too few time periods before treatment for a robust synthetic model. Therefore, a standard difference-in-difference method with fixed effects and control variables for grades before treatment has been chosen as the main method.

Figure 8.3. Placebo test. "Project participation" (Treatment) is moved back one semester in the model.