Identifying reasons for science students to not pursue a teaching career; why students don't want to become teachers.

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Abstract

This study investigates the perception of science bachelor students towards science teaching as a career. Using a questionnaire with open and closed questions on 137 first- and second-year students from different science bachelors on a large Dutch university, we found that general perceptions on being a science teacher did not significantly differ between students that had previously considered becoming a science teacher and students that had not. It was also found that low salary, high workload and problems related to working with adolescents are perceived as the biggest negative aspects of a career as a science teacher. Strikingly, working with adolescents is also the perceived positive aspect most often mentioned by students that have considered becoming a science teacher. Based on this data, recommendations are given to tackle some of the clichés and preconceptions students have about teaching science. Limitations of this study are also discussed, as well as recommendations for further research.

Introduction

Education is a large part of the life of almost every teenager. In school, they learn about the world and develop skills that they will use for the rest of their lives. This would not be possible without the help of teachers, as teachers stand at the core of good education. Each teacher is responsible for 3-8 classes, and every teenager has contact with 10-15 teachers, one for every course he/she takes .

However, these numbers are changing. Multiple countries are struggling with a 'teacher shortage' in secondary education. For example, the United Kingdom is dealing with a "growing recruitment and retention crisis". The British Department of Education published their strategy to increase recruitment and retention of teachers, and in this publication they showed a projection of what would happen if the current trend of increasing pupil numbers and decreasing teacher numbers continued without an intervention (Department for Education, 2019). This is shown in the graph below (Figure 1).

Not only the UK struggles with this problem, but countries such as Denmark, the USA and the Netherlands also deal with the same situation (Rychla, 2017; Betancourt, 2018; Bussemaker & Dekker, 2017). In a recent Dutch study, a similar trend to the UK was outlined (CentERdata, 2018). The graph below (Figure 2, translated) is taken from this article, and specifically shows the projections for the Netherlands. It shows the size of the growing teacher shortage in the next few years, given the most positive of circumstances. The study also identified courses in the Dutch curriculum for which the shortage will be the biggest. These courses are mostly STEM courses: Physics, Chemistry, Computer Sciences and Mathematics.

As a consequence of the growing teacher shortages, the workload for current teachers increases. These teachers know and experience this, and therefore they are going on strikes (de Vos et al., 6 November 2019; Geels, 4 November 2019) and demand the government to really do something to solve the problem of growing teacher shortages.

One of the primary causes for the growing teacher shortage is that many teachers from the

baby-boom generation are retiring. In 2018, a combined total of 8838,5 fulltime jobs was taught by teachers aged 60 or higher (DUO, 2019). Most of these teachers will retire within the next five years.

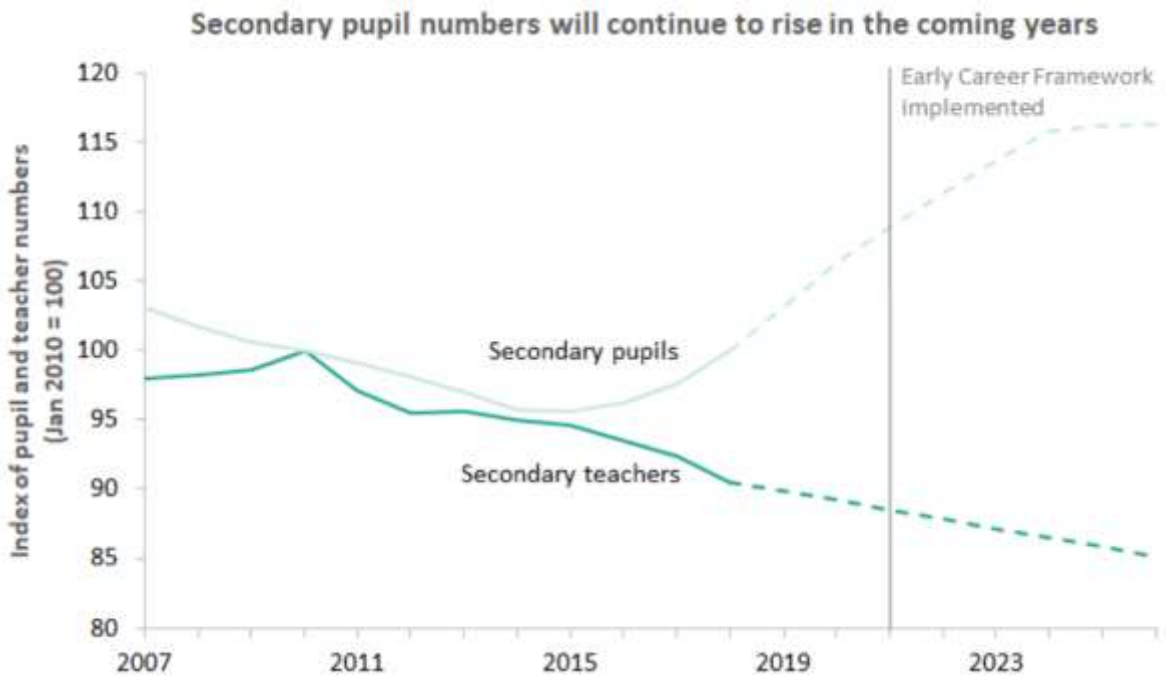

Figure 1. Projected pupil and teacher numbers for the UK (Department for Education, 2019).

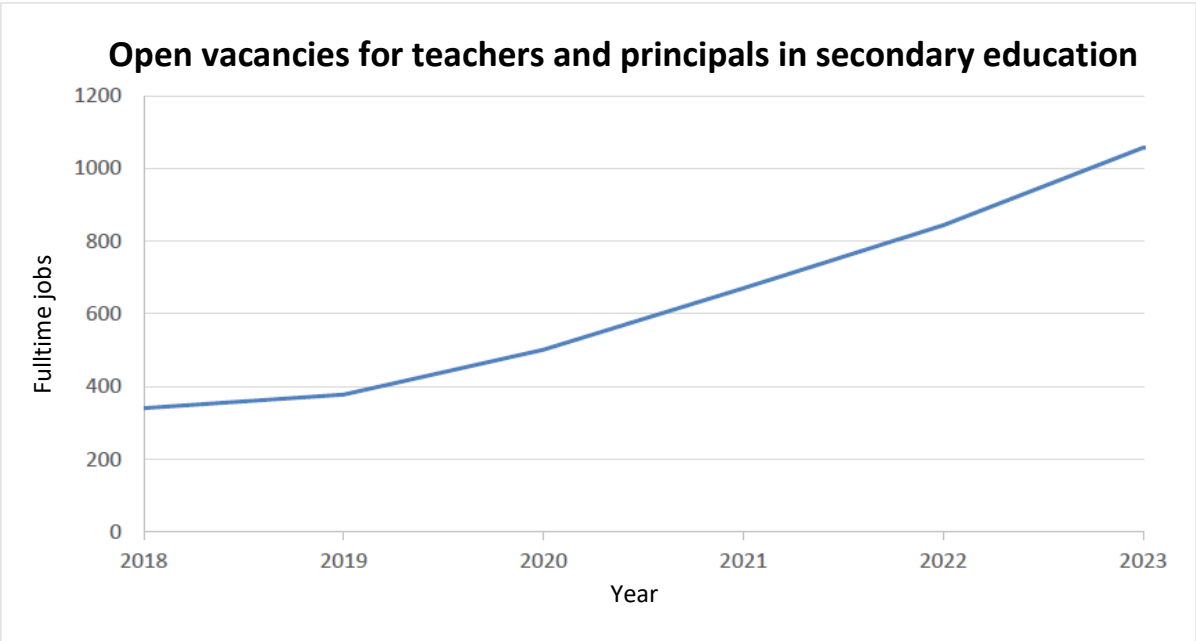

Figure 2. Growing teacher shortages in the Netherlands (CentERdata, 2019).

This problem was identified by the Dutch government, and they stated that this will also be one of the biggest problems in the next few years (Rijksoverheid, 2019). This efflux of teachers will be the cause of a big dip in the amount of teacher the Netherlands will have, as there are not enough teachers to fill the gap. To illustrate, in 2018 only around 300 fulltime jobs were taught by preservice teachers (DUO, 2019) as opposed to the aforementioned 8838,5 fulltime jobs that are taught by teachers aged 60 or older.

A number of measures have been taken by the Dutch government. The age of retirement for

teachers has been augmented with two years, retired teachers are asked to return to their jobs and people without a teaching qualification are teaching classes (around 6% of all classes are taught by unqualified teachers [CentERdata, 2018]). Whereas these measures are intended to alleviate the most pressing and acute consequences of the teacher shortage, they are not meant to be long-term solutions. Government policy states (Slob et al., 2019) that a long-term solution needs to be found in more trained and qualified teachers.

In summary, a large number of recently graduated teachers is needed to counter the decline in teacher numbers. This poses a problem. At this moment, there are more teachers retiring than there are teachers graduating their teacher training programme (TTP) (DUO, 2019). The output of these TTP's is too low. Even if all of the graduated teachers would fill positions now taken by teachers approaching retirement, there would still be a decrease in the total amount of teachers. So, what is needed is a substantial increase in the output of the TTP's and consequently, more students registering for a TTP. Finally, the current drop-out rate has to decrease. Training more teachers is the key to filling the gap between the amount of teachers starting their teaching career and the amount that end their teaching career.

On a typical Dutch university, about 43 to 50 percent of all students who start the bachelors programmes Physics and Astronomy, Mathematics, Chemistry, and Computer Sciences graduate within 4 years (UU, 2019a-d). However, the total intake into the TTP's in 2018 was only 39 students. Compared to the amount of students that start the bachelors programmes (which is over 100 students per programme), this intake is very small. If the government wants to use recently graduated, qualified teachers to solve the teacher shortage, this intake will have to be increased.

Several interventions have already been tried to tackle the problem of this low intake, but up until now, these interventions have not been sufficient (Aragon, 2016). To think of new interventions, and to increase the intake into TTP's, it is important to figure out what students look for in a TTP or a teaching career. This has been researched, but not a lot is known about why students do *not* want to pursue a teaching career. This study focuses on that.

The aim of this study is to find out which factors play a major role in the decision making process of Bachelor students when deciding about a career in teaching. More specifically, the focus of this study will be on negative deciding factors, which are factors that students consider when *not* choosing for a teaching career. Along with this aim, and to find the core information for this study, the following research question is posed:

What are the deciding factors that withhold STEM students from pursuing a teaching career?

Theoretical background

The context of this research is career choices. At some point in their lives, everyone will have to make a career choice. For the decision maker, this can be a daunting task, which involves much more than just the possession of the correct information or being matched with a certain career choice. Career choice has a much wider meaning, and is dependent on the life of the decision maker (Blustein et al., 2004).

Amundson et al. (2010) interviewed 17 adults who went through the process of decision making, and identified several factors that play a role in the decision making process. Overall, they found three overarching themes that were represented among their participants. These themes were relational life, personal meaning, and economic realities. An earlier study by Albion & Fogarty (2002) found an additional number of factors that influence career decision making, and more importantly found that most of these influential factors play a role in the decision making process for students as well as adults.

To prepare students for a teaching career it is important that the students have a realistic view of what it means to be a teacher. A good perception of a teaching career can help in creating personal meaning for the students, which could help them make a more informed choice, and have them be prepared for a teaching career. Kyriacou & Coulthard (2000) studied the view that English

first-degree subject university undergraduates have of teaching as a career choice. What they found was that students generally did not have a positive view of teaching. For example, they mentioned that the resources such as study books and online methods in secondary education are of low quality. They said that this had to change to make teaching a more viable career choice. The study did, however, find positive comments on a teaching career, such as that teaching is a job that gives responsibility, where one can contribute to society, and that teaching has a high job mobility. In the end, however, most undergraduates still don't choose to become a teacher. According to Valcke et al. (2010), the views of these 'prospective teachers' should be taken in to account in teacher education.

Despite these somewhat positive view prospective teachers have of being a teacher, the general public seems to think that teachers have a lesser image. A study from the Maastricht University, where researchers studied the status and image of a teacher in the 21st century, found that teachers with a full teaching qualification rank 43th on the 'job prestige scale', while teachers with a partial teaching qualification rank 50th (Cörvers et al., 2017). This image of teachers needs to change to encourage students to become teachers.

International surveys show what it means to be a teacher in the changing paradigm of lifelong learning, and at the end of his paper, Coolahan (2002) provided some guidelines to realise this view. Among those guidelines were notions of increasing and maintaining good quality teacher training, which could be based on the guidelines set by the OECD (OECD, 1998), and the notion of making the profession of teaching more attractive, which was substantiated by a recent OECD publication (OECD, 2019). To make the teaching profession more attractive, the publications focus on factors such as salary, but much less on other factors as a way of motivating current and future students and teachers to opt for a teaching career.

Current interventions focus on extrinsically motivating students to become teachers (OECD, 1998; OECD, 2019), but this might be part of the reason why there is a teacher shortage. These interventions are mostly based on increasing the salary, and although this increases the economic realities reasons Amundson et al. (2010) put forward, Deci & Ryan (2010) showed that disproportionate rewards (extrinsic motivation) tend to undermine the intrinsic motivation to do a certain activity. Therefore, if the main focus of decreasing the teacher shortage is to reward the people that do choose for a teaching career, the intrinsic motivation to become a teacher is lowered. This, together with the notion that teaching as a profession has a relatively low social status, could lead to the following hypothesis:

> *The main inhibiting factors for students to opt for a teaching career are the low social status of the job, ill-fitting extrinsic rewards, and low to no intrinsic motivation to become a teacher.*

Although Self-Determination Theory (Ryan & Deci, 2000) is the leading theory in the field of motivation, and a research by Watt & Richardson (2007) that concluded in the development and validation of a measuring scale (Factors Influencing Teaching Choice [FIT-Choice]) made use of the Expectancy-Value Theory (EVT), this research is mostly guided by the theory for career decision making by Amundson et al. (2010).

Based on this theory, the hypothesis can be broken down into the overarching themes of personal meaning, relational life and economic realities. The low social status of teaching has an impact on relational life. It was found that people who value relational life as a big aspect when making a career choice "actively sought out harmonious work environments and avoided those they perceived as toxic." This could potentially mean that the low social status of teachers could impact the relational life by not providing the teachers with a safe working environment and by putting strain on the relations between the decision maker and his or her relations.

The extrinsic rewards, such as salary, have a direct influence in what the students perceive as economic realities. If the salary is too low, it has a negative influence on economic realities, which could in turn mean that students do not choose for a teaching career because they feel that the pay

is not proportionate to the work they do.

Low to no intrinsic motivation may have to do with the fact that students don't see the possibility for meaningful engagement, stimulation and self-development. These themes are all subthemes of personal meaning. Students perceive the job of a teacher as very strict and with very little room for flexibility and freedom, which is something that they do look for in a prospective career.

Methods

To answer the research question, the following steps have been taken. First of all, subjects in secondary education with a teacher shortage have been identified. With this information, bachelor programmes that could potentially lead to a teaching qualification in those subjects have been identified. Subsequently, large mandatory courses in these bachelors programmes were identified and the teachers were asked if their students could participate in the research by filling out a questionnaire about what reasons they have and which factors are deciding for them when considering becoming a science teacher or not. Mandatory first-year bachelor courses were chosen because all students must take these. Of course, not all registered students can be expected to be actually present at the courses, but this selection could lead to a high response rate.

To further increase the response rate, the researcher was personally present during lectures or tutorials, where he could ask the students to fill out the questionnaire right away. A high response rate was needed for this study, so that the students who had not considered becoming a teacher, and who may have less interest in the study, could also be reached. The data from this questionnaire has been coded and analysed.

Sample

This study focuses specifically on teacher shortages in the Netherlands. It was determined to conduct it at one of the largest universities in the Netherlands, because it is located in the centre of the country, so it is very likely that students from all over the Netherlands will be studying at this university. The university offers a wide variety of different educational programmes, including many programmes that align with courses adolescents take in secondary education. Lastly, the university offers all existing types of Teacher Training Programmes (TTP's). There are 1-year and 2-year TTP's which lead to a full teaching qualification, and there are an Educational Minor and an Educational Profile, which lead to a partial teaching qualification. The table below gives a clear overview of the TTP's that can be followed at the university (Table 1). All these TTP's can be followed either during or after a bachelor or master programme. This means that at any point during their time as a student, the students can opt to pursue a career as a teacher.

Table 1. Overview of the TTP's, along with the teaching qualification it grants the graduates of these programmes.

Partial teaching qualification		Full teaching qualification	
Educational Profile	Educational Minor	1-year master programme	2-year master programme

From the university, first and second year students from the selected courses were asked to participate in the study, which resulted in a sample population of around 320 students.

Data collection

The data collection for this study was done by using a questionnaire approach. Once the sample population was selected, the researcher attended some of the lectures from large mandatory courses that all students of a particular bachelor programme have to take. During one of the lecture breaks, the researcher explained the goal of the study, and asked the students to take their devices

and fill out a questionnaire, which was supplied to them through the electronic learning environment.

Data collection instrument

The questionnaire is based on the theory by Amundson et al. (2010).The questionnaire consists of three types of questions. Firstly, there are some questions that determine the composition of the sample population (age, male/female, bachelor). This section ended with the yes/no-question 'have you ever seriously considered becoming a high school science teacher?', which would split the results of the sample in two. The data could then be compared between students who did and students who did not consider becoming a science teacher.

Secondly, the questionnaire contains Likert scale questions that are used to check whether there is a difference in perception of teachers between the students that had considered becoming a teacher and the students that had not. These Likert-scale questions were constructed on the basis of the results of earlier studies, such as Werfkracht, that targeted specific groups within the student population.

The third type of questions were open questions. These questions are constructed to find overarching themes in the answers students give about their view of teachers and the reasons they have to either consider becoming a science teacher or not. The questions in this section differed based on the answer of the yes/no question at the start of the questionnaire, so both groups answered a different set of open questions. The complete questionnaire can be found in Appendix A.

Data analysis

For analysis, the data was split up in three parts. The first part comprises the questions used to determine the age, gender, bachelors programme and what year the students are in. The question that followed divided the sample in two, because data analysis was done separately for the group that did consider becoming a science teacher (the 'yes-group') and the group that had not considered becoming a science teacher (the 'no-group').

The second part of the data consisted of 5 Likert scale questions, which were plotted in graphs and tested for normality after which an ANOVA test was done to compare the perceptions of being a teacher between the yes-group and the no-group.

The third part of the data consisted of open questions, in which students were asked about what they see as positive and negative aspects of being a teacher, as well as what would have to change to strengthen their consideration. This data was coded per question. The data was grouped in themes to find out whether there would be overarching reasons why students would or would not want to become science teachers. Two subsets of this data were coded by a second coder, which resulted in a high interrater reliability ($\kappa=0.899$, $p<0.0001$ & $\kappa=0.843$, $p<0.0001$).

Results

Of the roughly 320 students that were asked to fill out the questionnaire, 137 students did. This resulted in a response rate of 40%. Of these respondents, 53 are women, 83 are men and 1 respondent did not want to reveal their gender. The respondents are divided over different bachelors programmes, as can be seen in Table 2.

The age distribution ranged from 16 to 28, but the majority of the respondents were age 18 or 19, as can be seen from Figure 4. 112 students are 1st-year students, and there are 25 2nd year students in the sample.

From the 137 students, 59 (43%) said that they had considered becoming a science teacher and 78 (57%) students said that they had not considered becoming a science teacher. The distribution of male and female students among these groups is 58% male and 42% female in the yes-group and 63% male and 37% female in the no-group).

Table 2. Distribution of respondents over different bachelors programmes.

Mathematics	47	
Physics	27	
Chemistry	14	
Molecular Life Sciences	19	
Combined programmes	23	
Mathematics + Physics		16
Mathematics + Computer Sciences		1
Mathematics + Chemistry		1
Chemistry + Physics		5
Other programmes	7	
College of Pharmaceutical Sciences		1
Computer Sciences		1
English (with Physics courses)		1
Global Sustainability Science		2
Liberal Arts and Sciences		1
Medicine		1

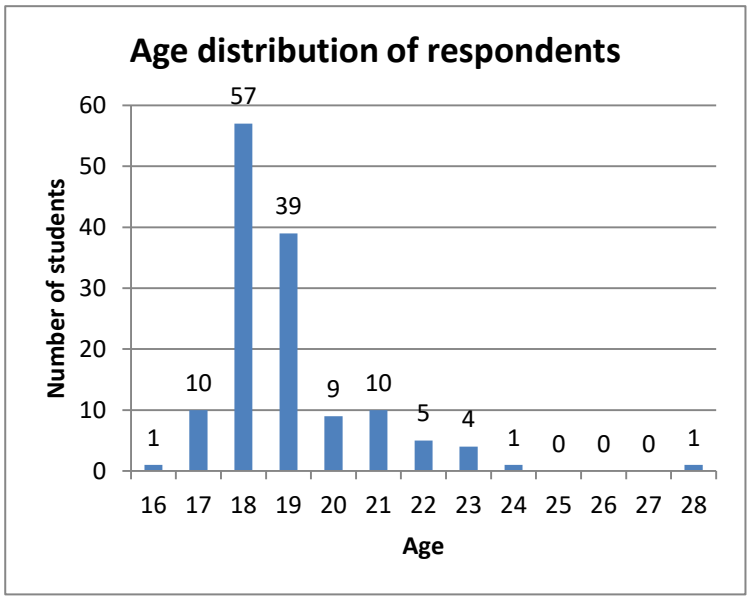

Figure 3. Age distribution of respondents.

Likert scale questions

The five questions with Likert scales were meant to assess the perception students have of teachers. The questions were statements about being a teacher (e.g. 'Science teachers get paid too little'), and the students could choose to what degree they agreed with this statement. The graphs showing the answers the students gave are shown in Appendix B. Students seemed to think that science teachers get paid to little. Many students also share the view that the social status of teachers is quite low. Students had no strong opinion on the workload of teachers, but most of them did not think teachers choose their job as a last resort. There was also no clear opinion on job mobility of teachers.

The answers to the statements were normally distributed, and therefore normality could be assumed. The Q-Q plots are shown in Appendix C. Therefore, a one-way ANOVA test (SPSS package) was done to assess whether there were differences in perception between the yes-group and the no-group. There was no significant difference found between the yes- and the no-group with any of the 5 statements regarding the perception. There was no significant difference in the perceptions of social status of the teachers [$F(1,135)=0.299$, $p=0.586$)], and there was also no significant difference in the perception of salary [$F(1,135)=0.249$, $p=0.591$)]. As for the perception of workload, choosing teaching as a last resort and the ability to switch jobs, there was also no significant difference found [resp. $F(1,135)=0.131$, $p=0.710$); $F(1,135)=2.034$, $p=0.156$); $(1,135)=2.129$, $p=0.147$)]. SPSS output of the tests are also shown in Appendix C.

Open questions

The yes-group and the no-group both answered a question about what they thought of their own high school science teachers, but they answered different questions on why they did or did not want to become teachers. The yes-group was also asked about what they view as positive and negative aspects about teaching a science course. This data was coded by dividing them into categories to find a bigger theme in the answers.

Views of students' own science teachers

Both groups answered the question about what they thought of their own high school science teachers. The responses of the students are shown below (Figure 5).

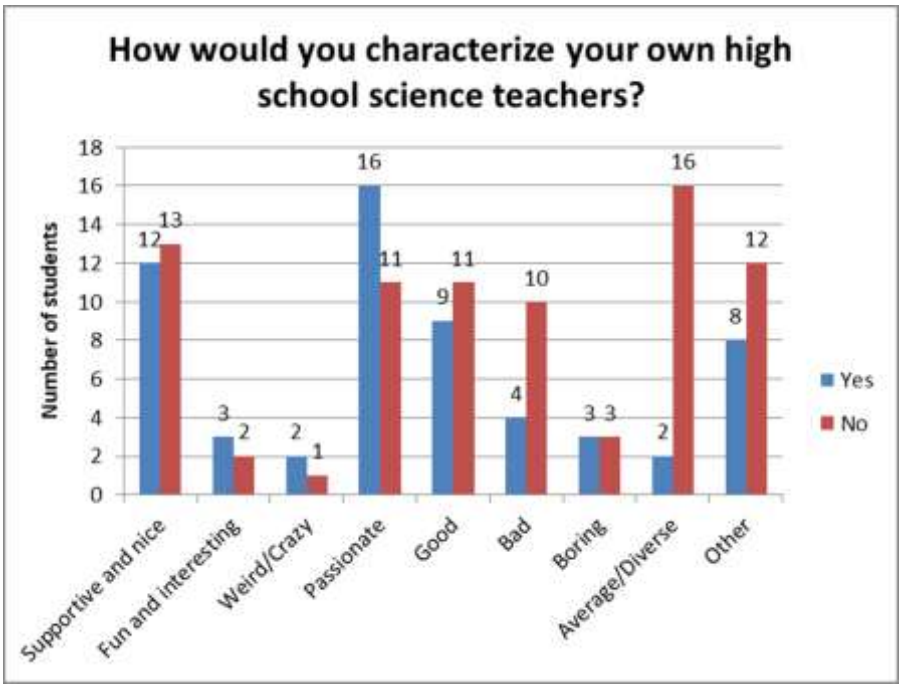

Figure 4. Students' answers on how they characterize their own high school science teachers.

What is most notable about this graph is that it is immediately clear that the no-group has a much higher number of students who had mixed experiences with their science teachers. This manifests itself in the data by answers such as “My math teacher was really good, but my physics teacher couldn’t teach very well”. Other noticeable results from the graph are that the yes-group found their science teachers in general more passionate than the no-group, and the no-group also had more bad teachers than the yes-group. Students from the yes-group even mentioned in the open questions that their passionate teachers were the reason that they chose their bachelors programme.

Positive and negative aspects of teaching as perceived by the yes-group

The yes-group was asked to specify what they thought are the biggest positive aspects of teaching. Most of the students found working with adolescents the biggest positive aspects of being a teacher. Because the biggest part of being a teacher involves working with adolescents, it is only logical that students who consider becoming a teacher find this a positive aspect. Having a lot of free days and having job stability were also among the positive aspects of teaching. All positive aspects are shown in Figure 6.

The students were also asked to name the three biggest negative aspects of teaching. Interestingly, working with adolescents is also seen as one of the biggest negative aspects of teachers. Salary and workload are also mentioned as the biggest negative factors. The graph depicting the negative aspects is shown in Figure 7.

What would have to change to have students actually pursue a science teaching career?

59 students out of the 137 respondents mentioned that they have considered becoming a science teacher. This is 43% of the sample population. However, as mentioned in the introduction, the amount of students that enrols in a TTP is much lower, which is only 6% of the sample population. So, there is something that is holding students back from pursuing a career in science teaching. Figure 8 shows the conditions that would have to change for a career in science teaching to become attractive, according to the students. This graph shows that salary is one of the biggest factors that would have to change. Some students also find that the workload of being a teacher is too high, so they would want to have the option to be a part-time teacher. This also has the added advantage that students can combine teaching and researching, which some of the students

mentioned as a solution. Opportunity for development and a higher status would also be needed for the students to pursue a science teaching career. A complete overview is shown in Figure 8.

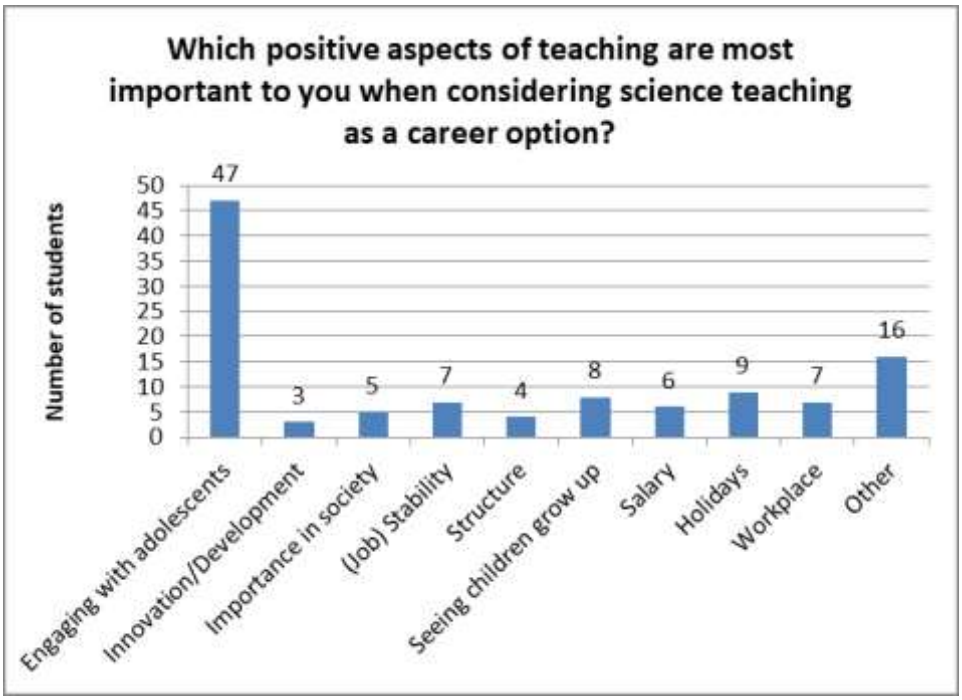

Figure 5. Students' answers on what they find the most important positive aspects of science teaching.

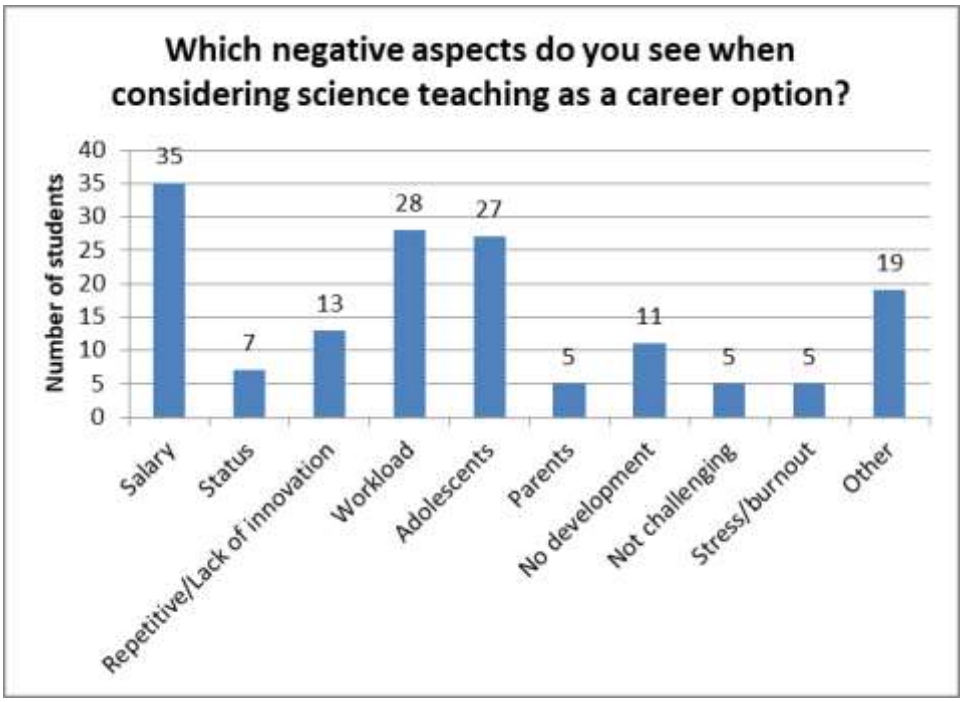

Figure 6. Students' answers on what they find the most important negative aspects of science teaching.

Negative aspects of teaching as perceived by the no-group

Students from the no-group were specifically asked why they had not considered becoming a science teacher. Interestingly, working with adolescents is the biggest reason to not become a science teacher. This was also shown to be a negative aspect for the yes-group. No interest in teaching or focussing on a different career were also among the more prominent reasons why students from the no-group had not considered becoming a science teacher. Salary seemed to only

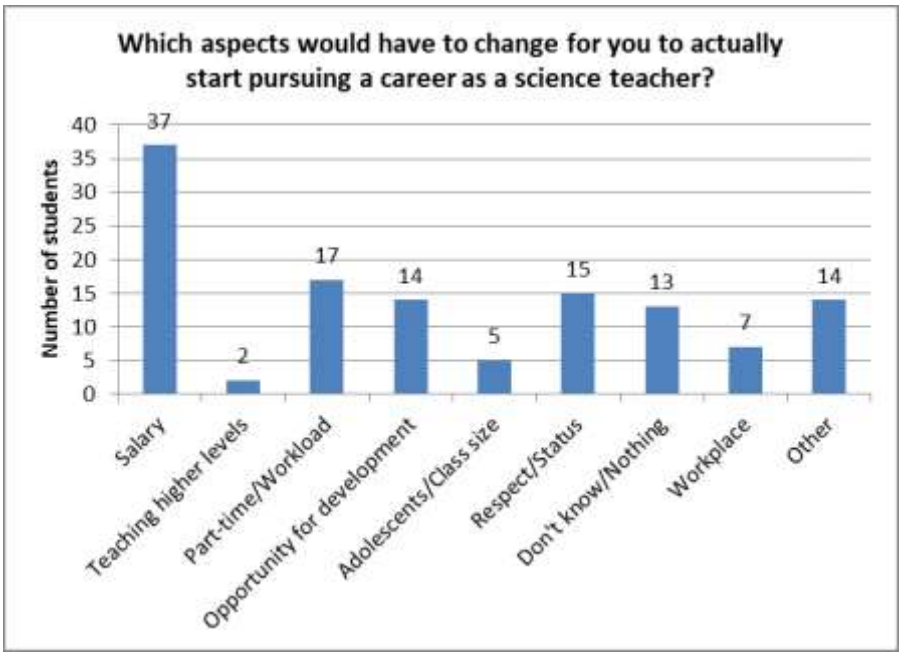

Figure 7. Students' answers on what would have to change to pursue a science teaching career.

be an issue for a relatively small amount of students, and some students had not yet thought about their future careers. See Figure 9 for the complete overview.

What would have to change for students to consider a science teaching career?

Figure 10 shows what students answered when asked what would have to change to start considering a career in science teaching. They mentioned salary, workload and working with adolescents as the biggest points. This was unexpected, because both salary and workload are hardly mentioned as reasons why students had not considered becoming a science teacher. Other factors that would have to change are the status and difficulty of being a teacher, or personal factors.

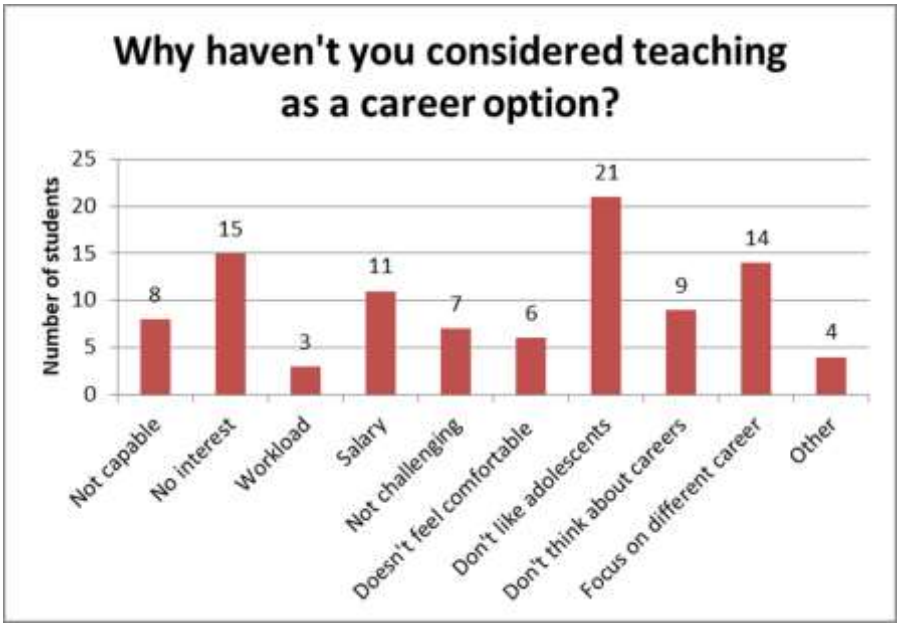

Figure 8. Students' answers on why they had not considered becoming a science teacher.

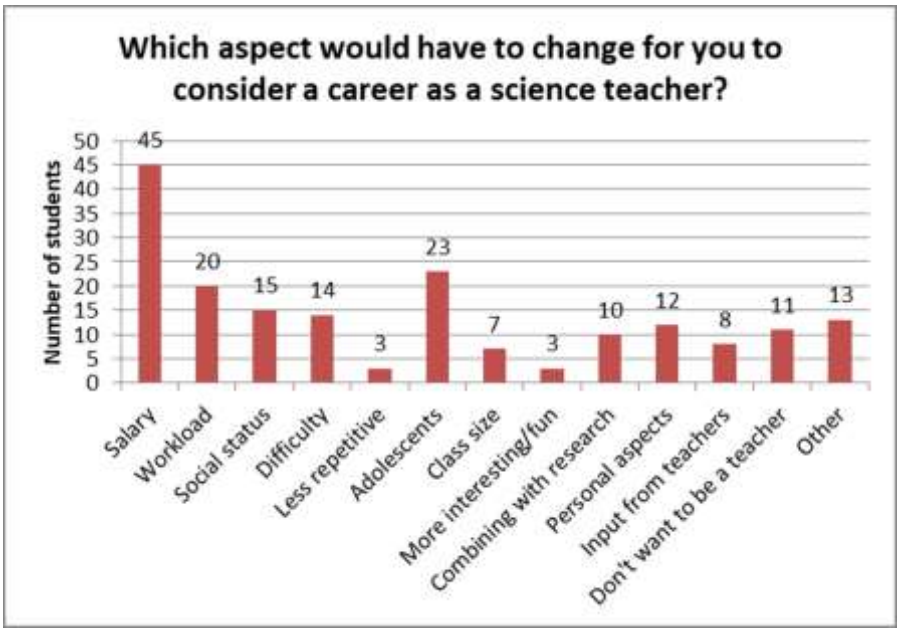

Figure 9. Students' answers on what would have to change to consider a science teaching career.

Discussion

As expected, many students seem to think that teaching does not provide them with a high enough salary, which would negatively impact their economic realities. These perceived economic realities are therefore not a strong enough reason to have them consider or pursue a science teaching career. Students also give very little personal meaning to becoming a teacher, because students that do not want to become science teachers mainly do not want to do so because they don't like working with adolescents or they think the workload is too high.

Contrary to what was expected, social status does not seem to be a big inhibiting factor for most students. Students did think it played a role in their decision making process, but it was not the biggest deciding factor and does not hold students back from becoming a teacher. This is similar to the findings of Fokkens-Bruinsma & Canrinus (2012) and Watt & Richardson (2007).

The question that asked students to characterize their teachers yielded very diverse results, with many students saying that they had mixed experiences with different teachers. Students answered that they liked their one teacher, but that a different teacher made a very bad impression. This data is not directly useful in this study, and in future studies of this or a similar kind, asking specifically to characterize the teacher of the course corresponding with the bachelors programme the students chose might result in more clear and better useable data. A possible question could be: "How would you characterize your high school [course] teacher?", with the course dependent on a previously given answer on what bachelors programme they are doing.

Salary was an often mentioned factor in the decision making process. This may have something to do with the current state of affairs in the Netherlands. Very recently, teachers from primary and secondary schools went on strike for extra government funding. This funding would have to be used to solve the teacher shortage, decrease workload and increase salary. The latter would be applied mainly to primary education teachers. This was often neglected by the media, since teachers were classified as one group and no distinction was made between primary and secondary education. It is the primary education teachers who – at the time of this research - have a lower salary than secondary education teachers. Secondary education science teachers on average make €1500-€2000 a month more than primary education teachers (according to the Collective Labour Agreement Primary Education,2019, and the Collective Labour Agreement Secondary Education, 2018). Students might have had misconceptions about the salary, which could have led to the fact that students think that teachers earn very little.

Working with adolescents is seen as a big positive factor in teaching, but also as a big negative factor. It could make students choose a teaching career, but also make students stay away from a teaching career. This makes sense, since working with adolescents lies at the core of teaching in secondary education. Working with adolescents is a reason that fits in the overarching theme of personal meaning. Students can see this as a positive reason, because they get to be a role model for the adolescents. However, students can also see this as a negative reason, because working with adolescents usually makes for a work environment where one has to deal with crises and conflicts.

When students were asked what would have to change to have them consider a career in science teaching, a combination of 'salary, status and workload' was observed in many answers. This may have to do with the way the questionnaire was constructed. In the questionnaire the students answered the statements before they were asked what would have to change to have them consider a teaching career. Answering the statements first might have put the idea of salary, status and workload in the students' heads. This may have caused them to answer this particular combination, because it was the first thing that came to mind ('test effect'). This can be easily overcome in future research, by having the students answer open questions first and statements afterwards.

Next to the test effect in the data, a discrepancy was also observed. When students from the no-group were asked why they had not considered a career in science teaching, there were only 3 mentions of 'Workload' and 11 mentions of 'Salary'. However, when students were subsequently asked what would have to change to have them consider a science teaching career, there were 20 mentions of 'Workload' and 45 mentions of 'Salary'. This is a considerable difference and may be explained by the test-effect as well. Another explanation could be that 'workload' and 'salary' are the easy answers. When the students did not know what else they could answer or they did not want to think of any new answers, they could easily resort to these answers. This could also be solved by changing the order of the questionnaire or asking more direct questions.

Perceptions

In this study, it was observed that students have certain perceptions of teaching as a career that are not always true, such as the amount of money a teacher earns. These perceptions could keep them away from a teaching career, and therefore it is important that they are tackled. If students have a correct perception of being a teacher, they can make a more informed career choice, and hopefully it can lead to more students choosing a teaching career. Students should be informed about the salaries in teaching and other job fields, because from the data it became clear that many students seem to think that they can earn a lot more money in different fields, even though this is usually not the case. A study by the SEO found that students that graduate from a TTP have one of the highest starting salaries (Bisschop & Zwetsloot, 2019).

Many students also don't know about the possibility to teach part-time. If they are properly informed about this, workload could become less of an issue, and students will see that they can combine teaching with a different career as well.

Tackling wrong perceptions could be done in one of two ways: students could learn about being a teacher by for example doing a small mandatory internship at a high school where they work with a teacher for a specified amount of time, or they could attend sessions in which a proper vision of a teacher is portrayed and students are orally informed about the job and the possibilities. Conducting a research of this kind over multiple years could give an insight in the development of the job market and whether more or less students want to become science teachers. It could also show if the interventions are working, so interventions can be altered or new interventions can be done.

Limitations

This study also had some limitations. The first limitation is the response rate. The response rate of this study was around 40%, which is relatively high, but it could be higher. Reasons for this are that the researcher physically went to see the students. The students were scattered over multiple rooms, and the research went to see them in these different rooms. It could have been the case that while the researcher was in the first room, students from the other rooms already left, and were

therefore excluded from the study. Another reason is that not all students filled out the questionnaire, even though they were asked to do so. By not filling out the questionnaire, these students also excluded themselves from the study.

The aforementioned reasons could also have led to a bias in the sample. The students that left their lectures at the earliest time possible (or did not show up at all) and the students that refused to fill out the questionnaire or just did not think to do it, are for the most part exactly the students that this study wanted to reach. The fact that these students are not taken up in the sample may have led to a bias. The data showed that 43% of the respondents had considered becoming a science teacher, but if the students that this study missed would have also filled out the questionnaire, this percentage would probably have been lower. Future research can tackle this problem by using multiple ways of getting the students to fill out the questionnaire. The researcher would still have to personally ask students to take part, but the questionnaire could also be sent to the students via e-mail, and the students could be motivated to fill out the questionnaire by giving them a reward or a chance to win a certain item.

Because this study missed certain students and there is a possible bias in the data, it is uncertain how representative this sample actually is. The findings of this study are based on the answers of the students that did fill out the questionnaire, but as mentioned, not all students that this study wanted to reach filled out the questionnaire. Future research should also focus on increasing the response rate to reach more students, and also incorporate more students from higher years and different studies that also lead to a teaching qualification.

Conclusion

This study found that a considerable amount of the sample population considered becoming a teacher. However, many students still change their minds about becoming a teacher, since the fraction of all students who register into the TTP's is lower. It was found that the biggest factor students consider when considering a teaching career is working with adolescents. This was the biggest positive factor, as well as the biggest negative factor. The salary was not enough cause for motivation to become a science teacher. A solution to increasing motivation to become a science teacher is having students experience first-hand what it is like to be a teacher or properly inform them about the many faces of being a teacher.

A continuation of this study could be done by changing certain questions, and using the data from this study, new statements can be created, which could help in yielding more direct and useful answers. The order of the questions should also be mixed up, so that the respondents are influenced by the questionnaire as little as possible. Performing this research over multiple years and with multiple cohorts of students could lead to insights in the motivations of different groups of students, which could in turn indicate the state of the job market, the effectiveness of interventions to change students' perception and help alleviate the teacher shortage in the STEM courses in the Netherlands.

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Appendices

Appendix A: the questionnaire

1. Which bachelor's programme are you currently enrolled in?
    a. Mathematics
    b. Chemistry
    c. Physics and Astronomy
    d. Other (fill out which programme)
2. What year of your bachelor's programme are you in?
    a. 1st year
    b. 2nd year
    c. 1st year, but I'm currently enrolled in this 2nd year course
    d. 2nd year, but I'm currently enrolled in this 1st year course
3. What is you gender?
    a. Female
    b. Male
    c. Prefer not to say
4. What is your age?
5. Have you ever seriously considered a career as a high school science teacher?
    a. Yes // leads to questions 6a through 14a
    b. No // leads to questions 6b through 13b

6a. How would you characterize your own high school teachers?

7a. I think the social status of science teacher is too low.

8a. Science teachers get paid too little.

9a. Science teachers experience a higher workload than other professions.

10a. Science teachers choose teaching as a last resort.

11a. Science teacher can easily switch to a different job after being a teacher.

12a. Which positive aspects of teaching are most important to you when considering science teaching as a career option? Mention three.

13a. Which negative aspects of teaching are most important to you when considering science teaching as a career option? Mention three.

14a. Which aspects would have to change for you to actually start pursuing a career as a science teacher? Mention three.

6b. How would you characterize your own high school teachers?

7b. I think the social status of science teacher is too low.

8b. Science teachers get paid too little.

9b. Science teachers experience a higher workload than other professions.

10b. Science teachers choose teaching as a last resort.

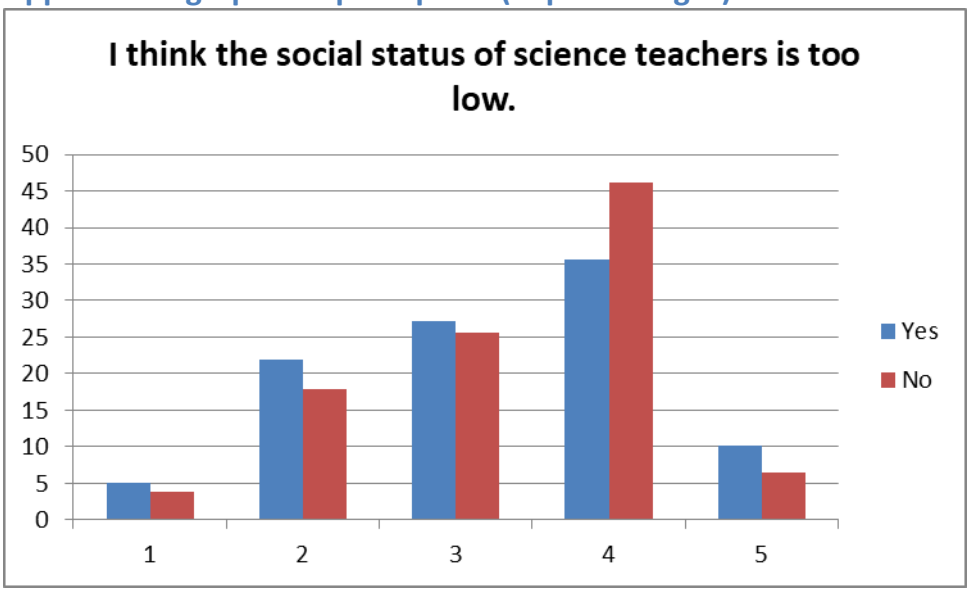
11b. Science teacher can easily switch to a different job after being a teacher.

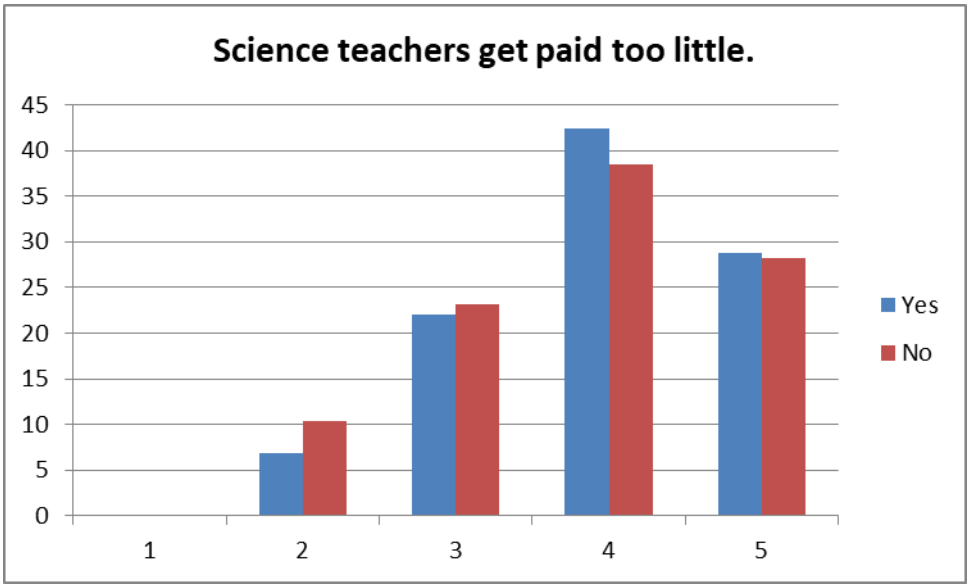
12b. Why haven't you considered teaching as a career option?

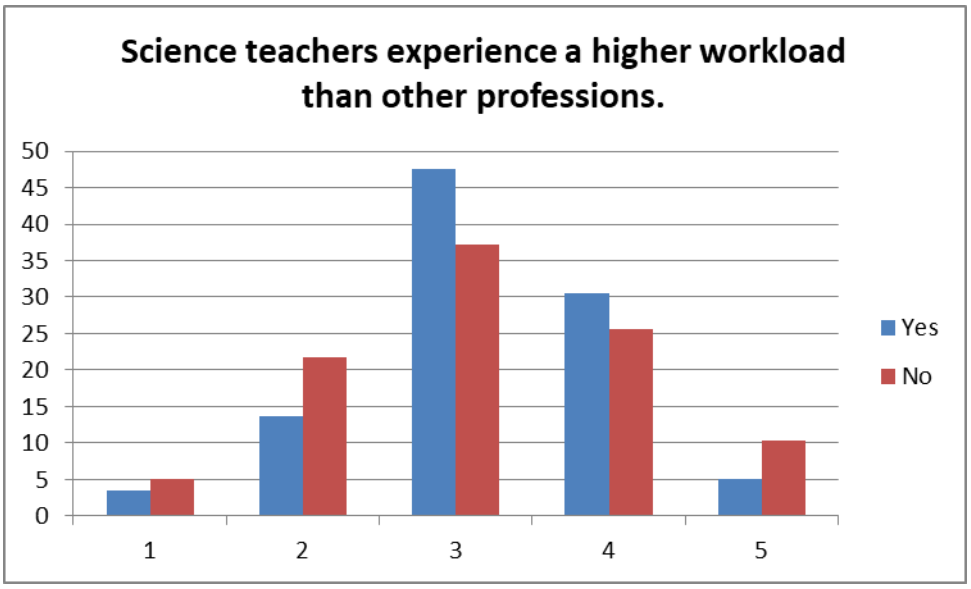
13b. Which aspects would have to change for you to consider a career as a science teacher? Mention three.

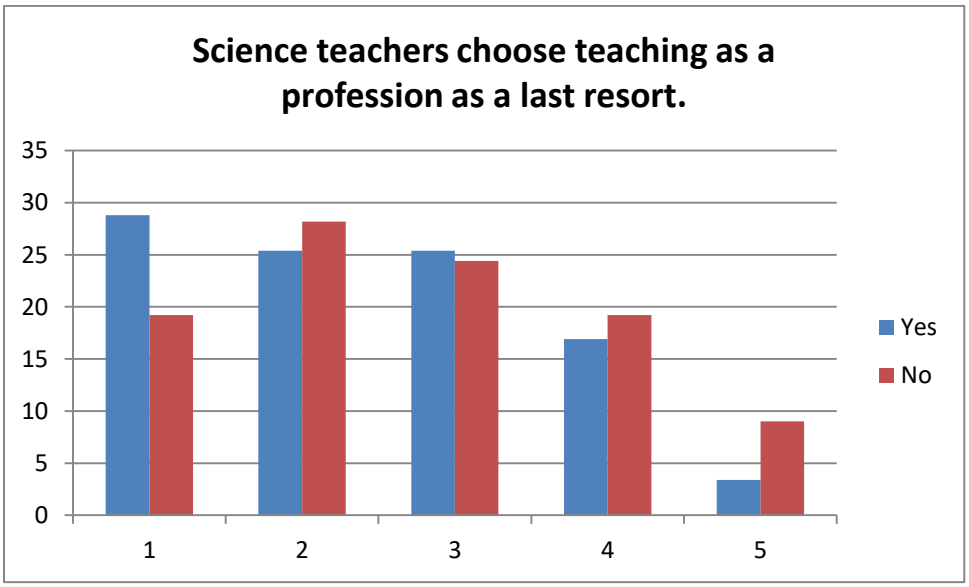
15. Do you have any other comments on the subject of science teaching as a career?
16. If you are open to having a 10-minute interview on this subject, you can leave your email address here.

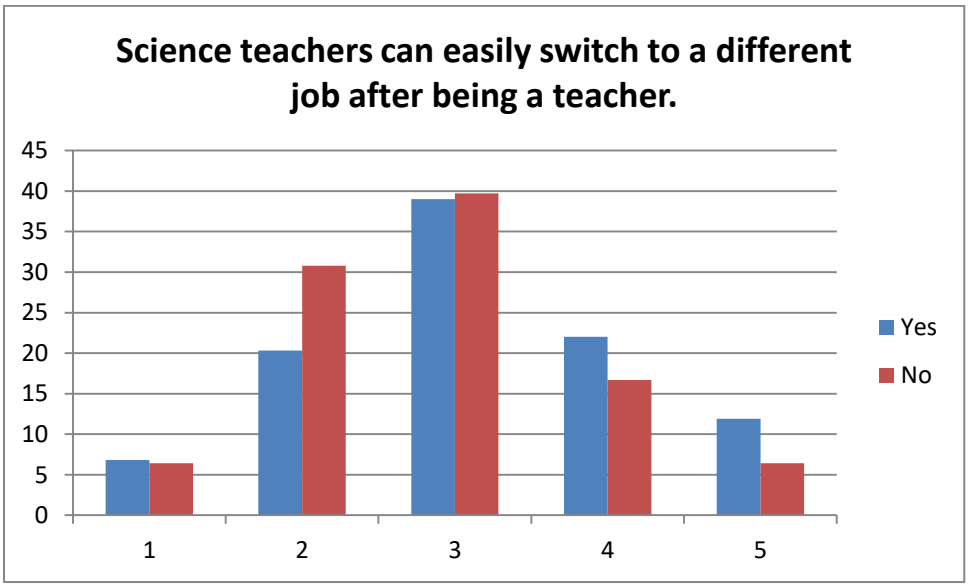
Appendix B: graphs on perception (in percentages)





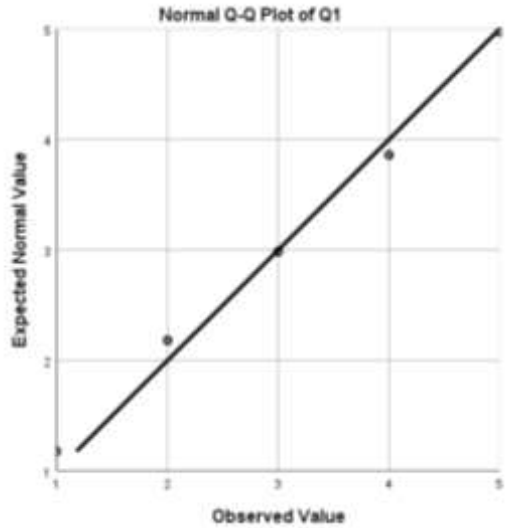

Science teachers experience a higher workload than other professions.
50
45
40
35
30
25
20
15
10
5
0
1
2
3
4
5
Yes
No

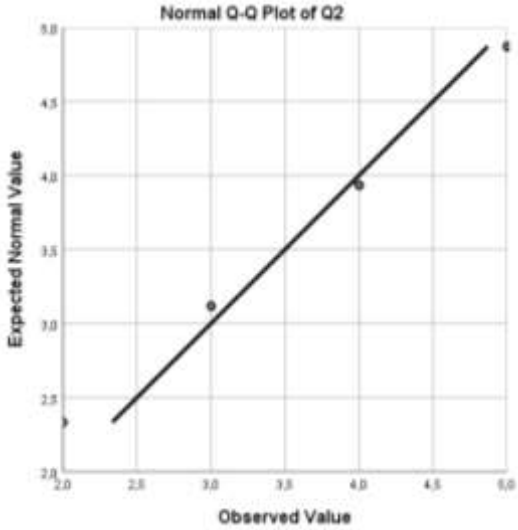

Science teachers choose teaching as a profession as a last resort.
35
30
25
20
15
10
5
0
1
2
3
4
5
Yes
No

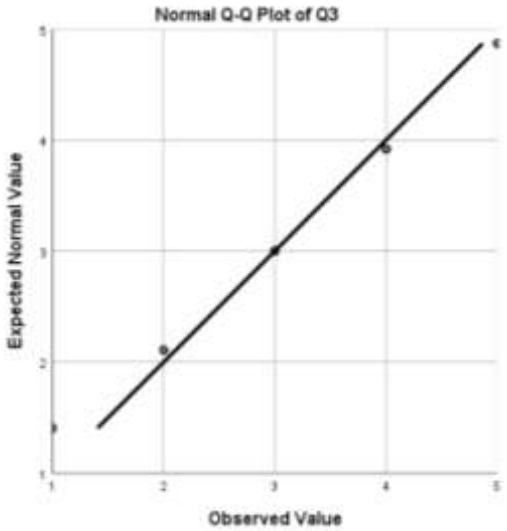

Science teachers can easily switch to a different job after being a teacher.
45
40
35
30
25
20
15
10
5
0
1
2
3
4
5
Yes
No

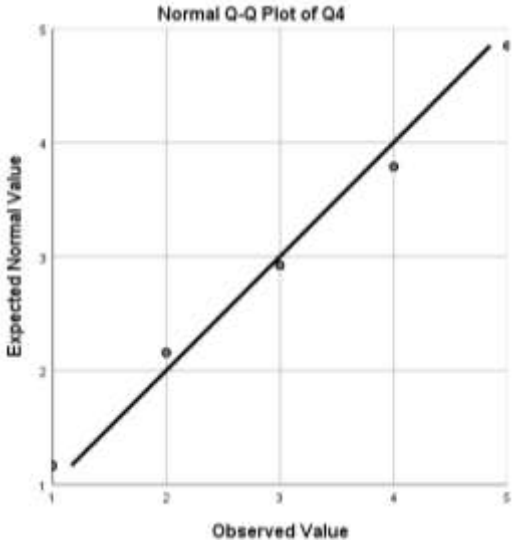
Appendix C: Q-Q plots for normality of perception answers + SPSS output of ANOVA test

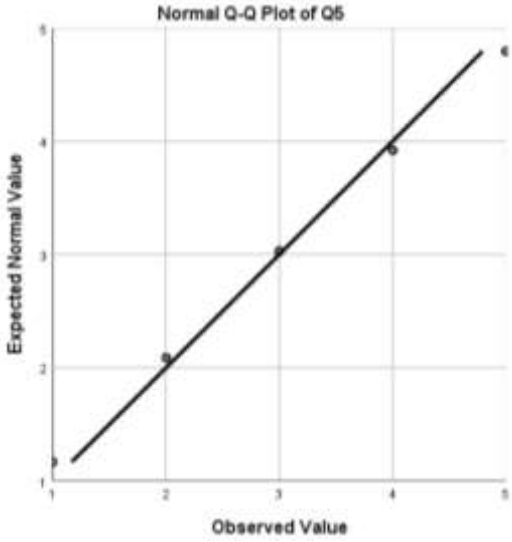
Q-Q plots from the Likert scale questions 7 – 11 (resp. Q1 – Q5) from the yes-group.



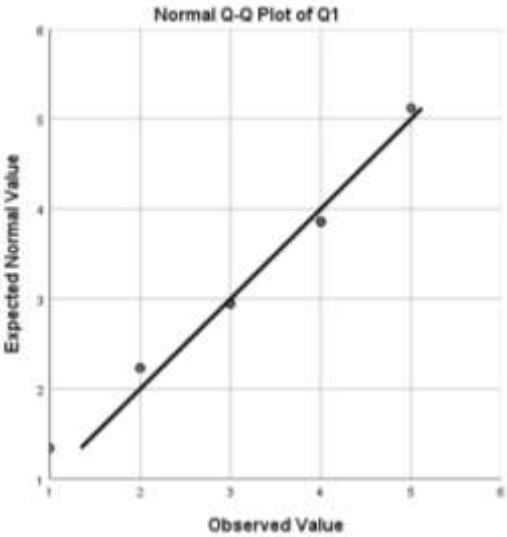


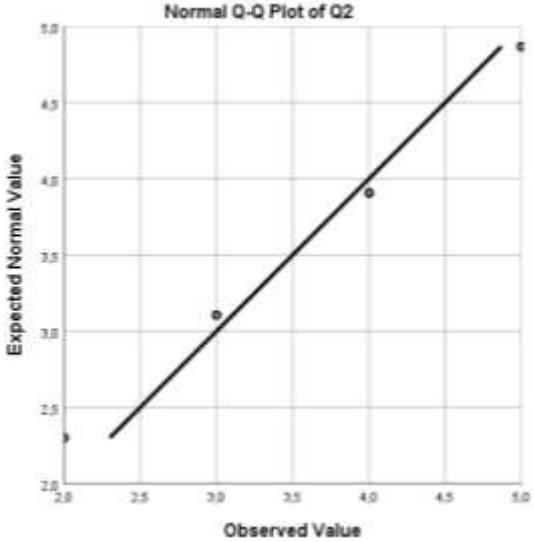


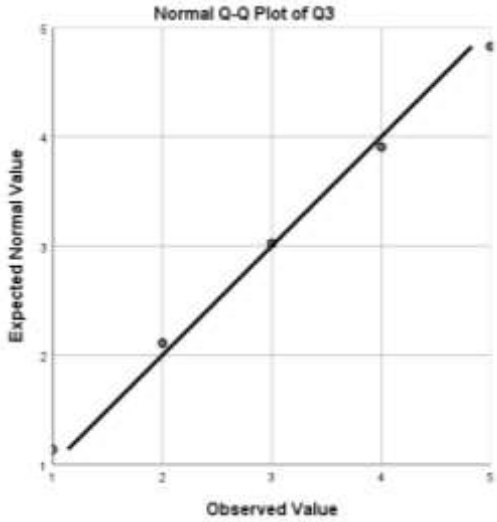


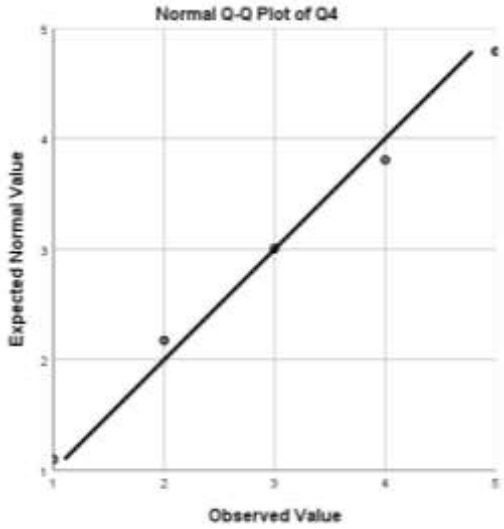


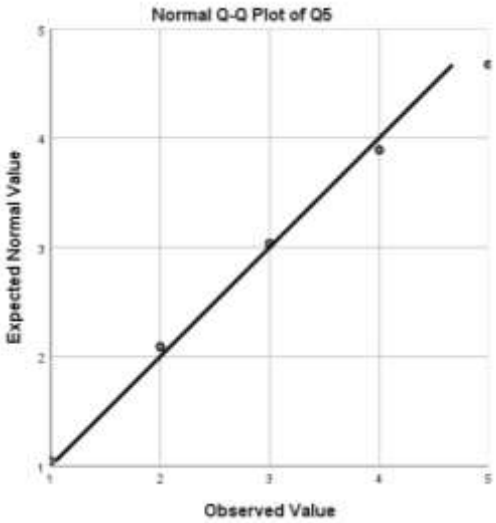
Q-Q plots from the Likert scale questions 7 – 11 (resp. Q1 – Q5) from the no-group.











ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Q1	Between Groups	,310	1	,310	,299	,586
	Within Groups	140,011	135	1,037		
	Total	140,321	136			
Q2	Between Groups	,249	1	,249	,290	,591
	Within Groups	115,883	135	,858		
	Total	116,131	136			
Q3	Between Groups	,131	1	,131	,139	,710
	Within Groups	127,008	135	,941		
	Total	127,139	136			
Q4	Between Groups	2,990	1	2,990	2,034	,156
	Within Groups	198,455	135	1,470		
	Total	201,445	136			
Q5	Between Groups	2,265	1	2,265	2,129	,147
	Within Groups	143,618	135	1,064		
	Total	145,883	136			