International Journal of Gender, Science and Technology
http://genderandset.open.ac.uk

The influence of parents, teachers, and friends on ninth graders' educational and career choices

Kirsi Ikonen, Risto Leinonen, Mervi A. Asikainen, Pekka E. Hirvonen

University of Eastern Finland

ABSTRACT
Socializers, such as parents, teachers and friends, play an important role in gendered choices in STEM fields. This study examined Finnish ninth graders' and their school guidance counselors' views concerning the influence of socializers in adolescents' educational and career exploration and decision-making. The data were gathered with the aid of online surveys (246 pupils) and semi-structured interviews (7 school guidance counselors). Our results indicate that ninth graders reported to have future education and career-related discussions mostly with their parents, friends, and school guidance counselors but only rarely with their subject teachers. According to guidance counselors, parents are the main source for occupational gender-stereotypes, and gender-typed views are clearly present in education- and career-related discussions in friend groups. The latter view is also witnessed in the responses of ninth graders. We suggest that subject teachers should play a more prominent role in career-related discussions in order to prevent and mitigate pupils' gender stereotypes and to update their knowledge about STEM career possibilities. Parents should also be encouraged to talk about gender in career planning and should be provided with information about STEM education and occupations. Developing new methods and materials demonstrating career possibilities with regard to gender is required for STEM teaching and for parental participation in adolescents' career planning.

KEYWORDS
STEM; gender; segregation; socializers; career choice

The influence of parents, teachers, and friends on ninth graders' educational and career choices

INTRODUCTION

Finland is considered to be a pioneer in gender equality, but still its young people choose quite traditional careers and its level of occupational gender segregation is the fourth highest in Europe (Bettio & Verashchagina, 2009). Despite the progress in gender-equality legislation and countless programs and projects in the pursuit for de-segregation, segregation levels are high and stable, especially in the fields of science, technology, engineering and mathematics (STEM) (Statistics Finland, 2016a). Female students are already underrepresented at secondary-level vocational education in the fields of science and engineering, while in higher education they orient towards the fields of life sciences more often than the physical sciences, applied mathematics, or engineering. Science and engineering are among the principal occupations of Finnish men, while those of Finnish women are related to social work, healthcare or education (Statistics Finland, 2016a).

Labour markets in many other egalitarian welfare states in Europe and the USA have similar characteristics (National Science Foundation, 2017; Burchell, Hardy, Rubery, & Smith, 2014). Currently, the amount and type of workforce does not meet the demands of labour markets, and hence STEM fields are suffering from shortages of skills and labour (Caprile, Palmén, Sanz, & Dente, 2015, pp. 9-17). In Finland, for example, technology is the country's largest industry and its products and services account for a half of all Finnish exports (Finnish Customs Statistics 2016; Statistics Finland 2016b). Its forestry and chemical industries are the country's second and third largest, respectively, so a sufficient supply of STEM skilled labour is essential for maintaining and developing the well-being of its citizens. While societies all over the world rely on the development of science and technology, the dearth of female skills and labour input causes concern in these fields.

Recent international comparative assessments of student achievement, such as Trends in Mathematics and Science Study (TIMMS) and the Programme for International Student Assessment (PISA), have shown a reduction in boys' advantages when it comes to achievements in science (Martin, Mullis, Foy, & Hooper, 2016; OECD, 2016). Gender differences in achievement in math have also been observed to be rather small cross-nationally (Else-Quest, Hyde, & Linn, 2010). Despite their good learning outcomes in science and math, recent research shows that girls still feel that they are less likely to obtain work in certain STEM areas; PISA's 2015 report showed that 15-year-old girls who were interested in a pursuing a science career saw themselves working as healthcare professionals rather than as scientists, engineers, or ICT professionals (OECD, 2016).

The narrowing gap in gender differences in science and math achievement suggests that the causes underlying gendered choices in STEM are related to socialization and attitudes rather than to actual academic achievement. Research (e.g. Ferry, Fouad, & Smith, 2000; Gunderson, Ramirez, Levine, & Beilock, 2012; Jacobs,

Chhin, & Bleeker, 2006) has provided a vast amount of evidence to indicate that parents, teachers, friends, and other *socializers* contribute to the continuance of gender segregation in STEM fields by reinforcing cultural stereotypes of male superiority in science and mathematics and encouraging boys and girls to follow different career paths.

The influence of socializers is recognized in many career choice models (e.g. Gottfredson, 1981; Lent, Brown, & Hackett, 1994; Meece, Parsons, Kaczala, Goff, & Futterman, 1982; Van Esbroeck, Tibos, & Zaman, 2005). In their investigation of the influence of socializers in gendered career choices in science and engineering, Dick and Rallis (1991) adapted a model of career choice (Figure 1) based on the work of Meece et. al (1982). Their model suggests that attitudes and behaviors of socializers influence student's self-concept and career values via students' own perceptions of socializers and interpretations of the experiences that they provide. Both students and their socializers are part of the same cultural milieu, which shapes socializers' attitudes and behaviors, student's perceptions of them, and, directly, student's self-concept and career values – the two constructs guiding a student to his or her final career choice.

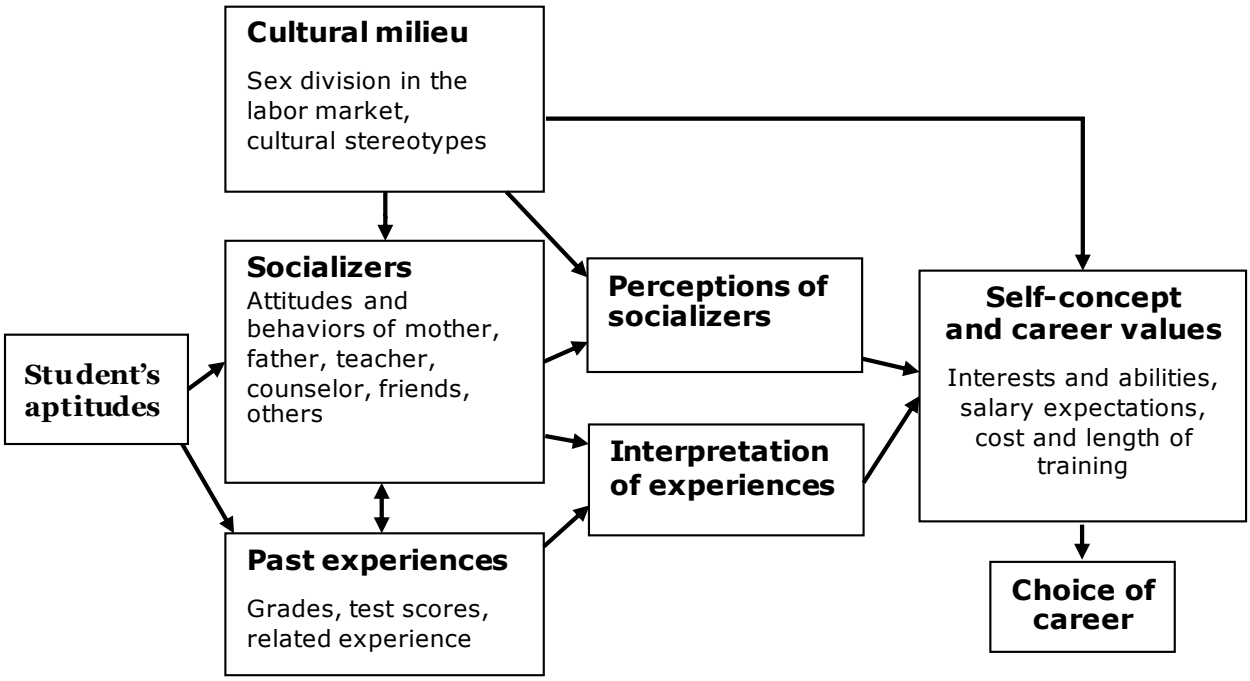

Figure 1: Model of career choice, adapted by Dick and Rallis (1991)

Dick and Rallis's model for career choice suggests that the differences in boys' and girls' self-concepts and career values result partly due to the different influences provided by socializers, who (1) have different attitudes, expectations and goals for boys and girls and (2) provide different activities and experiences for both sexes. These two aspects are examined below in more detail in light of recent research findings regarding the influence of those close to them on students' gendered career choices in STEM.

(1) Socializers have different attitudes, expectations and goals for boys and girls

Several studies from recent years document that parents' attitudes, expectations, and goals for their male and female children are still different with respect to their future education and career. First of all, parents' perceptions of their children's science and math abilities are gender-biased. Tenenbaum and Leaper's (2003) study, for example, revealed that parents of adolescents believed that science was more difficult and less interesting for daughters than for sons, despite the lack of evidence of any gender-related differences in childrens' achievements in science. Other studies (Bhanot & Jovanovic, 2009; Bleeker & Jacobs, 2004) have also revealed that parents of boys overestimate their child's science and math ability more often than the parents of girls. Parents' gender-biased beliefs of their children's abilities have been documented to have an influence on young people's science and math self-efficacy, and as a result of them girls commonly underestimate their skills in these fields (Bhanot & Jovanovic, 2009; Tenenbaum & Leaper, 2003). While perceived efficacy is a key determinant of children's and adolescents' perceived occupational self-efficacy and preferred career choice (Bandura et al., 2001), research findings suggest that retention of women in STEM fields is partly a result of the girls' low self-efficacy in science and math due to parental influence.

Research shows that parents have gender-related expectations for their children's occupational achievements at an early age, and that these expectations are connected to the career-related decisions made by the children (Jacobs et al., 2006). Shin et al. (2015) found that parents were more likely to expect their sons to orient towards STEM occupations than their daughters. Parents have also been found to consider science and math more important for their sons than for their daughters (Bhanot & Jovanovic, 2009). In their study, Bhanot and Jovanovic's reported that middle-school girls valued science more when either parent believed learning science was important for their daughter. Findings like these suggest that parental career expectations and perceptions regarding the value of science and math for their children play an important role for girls when they are deciding whether or not to pursue further education and a career in STEM (Bhanot & Jovanovic, 2009).

Friend groups have also been found to hold gender-stereotypical beliefs such as male superiority in the fields of science and mathematics (Bleeker & Jacobs, 2004). It has been suggested that the peer pressure exerted by friend groups for maintaining traditional gender roles has resulted in girls experiencing more support for subjects perceived as feminine (e.g. English) than for perceived masculine subjects, such as science and mathematics (Leaper, Farkas, & Brown, 2012). On the other hand, the support of friends has been found to have a positive influence on adolescent girls' motivation to pursue a career in science and mathematics (Stake, 2006; Leaper, Farkas, & Brown, 2012).

When it comes to the attitudes and behaviors of educators, the support of teachers appears to play an important role in pupils making non-traditional educational and occupational choices. Dick and Rallis (1991) documented that teachers were perceived to have influenced female senior high-school students' career choices more often for those who had chosen careers in engineering and science than for

those who hadn't chosen such careers. Buschor, Kappler, Keck, and Berweger (2014) reported similar results in their study, in which students who oriented towards a career in a non-traditional area of work reported to have received support from their teachers. On the other hand, Gunderson et al. (2012) found that teachers often hold gender-stereotyped beliefs regarding their students' math abilities, and that these beliefs influence students' attitudes and performance regarding math and their pursuit of math-related careers.

(2) Socializers provide different activities and experiences for boys and girls

According to Dick and Rallis's model of career choice (Figure 1), socializers not only influence children through their attitudes and expectations but also provide experiences and influence on children's interpretations of those experiences. For instance, parents have the final say regarding what leisure activities their offspring engage in during childhood and adolescence.

As explored in section (1), parents have different perceptions of the abilities of boys and girls. Research has found that these perceptions influence them in providing their children with activities that they believe they are interested in and able to do. Parents have been found to encourage boys to participate in science- and math-related leisure activities more than they encourage girls (Jacobs & Bleeker, 2004). While involvement in specific leisure activities shapes children's values and self-competence regarding similar activities (Jacobs, Vernon, & Eccles, 2005), girls' lower participation in science- and math-related activities has been suggested as being partially responsible for girls' lower self-competence and interest in those subject areas.

From sections (1) and (2), it can be concluded that recent research findings are well in agreement with Dick and Rallis's (1991) model of career choices (Figure 1) and give evidence that adolescents still plan their career paths within the context of socializers' attitudes and behaviors, which largely reflect common cultural gender stereotypes. Thus, it is no wonder that adolescents' educational and occupational choices in STEM continue to be gendered. It is important to recognize the influence of different groups of socializers while pursuing the de-segregation of STEM in order to develop relevant ways for recruiting socializers to cultivate young people's interest in science-related fields and mitigating the effect of gender stereotypes in career planning.

RESEARCH AIMS

Earlier research into the influences of socializers on children's attitudes to STEM includes very little examination of how much adolescents discuss their future education and career plans with them. In addition, there has been little research in exploring their perceptions of occupational gender stereotypes in these discussions and how they have observed socializers to express these stereotypical views.

There is certainly limited research on teachers' influence on their pupils' gender-related choices in STEM. Even though the role of schools in making young people ready for working life is often emphasized, earlier research gives only limited insight into actual career-related conversations between STEM subject teachers and pupils, not to mention how much or how little they talk about gender-

appropriateness of certain occupations in these conversations. These are important factors to be aware of in order to develop new methods and materials for teachers to help them promote de-segregation and encourage girls in pursuing education in STEM-related subjects.

It is worth noting that earlier research examining the influence of socializers on adolescents' career choices in Finland has not included ninth graders. Ninth grade is, however, the point when adolescents are finishing their compulsory education and are making educational and occupational choices for the future. Therefore, examining the views of ninth graders is crucial for tackling gendered attitudes towards STEM fields already included in compulsory basic education, because gender segregation levels are already high at upper-secondary level.

Besides ninth graders' views, we also chose to examine the perceptions of school guidance counselors, since they play a central role in education- and career-related discussions and in offering careers advice to adolescents in a school environment (CIMO, 2009). Thus, they presumably have some insight into the role of socializers in adolescents' gendered educational and career choices.

In this article, we investigate the type and frequency of education- and career-related conversations between different groups of socializers and adolescents, and the extent to which occupational gender stereotypes are present in these conversations. The following research questions were formulated:

1. What is the role of socializers for ninth graders' educational and career-related choices?

2. To what extent do socializers hold occupational gender stereotypes?

Both of these research questions were evaluated from the perspectives of ninth graders and their school guidance counselors.

METHODOLOGY

In order to find answers to the stated research questions, a survey to examine the views of Finnish ninth graders was designed and implemented. As well as ninth graders, school guidance counselors were interviewed and their views were compared to the ninth graders' views.

Data Collection Methods

In order to address ninth graders' ideas about the role of socializers in their education and choice of career, a survey instrument (Trochim, 2006) was designed consisting of demographic questions, Likert-scale statements, and comment boxes in which pupils could justify their responses to the those statements. The aim was to gather information concerning the following themes:

1. Basic information: the respondent's gender, home town, school and class

2. How much (or how little) each respondent discussed education- and career-related matters with the different groups of socializers
3. Whose advice the respondent listened to most when making decisions about their education and career
4. The respondent's perceptions of their parents' expectations of them choosing the same area of work in which their parents were working
5. The extent to which the respondent considered socializers to hold occupational gender stereotypes.

The survey was administered online, which made it easier for the guidance counselors to distribute it to their pupils and expedited the analysis process.

The survey was piloted with 73 ninth-grade pupils from one school located in southern Finland. In the pilot survey instrument, pupils were encouraged to write down their feedback of the survey, and the pupils' guidance counselor was also asked to report their experiences concerning the pilot study. Based on the feedback from pupils and their guidance counselor, one potentially ambiguous question was consequently reformulated to correct this.

In order to explore the views and experiences of school guidance counselors regarding the role of socializers in adolescents' education and career planning, and their gender-typed views concerning occupations, a semi-structured interview protocol (Galletta, 2013) was designed based on results of earlier research findings to form a framework for the interview questions.

With the final interview instrument, guidance counselors' views and experiences of the following topics were explored:

1. The role and effect of parents in adolescents' education- and career-related choices
2. The role of siblings and other relatives in adolescents' education- and career-related choices
3. The role of friends in adolescents' education- and career-related choices
4. The influence of socializers on adolescents' gender-typed education- and career-related views and choices.

The interview protocol was piloted by interviewing one school guidance counselor from southern Finland. The transcription of this interview recording did not flag any reasons to modify the questions, so the same instrument was used in the final interviews. The pilot interview data was not included in the analyzed data.

Sample

Altogether, 24 school guidance counselors in eastern Finland were contacted and asked to conduct the survey with their ninth graders. Each was also invited to participate in an interview. Eight guidance counselors from separate schools agreed to conduct the survey in their lessons, and seven of them were willing to participate in the interview as well.

Overall, 348 pupils (157 male, 191 female) from eight schools in east Finland completed the survey. A trap question was included in the survey to ensure that each respondent had read the items instead of just clicking through them randomly. Due to the erroneous responses to the trap question, 246 pupils (96 male, 150 female) were eventually included in the analysis.

Data Analysis

The data produced by this study consisted of ninth graders' survey results and guidance counselors' interviews. The Mann–Whitney U test and Pearson's chi-squared test were applied to the quantitative survey data in order to determine differences between the views of boys and girls (Davis, 2013). With the guidance counselors' interview data, content analysis (Elo & Kyngäs, 2008) was used as a method of examining differences and similarities between their views and experiences. In addition, their views were compared with those of the ninth graders that mediated through the survey responses.

Because the survey and interviews were conducted in Finnish, all the analysis was conducted with the original data. Thus, the surveys items, interview questions, and examples of the guidance counselors' interview responses and the ninth graders justifications to the Likert statements were translated from Finnish to English for this manuscript after the actual data analysis in order to keep the possible interpretations as pure as possible. The translations were conducted by the authors, who have years of experience of translating different types of text from Finnish to English and vice versa. The underlying idea for the translations was to concentrate on intended meanings and readability, and the authors debated some possibly ambiguous cases in order to ensure the quality of translations. (It should also be highlighted that Finnish uses the same term, *hän*, for both feminine and masculine personal pronouns, which is a rather unique linguistic characteristic.)

To enable the reader to evaluate our analyses and conclusions, examples of the guidance counselors' interview responses and the ninth graders justifications to the Likert statements are presented in the Results section.

RESULTS

Ninth Graders' Views

Table 1 shows the number of ninth graders who reported having a lot or quite a lot of education- and career-related discussions with the socializers given in the survey instrument. The majority (74%) of ninth-grade pupils reported having a lot or quite a lot of education- and career-related discussions with their parents. At 70%, friends were the second most important discussion partners (for girls, the proportion of discussions with parents and friends were equal), while school

guidance counselors were the third most important discussion partners (46%) for both boys and girls. The Mann–Whitney U test revealed significant differences between the responses of boys and girls in terms of the number of discussions with parents, friends and siblings. Girls reported having education- and career-related discussions with these people more than boys did.

Both boys and girls reported having fewest career-related discussions with their subject teachers; only 6% reported having a lot or quite a lot of discussions regarding their future plans with math, physics and chemistry teachers and 12% with other subject teachers.

Table 1: Number of ninth graders (N=246) who reported having a lot or quite a lot of education- and career-related discussions with the people given in the survey

	Girls (N=150)	Boys (N=96)	Total (N=246)
Parents	120 (80%)**	61 (63%)	181 (74%)
Friends	121 (81%)**	51 (53%)	172 (70%)
Guidance counselor	68 (45%)	46 (48%)	114 (46%)
Siblings	59 (39%)*	27 (28%)	86 (35%)
Other relatives	32 (21%)	23 (24%)	55 (22%)
Other teachers	11 (7%)	9 (9%)	20 (8%)
Math, physics and chemistry teachers	6 (4%)	8 (8%)	14 (6%)
Language teachers	2 (3%)	9 (9%)	11 (4%)

*Significant gender difference within the answers * $p < .01$, ** $p < .001$.*

For questions that came with a comment box, the ninth graders were asked to write down whose advice they listen to the most when making decisions regarding their education and future career (see Table 2). Altogether, 45% of the ninth graders reported listening the most to their parents or either their mother or father when making these kinds of decisions, although their mother was mentioned more often (10%) than their father (2%). Twenty-eight per cent of the pupils said that they didn't listen to anyone else when making these decisions. Guidance counselors were placed third in these rankings, at 17%, and even though ninth graders had significant numbers of education- and career-related discussions with their friends, only 8% of the pupils reported listening to their friends' advice the most, and only 1% (three pupils) wrote that they listened to their teachers the most. Statistical

analysis using Pearson's chi-squared test showed that for this question there were no statistically significant differences between the responses of boys and girls.

Table 2: Number of ninth graders who reported listening to various people's advice the most when making education- and career-related decisions. (Note: Responses do not add up to 246 because some respondents reported more than one person.)

	Girls (N=150)	Boys (N=96)	Total (N=246)
Parents	56 (37%)	24 (25%)	80 (33%)
No one	42 (28%)	26 (27%)	68 (28%)
Guidance counselor	28 (19%)	14 (15%)	42 (17%)
Mother	17 (11%)	7 (7%)	24 (10%)
Friends	16 (11%)	4 (4%)	20 (8%)
Don't know/Didn't understand the question	4 (3%)	4 (4%)	8 (3%)
Other relatives	6 (4%)	1 (1%)	7 (3%)
Father	2 (1%)	4 (4%)	6 (2%)
Family	5 (3%)	-	5 (2%)
Teachers	3 (2%)	-	3 (1%)
Boyfriend	1 (<1%)	-	1 (< 1%)
Career psychologist	1 (<1%)	-	1 (< 1%)

Table 3 shows the number of ninth graders who agreed or strongly agreed to a statement that their mother or father wanted them to choose the same area of work in which they themselves worked. Overall, 9% of the ninth graders reported that they thought their father expected this of them and 4% thought that their mother did. There were no statistically significant differences between the responses of boys and girls according to the Mann–Whitney U test.

Table 3: Number of ninth graders (N=246) who agreed to a statement that their mother or father wanted them to choose to the same area of work in which they themselves worked.

	Girls (N=150)	Boys (N=96)	Total (N=246)
Father	7 (5%)	14 (15%)	21 (9%)
Mother	9 (6%)	2 (2%)	11 (4%)

Table 4 shows the numbers of ninth graders (N=246) who agreed to statements concerning claims that different groups of socializers think that some occupations are more suitable for men and vice versa. Out of the people listed, ninth graders ranked their friends as having the most gender-stereotypical views regarding occupation; one-third of the pupils stated that their friends considered certain occupations to be more suitable to women and vice versa.

Table 4: Number of ninth graders (N=246) who agreed to a statement stating that the people listed view certain occupations as being more suitable for men while others are more suitable for women.

	Girls (N=150)	Boys (N=96)	Total (N=246)
Friends	38 (25%)	38 (40%)	76 (30%)
Father	31 (21%)*	15 (16%)	46 (18%)
Mother	18 (12%)*	10 (11%)	28 (11%)
Teachers	25 (17%)	10 (10%)	35 (14%)
Guidance counselor	17 (11%)	17 (18%)	34 (14%)

*Significant gender difference within the answers * $p < .01$, ** $p < .001$.*

In the comment boxes that were placed alongside the Likert statements, a few pupils commented on how their friends held segregation-oriented views:

Boy A: "*They laugh at some jobs*."

Boy B: *"They believe in the same old stereotypes."*

Boy C: *"They think jobs in the cosmetics industry aren't suitable for men."*

Girl A: "*Some of them think a woman can't be a lumberjack, for example*."

Girl B: "*Boys always have a go at us for not being able to change a car tire, etc*."

Two girls announced that gender wasn't an issue among their friends when it came talking about careers:

Girl C: *"My friends are so clever, they think gender doesn't matter."*

Girl D: *"None of my friends care whether a job's feminine or masculine when making career plans."*

More than half of the ninth graders were unable to say whether or not their parents had views regarding the gendered segregation of jobs; when asked that question with regard to their fathers, 59% responded with "no opinion" while 53% said the same when asked about their mothers. Nevertheless, analysis on the responses using the Mann–Whitney U test revealed that girls noticed their parents' segregation-oriented views more than boys did. Here are some examples from the girls in the sample that illustrate how gender-typed views have come up when talking to their parents:

Girl E: "*My father thinks the automobile industry is for men only."*

Girl F: "*My father sometimes thinks women can't handle men's work."*

Girl G: "*My father thinks men are stronger, which is why they're better at some jobs than women."*

Altogether, 14% of the pupils agreed that their guidance counselor held gender-typed views about certain jobs, and the same number of pupils said the same about subject teachers (see Table 4). However, none of them gave examples of how guidance counselors' gender-stereotypes were revealed. Those pupils who disagreed with the statement commented that their guidance counselors demonstrated evidence of non-stereotypical thinking and an encouraging attitude towards the pupils. (Note: Because the Finnish language does not distinguish *he* and *she*, the gender of the guidance counselor could not be identified in ninth graders' responses, so they are referred as he/she in the examples given below.)

Boy E: *"My guidance counselor said you should choose any job you're really interested in."*

Girl I: *"My guidance counselor is open-minded. He/she thinks that men and women can do the same things."*

Girl J: *"My guidance counselor encourages us to choose jobs we're interested in rather than girls' jobs, or something like that."*

Girl K: *"We've talked about this [gender aspect] in class, and my career counselor thinks that a man or a woman can study whatever he or she wants, even if the career field is predominantly female or male."*

Three girls told of how they found out about their subject teachers' views regarding occupational segregation:

Girl L: *"One teacher has said disparaging things about women."*

Girl M: *"Some of my teachers are old-fashioned."*

Girl N: *"My physics and chemistry teacher's [views came out] during conversations with them."*

School Guidance Counselors' Views

Table 5 summarizes the similarities that were found between the views of seven guidance counselors regarding the influence of socializers in adolescents' education and in their choice of career. The crosses in the table represent which ideas occurred during interviews with each of the guidance counselors (GC1–7).

Table 5: Guidance counselors' views regarding the influence of socializers in adolescents' choice of education and career

	GC1	GC2	GC3	GC4	GC5	GC6	GC7
Socializers' own career paths have an influence on adolescents' career paths	X	X	X	X		X	X
Adolescents claim that they make choices regarding education and careers individually	X			X	X	X	
Parents have the biggest influence on adolescents' choices	X					X	X
Older siblings' experiences have an impact on adolescents' choices	X	X	X				X
The influence of school guidance counseling on adolescents' choices is minimal	X	X	X	X	X	X	X
Teachers' attitudes and behaviors are mostly encouraging/motivating	X	X	X	X	X	X	X
Teachers play a minor role in pupils' education and career selection		X	X		X	X	X
Friends' views have an impact on pupils' choices	X	X	X	X		X	X

Four out of the seven guidance counselors reported that adolescents often claim that they make education- and career-related decisions individually, but in reality their parents' advice has a significant influence and adolescents feel that their participation in the decision-making process is important. Five out of seven guidance counselors considered that adolescents want their parents to participate more in their career planning.

GC1: "*They often claim that [making education- and career-related choices] is just their own business. I still think they'd be happy for their parents to make the effort to come to school and discuss these things together*."

GC3: "*Yes, they do [want to make choices individually]. First, they may think, 'I'm going to choose by myself, it's none of their business,' … but as they talk things over [with their parents] they see that some progress related to the decision -making process occurs during these discussions.*"

GC6: "*Even though adolescents say they can make the decisions all by themselves, and even though they argue with their parents, their parents' opinions come through. The role of parents is a very important part of the process … as is their interest in general.*"

According to the guidance counselors, it's rare these days for parents to pressurise their children into making certain kinds of choices. Two guidance counselors mentioned a case where a parent had been shocked by their child's educational choice and pursued the matter with their guidance counselor.

With respect to the influence of siblings and other relatives, four guidance counselors noted that the older siblings' experiences at school and work sometimes have an impact on adolescents' educational choices at upper-secondary school or their choice of career. One guidance counselor also observed that grandparents sometimes serve as career role models.

The guidance counselors were asked to comment on their influence on the children's educational- and job-related choices in general. They all said that, on average, their influence was minimal. Three of them stated that their influence was strictly secondary to that of the children's parents.

GC5: "*On a scale of one to ten, I would say that [guidance counselors' influence] is three at most. The views of the family members play a much bigger role.*"

All of the guidance counselors said that subject teachers are mostly encouraging towards their pupils and aim to motivate them with respect to their plans for the future, although five of them believed that the subject teachers' role in the children's choices regarding education and career was a minor one.

GC4: "*I think that the influence of subject teachers is minor. It depends a lot on the subject and on the teacher. I believe that subject teachers could have a stronger influence on adolescents' choices, but they aim to do it very seldom.*"

Six out of seven guidance counselors reported that friends had an impact on adolescents' educational and occupational choices, while three thought that friends'

views were more influential on boys than on girls. In general, it's true that adolescents discuss their future plans with their friends a lot and often want to go to the same school with their closest friends. One guidance counselor pointed out that maturity is an important factor for pupils when it comes to their friends influencing their plans for the future.

GC4: "*Friends do have an influence on them … Also, if the student isn't very mature yet, their peer group's influence on their future plans is stronger compared to that of peers of the same age who are more mature*."

Table 6 summarizes the seven guidance counselors' views regarding socializers' influence on occupational gender stereotypes and gendered educational and occupational choices. Six of them thought that parents are the main source of gender-typed images of occupations. They also observed that perceptions of and attitudes towards occupations develop at childhood via toys, hobbies and other cultural experiences.

GC1: "*Parents mediate the models of a man and a woman when children are very young … via toys they buy for them and the way they play with them."*

GC7: "*I think that parental effect strengthens the gender-typed images of occupations because many of the mothers work in healthcare and many of the fathers work with machines, etc. Even if they didn't recommend these jobs for their children, all this mediates the roles of men and women."*

Table 6: Views of guidance counselors regarding socializers' segregation-oriented influence on pupils

	GC1	GC2	GC3	GC4	GC5	GC6	GC7
Parents are the main source of gender-typed images of occupations	X	X	X	X	X	X	
Parental influence in education and career choice process is segregation-oriented	X				X		X
Subject teachers fight against gender stereotypes or their influence is neutral	X	X	X	X	X	X	
Subject teachers have gender-stereotyped attitudes or behaviors	X	X					X
Friends' attitudes influence students to make gender-stereotypical choices			X		X		X

Six out of seven guidance counselors believed that, in general, subject teachers' attitudes and behaviors towards pupils are not very gender-biased anymore. One guidance counselor thought that male teachers handle male pupils differently compared to female pupils but did not explain further. Two counselors related cases where pupils had reported a male teacher for expressing gender-stereotyped attitudes or behaviors.

GC1: "*A few girls once complained me of one of their male mathematics teacher who had said girls don't understand certain [math-related] things… But I would say that cases like this are very rare*."

Of the six guidance counselors who reported that friends have an influence on adolescents' educational and occupational choices, three stated that the friends' influence resulted in gendered choices. Friends' gender-stereotypical attitudes seem to guide particularly those pupils who are pursuing vocational education after compulsory basic education.

GC2: *"You can clearly see that friend groups have an impact on adolescents' choices, especially in pupils who pursue secondary vocational education. They [debate] with each other about which area to choose … the electrical trade or the social and healthcare sectors, for example. In my opinion, friend groups really have an influence on them."*

GC6: *"There have been boys [in my counseling sessions] who have felt a bit unsure [about applying] to study to be a nurse. They worry about the views of their friends*."

One guidance counselor observed that relatives and other socializers can also help to subvert gender stereotypes. According to GC4, non-stereotypical examples can encourage adolescents to orient towards atypical career paths.

GC4: "*In many cases, the role models that come from the pupil's inner circle are a pretty big influence on those who end up making adventurous career choices."*

DISCUSSION

This study investigated the type and amount of education- and career-related discussions between different groups of socializers and ninth graders, and the extent to which these socializers hold gender-based views regarding occupational stereotypes. This study was unique in that these issues were explored by examining the perspectives of both ninth graders and their school guidance counselors. The results of the study contribute to the research and development of new ways of targeting socializers in the pursuit of de-segregation in STEM fields.

The results of the study indicate that ninth graders have most discussions regarding their education- and career-related choices with their parents, friends, and school guidance counselors, with parents topping this list. However, almost one-third reported that they didn't listen to anyone when making these kinds of decisions. The school guidance counselors interviewed for the study suggested that, while adolescents often claim to make such choices individually, in reality parental participation in the career-choice process and the views and choices of friends seem to be particularly influential factors.

The results also revealed that education- and career-related discussions between subject teachers and ninth graders are minimal; only a couple of ninth-graders reported heeding their teachers' advice the most when making such decisions, and most of the guidance counselors' responses supported this claim. Most of the guidance counselors considered that subject teachers' influence on adolescents' plans for the future is also minimal.

The guidance counselors considered that the pupils' parents were the main source of occupational gender stereotypes. This finding supports the well-established hypothesis that parents' beliefs and stereotypes have the biggest influence on their

children's gender-role socialization (e.g. Eccles, Frome, Yoon, Freedman-Doan, & Jacobs, 2000). On the other hand, most of the ninth graders were unable to say whether their parents held views about occupations that were gender-stereotyped; their survey responses indicated that they might not have been aware of their parents' views, maybe due to them having relatively few discussions with their parents in which gender issues might have intersected with career planning. However, both ninth graders' survey responses and the guidance counselors' interview responses indicate that gender-stereotypical perceptions of occupations are clearly present in conversations in friend groups, and that pupils pursuing vocational education after compulsory education seem to be particularly exposed to their friends' gender-stereotypical views.

In pursuing de-segregation in STEM, it is not enough that only young people are targeted with campaigns and educational interventions; it should also be considered how the socializers who have the biggest role in young people's career planning could be deployed as mediators of STEM career knowledge and critique related to occupational gender-stereotypes. The results of this study suggest that adolescents' gendered choices result partially from having many education- and career-related discussions with these socializers, who are most likely to hold gender-based stereotypical perceptions of occupations and may not have up-to-date knowledge about STEM career possibilities (e.g. Archer & Dewitt, 2015).

Parents evidently play the most important role in helping adolescents to choose their career and are also the main mediators of cultural gender stereotypes. According to our study, even school guidance counseling plays second fiddle to the influence of parents in adolescents' career planning. Thus, we suggest that future research should be geared towards developing new methods and materials to promote parent–adolescent communication regarding the benefits of studying STEM courses and the career possibilities in STEM fields. Earlier studies have indicated that interventions increasing parent–child communication promote both parents' and adolescents' perceptions of the usefulness of STEM courses and increase adolescent enrolment onto STEM courses during high school (e.g. Harackiewicz, Rozek, Hulleman, & Hyde, 2012). We suggest that parents should be offered information about further education in STEM subjects and STEM occupations, along with tools to help their children to identify their own skills and attributes and find out more about which STEM occupations they could use them in. Increasing co-operation between STEM education, school guidance counseling and families is therefore recommended.

Besides talking about the value of STEM courses and STEM career possibilities, however, we suggest that parents should be encouraged to talk about the general effect of gender when discussing matters relating to educational and career choices with their children. Thinking about traditional gender expectations and stereotypes regarding skills and abilities will help adolescents to recognize and question widely held beliefs that may be limiting their own choices regarding their education and career. Educational practitioners such as guidance counselors should provide parents with tools with which, together with their children, they could critically examine gender-stereotyped perceptions of occupations that may occur in their family, in their children's social groups or in the media.

There is a vast amount of evidence to support the suggestion that parents' socio-economic status influences high-school pupils' academic performance and educational choices. PISA 2015, showed that socio-economic status remains a strong predictor for science performance amongst OECD countries (OECD, 2016). Archer et al. (2012) argue that families in higher social classes have more cultural and social capital with which to realize their children's career aspirations and identifications with science, while Archer & Dewitt's (2015) study indicates that girls from middle-class families are more likely to develop and sustain hopes of pursuing a science-related career than those of working-class families. We suggest that future studies should explore more thoroughly the influence of socio-economic status on occupational gender stereotypes among young people and their families. It would also be a valuable exercise to investigate how parents' academic backgrounds and occupations influence the education- and career-related discussions they have with their children, and whether the nature of these discussions differ depending on the child's gender.

As the sample of ninth graders in this study perceived that their friends held gender-based stereotypes regarding certain jobs more than any other group of socializers, it is clear that friends represent a crucial target group in pursuing de-segregation. Future research should therefore be conducted to develop educational interventions that stimulate friend-group discussions regarding not only the value of STEM courses and STEM career possibilities but also occupational gender stereotypes and gender-biased beliefs related to science and math. As mentioned in the Introduction of this article, the support of friends has been found to have a positive influence on teenage girls' motivation to pursue a career in science and mathematics (Leaper et al., 2012). It would be worthwhile to harness this influence in cultivating female students' motivation to pursue STEM careers.

As previously mentioned, this study revealed that the sample of ninth graders rarely discussed education- and career-related matters with their math, physics, and chemistry teachers. Earlier studies have indicated that teachers with encouraging attitudes can promote students' interest in choosing a career in science or engineering (Buschor, Kappler, Keck, & Berweger, 2014; Dick & Rallis, 1991; Hazari, Sonnert, Sadler, & Shanahan, 2010), while Dick and Rallis (1991) argue that teachers may play a particularly important role in influencing the career choices of female students orienting towards science or engineering. We therefore suggest that, while pursuing de-segregation in STEM and aiming to increase the number of pupils orienting towards these fields, subject teachers start to play a bigger role in pupils' career planning. Developing methods and materials is essential for helping subject teachers to give pupils interested in pursuing a STEM career the most up-to-date advice, showing the connections between STEM subjects and working life, and introducing different types of STEM professional role models. This is particularly true in Finland, where compulsory basic education has started to implement a revised national core curriculum focusing specifically on physics and chemistry with a view to increasing pupils' awareness of educational pathways and occupations that require skills in these subjects (FNBE, 2014, p. 418, p. 424).

REFERENCES

Archer, L., & Dewitt, J. (2015). Science aspirations and gender identity: Lessons from the ASPIRES project. In E. K. Henriksen, J. Dillon, & J. Ryder (Eds.), *Understanding student participation and choice in science and technology education*, 89–102.

Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2012). Science aspirations, capital, and family habitus: How families shape children's engagement and identification with science. *American Educational Research Journal*, *49*(5), 881–908.

Bandura, A., Barbaranelli, C., Caprara, G. V, & Pastorelli, C. (2001). Self-efficacy beliefs as shapers of children's aspirations and career trajectories. *Child development*, *72*(1), 187–206.

Bettio, F., & Verashchagina, A. (2009). *Gender segregation in the labour market*. Retrieved from https://publications.europa.eu/en/publication-detail/-/publication/39e67b83-852f-4f1e-b6a0-a8fbb599b256

Bhanot, R. T., & Jovanovic, J. (2009). The links between parent behaviors and boys' and girls' science achievement beliefs. *Applied Developmental Science*, *13*(1), 42–59. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/10888690802606784

Bleeker, M. M., & Jacobs, J. E. (2004). Achievement in math and science: Do mothers' beliefs matter 12 years later? *Journal of Educational Psychology*, *96*(1), 97–109.

Burchell, B., Hardy, V., Rubery, J., & Smith, M. (2014). *A new method to understand occupational gender segregation in European labour markets*. Brussels: European Commission.

Buschor, C. B., Kappler, C., Keck, A. F., & Berweger, S. (2014). I want to be a scientist/a teacher: students' perceptions of career decision-making in gender-typed, non-traditional areas of work. *Gender and Education*, *26*(7), 743–758. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/09540253.2014.970615

Caprile, M., Palmén, R., Sanz, P., & Dente, G. (2015). *Encouraging STEM studies for the labour market*. Brussels: European Union.

CIMO (Centre for International Mobility) (2009). *Educational and vocational guidance in Finland* (12th ed.). Helsinki: Lönnberg Print & Promo.

Davis, C. (2013). *SPSS for applied sciences: Basic statistical testing*. Clayton, Australia: CSIRO Publishing.

Dick, T. P., & Rallis, S. F. (1991). Factors and influences on high school students' career choices. *Journal for Research in Mathematics Education*, *22*(4), 281–292. Retrieved from http://www.jstor.org/stable/749273

Eccles, J. S., Frome, P., Yoon, K. S., Freedman-Doan, C., & Jacobs, J. (2000). Gender-role socialization in the family: A longitudinal approach. *The Developmental Social Psychology of Gender* (August 2015), 333–360.

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107–115.

Else-Quest, N. M., Hyde, J. S., & Linn, M. C. (2010). Cross-national patterns of gender differences in mathematics: A meta-analysis. *Psychological Bulletin*, *136*(1), 103–127. Retrieved from http://doi.apa.org/getdoi.cfm?doi=10.1037/a0018053

Ferry, T. R., Fouad, N. A., & Smith, P. L. (2000). The role of family context in a social cognitive model for career-related choice behavior: A math and science perspective. *Journal of Vocational Behavior*, *57*(3), 348–364. Retrieved from http://www.sciencedirect.com/science/article/pii/S0001879199917438

Finnish Customs Statistics (2016). International trade 2016: Finnish trade in figures. Retrieved from http://tulli.fi/documents/2912305/4762055/International+Trade+2016+Pocket+Statistics/30da43d3-73f1-421c-8682-e4315f8df85a

FNBE (Finnish National Board of Education) (2014). *National core curriculum for basic education 2014*. Helsinki: Finnish National Board of Education.

Galletta, A. (2013). *Mastering the semi-structured interview and beyond: From research design to analysis and publication*. New York: New York University Press.

Gottfredson, L. S. (1981). Circumscription and compromise: A developmental theory of occupational aspirations. *Journal of Counseling Psychology*, *28*(6), 545–579.

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2012). The role of parents and teachers in the development of gender-related math attitudes. *Sex Roles*, *66*(3–4), 153–166.

Harackiewicz, J. M., Rozek, C. S., Hulleman, C. S., & Hyde, J. S. (2012). Helping parents to motivate adolescents in mathematics and science: An experimental test of a utility-value intervention. *Psychological Science*, *23*(8), 899–906. Retrieved from http://journals.sagepub.com/doi/10.1177/0956797611435530

Hazari, Z., Sonnert, G., Sadler, P. M., & Shanahan, M.-C. (2010). Connecting high school physics experiences, outcome expectations, physics identity, and physics career choice: A gender study. *Journal of Research in Science Teaching*, *47*(8), 978-1003.

Jacobs, J. E., & Bleeker, M. M. (2004). Girls' and boys' developing interests in math and science: Do parents matter? *New Directions for Child and Adolescent Development*, *106*, 5–21.

Jacobs, J. E., Chhin, C. S., & Bleeker, M. M. (2006). Enduring links: Parents' expectations and their young adult children's gender-typed occupational choices. *Educational Research and Evaluation*, *12*(4), 395–407.

Jacobs, J. E., Vernon, M. K., & Eccles, J. (2005). Activity choices in middle childhood: The roles of gender, self-beliefs, and parents' influence. In Mahoney, J. L., Larson, R. W., & Eccles, J. S. (Ed.), *Organized activities as contexts of development: Extracurricular activities, after-school and community programs*. Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

Leaper, C., Farkas, T., & Brown, C. S. (2012). Adolescent girls' experiences and gender-related beliefs in relation to their motivation in math/science and English. *Journal of Youth and Adolescence*, *41*(3), 268–282.

Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior*, *45*(1), 79–122. Retrieved from http://linkinghub.elsevier.com/retrieve/pii/S000187918471027X

Martin, M. O., Mullis, I. V. S., Foy, P., & Hooper, M. (2016). TIMSS 2015 International results in science. Retrieved from http://timssandpirls.bc.edu/timss2015/international-Results/

Meece, J. L., Parsons, J. E., Kaczala, C. M., Goff, S. B., & Futterman, R. (1982). Sex differences in math acheivement: Toward a model of academic choice. *Psychological Bulletin*, *91*(2), 324–348.

National Science Foundation (National Center for Science and Engineering Statistics) (2017). Women, minorities, and persons with disabilities in science and engineering: 2017. Special report NSF 17-310. Arlington, VA. Available at www.nsf.gov/statistics/wmpd/.

OECD (2016). *PISA 2015 results (volume I): Excellence and equity in education*. Paris: OECD Publishing. Retrieved from http://www.oecd-ilibrary.org/docserver/download/9816061e.pdf?expires=1481534188&id=id&accname=guest&checksum=0F0146CF61BC72AD7B0688562F01272C

Shin, J., Lee, H., McCarthy-Donovan, A., Hwang, H., Yim, S., & Seo, E. (2015). Home and motivational factors related to science-career pursuit: Gender differences and gender similarities. *International Journal of Science Education*, *37*(9), 1478–1503. Retrieved from http://www.tandfonline.com/doi/full/10.1080/09500693.2015.1042941

Stake, J. E. (2006). The critical mediating role of social encouragement for science motivation and confidence among high school girls and boys. *Journal of Applied Social Psychology*, 36(4), 1017-1045.

Statistics Finland (2016a). Women and men in Finland. Available from http://www.tilastokeskus.fi/ajk/julkistamiskalenteri/kuvailusivu_en.html?ID=16133#_ga=2.112425031.235718940.1512652895-530817608.1512652895'

Statistics Finland (2016b). Service exports at the previous year's level in the last quarter of 2016. Retrieved from http://www.stat.fi/til/tpulk/2016/04/tpulk_2016_04_2017-03-15_tie_001_en.html

Tenenbaum, H. R., & Leaper, C. (2003). Parent-child conversations about science: The socialization of gender inequities? *Developmental Psychology*, *39*(1), 34–47.

Trochim, W. M. (2006): *Survey research*. Research Methods Knowledge Base (2nd ed.).

Van Esbroeck, R., Tibos, K., & Zaman, M. (2005). A dynamic model of career choice development. *International Journal for Educational and Vocational Guidance*, *5*(1), 5–18.