

# Factors Supporting and Preventing Master Thesis Progress in Mathematics and Statistics – Connections to Topic and Supervisor Selection

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## ABSTRACT

Mathematics and statistics major master graduates of a Finnish university answered a questionnaire about the master thesis process. Their response was analyzed to find connections of the topic and supervisor selection to the factors supporting and preventing the master thesis progress. Certainty of the thesis topic and of selecting a supervisor does not seem to predict smoother thesis progress than uncertainty of the selections. Students who are not very sure but still fairly sure about the both selections provisionally meet more supporting factors and less preventing factors than other students. An interesting observation is that there are factors which support the progress of some students but prevent the progress of some other students. Mathematics teacher specialization students' experiences differ slightly from those of the other specializations students, in particular, their theses are graded lower and they hesitate more the selection of the master thesis supervisor.

**Keywords:** master thesis, mathematics, statistics, master thesis topic, master thesis supervisor, master thesis progress

## INTRODUCTION

Most areas of mathematics and statistics university level teaching and learning are diversely studied in educational research literature. However, research on master thesis topic and supervisor selections is scarce. There are plenty of guides about how to write a master thesis or dissertation in various disciplines, including in mathematics and statistics, but these references are mainly like cookery books and not of significant scientific value.

Peters (1997) has written a comprehensive guide to earning a master degree or a doctoral degree but the book is focused entirely on the US educational system. One chapter of the book is devoted to choosing a thesis supervisor and it fits well to educational systems in general. Choosing a thesis supervisor consists of similar steps in all disciplines globally, especially at the universities in Europe. The thesis topic selection is another task: by Peters (1997) a topic can be found easily if it is searched actively, and if needed the supervisor may suggest a topic of the thesis. It is important to keep in mind that the “perfect thesis” is a myth.

Recent articles by Lei (2009), Bitchener et al. (2010), Pemberton (2012), and de Kleijn et al. (2012, 2013) give some knowledge of the thesis supervisor and topic selections and what consequences different choices may have. However, these distinct references do not create a coherent view of the topic.

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**Article History:** Received 22 November 2018 ♦ Revised 12 December 2018 ♦ Accepted 12 December 2018

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The purpose of this study is to find connections of the topic and supervisor selections to the factors supporting and preventing the master thesis progress in mathematics and statistics. The monograph by McKnight et al. (2000) is a source of the methodological basis.

## REVIEW OF LITERATURE

Lei (2009) and Peters (1997) consider broad-mindedly the thesis supervisor and topic selections. By Peters (1997) the ideal supervisor helps you to find a thesis topic, or even finds one for you, reads your thesis drafts, and edits them as needed. Sometimes a falling-out is the student's fault, sometimes the supervisor's, and sometimes there are just problems with communication. But whoever is at fault, it is the student who suffers. It is possible to change supervisors, but this might be costly in terms of time.

Early evaluation of the supervisor potential of professors at the department and making contact with professors increase chances of ending up with a good supervisor. Peters (1997) states that the process of hunting for a supervisor can be divided into three independent tasks: identify a small number of potential supervisors, establish personal contact with professors on the short list, and play detective by interviewing the professors and their graduate students to find out what the professors are really like.

In addition to the supervisor selection Peters (1997) surveys the thesis topic selection. Choice of a thesis topic will play a large part in determining how quickly to finish. Once the topic is found, then additional courses, seminars, and so on can be chosen to prepare the student for actually doing the thesis. Therefore the thesis topic should be chosen as early as possible. Lei (2009) claims that selection of a thesis topic is one of the most important decisions students will make during the studies. Some students may spend a year or even longer looking for potential topics before finally selecting one.

By Peters (1997) there are, in principle, two ways to find a thesis topic: Either the topic can be provided or it can be chosen by the student in consultation with the supervisor. It is recommended to read the theses of recent successful graduates. Once you have identified some topics you are interested in, you can research them rapidly by contacting experts in the field. By Peters (1997) criteria for evaluating potential thesis topics include amount of existing background information, scope and tractability of the topic, the time it will take to finish the thesis, and fundability and hotness of the topic.

Lei (2009) suggests that good strategies to find a topic involve using advisors, professors and scholars, reading primary and secondary literature, and getting acquainted with the curriculum. Identifying the most critical factors and weighting their importance against the large quantity of choices available a student needs to consider faculty and student factors, nature of a topic, availability of reference materials, trends and future research directions, duration of study, research funding and eventual audience. Lei (2009) describes the process of finding and choosing an ideal thesis (or dissertation) topic using previously published literature. The final topic selection should closely match the personal, academic, and career goals of a student.

By Pemberton (2012) teachers can and do play a key role in selecting a thesis topic, counseling students to consider potential topics in terms of (a) sustaining their interest; (b) their range of competence to conduct and complete the research; (c) manageability – neither too wide nor too narrow; (d) contribution to the field – fill a gap in the literature, or substantiate or refute prior research; (e) obtainable data; and (f) providing an opportunity to demonstrate independent mastery of subject-matter content.

de Kleijn et al. (2012, 2013) consider master thesis projects and supervision in two articles. In the first study (2012) they focus on relations between perception of the supervisor–student relationship which was conceptualized by means of two interpersonal dimensions: control and affiliation. Control was positively related to perceived supervisor contribution to learning and satisfaction. A greater degree of affiliation was related to higher outcome measures. It is important for supervisors to be perceived as highly affiliated but control should be carefully balanced. In the latter study (2013) they consider student perception of supervisor feedback. The students that perceive the feedback to be positive, and to provide information on how they are going and what next steps to take, are the most satisfied with their supervision and perceive they are learning most from their supervisor.

Bitchener et al. (2010) investigate what supervisors across three disciplines (humanities, science/mathematics, commerce) said they focused on when giving feedback to thesis students. Wide range of beliefs concerning feedback are held by supervisors, there is little difference in the type of feedback provided by supervisors in the different disciplines and similar feedback tends to be given to both native and non-native writers.

## STUDY AIM AND RESEARCH QUESTIONS

The aim of this study is to examine the process of selecting master thesis topic and supervisor in mathematics and statistics. In particular, the aim is to examine if certainty or uncertainty of selections have an influence on the factors supporting or preventing the thesis progress.

The research questions are the following:

1. Is certainty in selecting a supervisor and in selecting a topic of the master thesis connected to the smooth thesis progress?
2. Are the factors supporting or preventing the thesis progress connected to certainty or uncertainty of the thesis topic and the supervisor selections?
3. Do the students of mathematics, applied mathematics, mathematics teacher and statistics specializations differ regarding the master thesis process?

## METHOD

### Context of the Study

The description of the context concerns the Finnish university where the study was performed, but the situation is equivalent at all universities in Finland and at most universities in the world. In mathematics and statistics, like mainly in all disciplines, students usually start to plan and to write their master thesis during the last study year, which means the fifth year for those who graduate in the desired time. Especially in mathematics it is possible to complete a thesis in a rather short time, since typically a mathematics thesis does not contain any experimental parts. However, completion of bachelor and master degrees (3 + 2 years) takes on average more than five years. On the other hand, it is not unusual to start preparing for a master thesis during the fourth year or even earlier.

Basis of the master thesis in mathematics and statistics is in the literature. In mathematics the whole thesis is usually based on the known mathematical results available in the literature. It is not required to invent any new research results in the master level. In statistics and in mathematics teacher specializations master theses usually include experimental parts, but in general making master thesis also in these specializations requires at most one term of fulltime studying.

A mathematics or statistics student making a master thesis has one supervisor responsible for guidance but sometimes there are secondary supervisors, too. A completed master thesis is evaluated by the supervisor, who is the first examiner, and by the second examiner who is selected from the staff of the department and acquainted with the thesis topic. At least one of the examiners is required to be a professor. Examiners together decide the grade which they propose to be given for the thesis and the proposed grade is approved or disapproved by the department council (or the programme board). The latin word based grading scale has 8 steps and the lowest one *improbatur* (i) is rejected. The lowest accepted grade is *approbatur* (a), the next ones in increasing order are *lubenter approbatur* (lub), *non sine laude approbatur* (nsla), *cum laude approbatur* (cl), *magna cum laude approbatur* (mcl), *eximia cum laude approbatur* (ecl) and *laudatur* (l).

### Participants

The cohort group of this study (called *cohort group*) contains a Finnish university mathematics and statistics major students whose master theses were accepted during the spring semester 2016. Acceptance of the master theses was considered by the department council which had five meetings during the spring. The council accepted 53 master theses, 8 of which the specialization was mathematics (Math.), 15 applied mathematics (Appl. Math.), 26 mathematics teacher (Math. Teacher) and 4 statistics (Stat.).

The sample group of the study (called *sample group*) is formed by the cohort group students who answered to an allocated web questionnaire carried out during the spring 2016. Nineteen students answered to the questionnaire ( $N = 19$ ) which means that the proportion of the sample group from the cohort group is 36 %. Specializations of the answered students are mathematics 2, applied mathematics 5, mathematics teacher 11 and statistics 1. University studies starting years in the sample group vary from 2001 to 2013, most students have started in 2006 (3 students), 2009 (3 students), 2010 (4 students) or 2011 (5 students), and there is one beginner in each years 2001, 2007, 2012 and 2013.

## Materials

Immediately after the master thesis acceptance the students received in their e-mail a web link to the master thesis questionnaire. The questions concerned the beginning of the master thesis, selection of the master thesis topic and supervisor, factors supporting and preventing the thesis progress and completion and evaluation of the master thesis. The questionnaire was implemented by an electronic form which contained 17 closed and 12 open questions (see **Appendix**, translation from Finnish into English). The researcher received the answers in the same electronic system where he created the questionnaire. The electronic collecting system converts the data to HTML, Excel, SPSS, CSV and XML formats, and the data are available in all these formats for the researcher.

## Analysis

The students were asked about the certainty of the selection of the topic and the supervisor of the master thesis. Four options were given, very unsure (1), a little unsure (2), fairly sure (3) and very sure (4). The students in the sample group were classified to three categories based on the certainty about the selection of the topic and the supervisor. Category A includes the students who were very sure (answer 4) about both the topic and the supervisor. Category B includes the students who were very sure (answer 4) about either the topic or the supervisor but a little unsure (answer 2) or fairly sure (answer 3) about the other one. Category C includes the students who were a little unsure (answer 2) or fairly sure (answer 3) about both the topic and the supervisor. Nobody in the sample group was very unsure (answer 1) about the topic or the supervisor, hence it was not needed to take answer 1 into account in the classification.

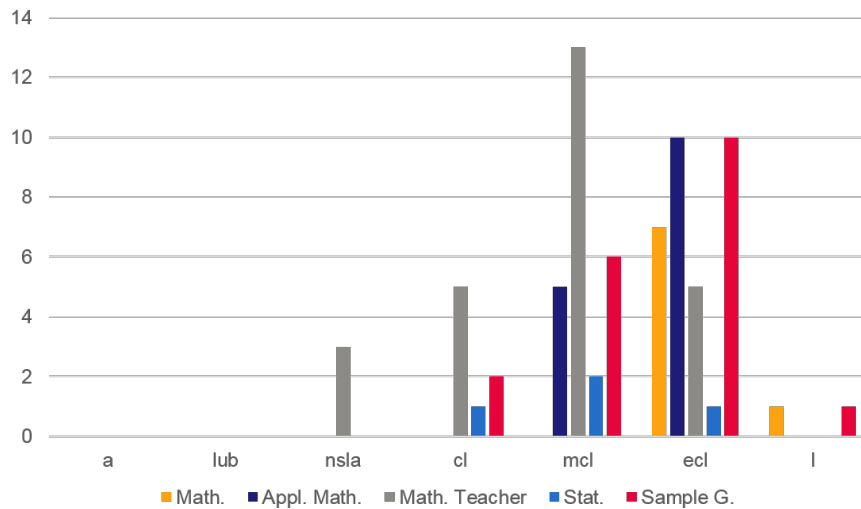
In this study the factors supporting and preventing the master thesis progress are connected to the students in categories A, B and C. The data are analysed to find differences between the categories. The factors supporting or preventing the progress given in the questionnaire are (a) attractiveness of the topic, (b) difficulty level of the topic, (c) restricting the topic, (d) supervisor, (e) time management, (f) peer support, (g) earlier study success, (h) life situation, (i) working, (j) motivation, (k) overlapping other studies, (l) social networks and (m) hurry to graduate. The students were free to choose as many options as they liked for supporting and preventing factors. All factors were allowed to choose for both supporting and preventing ones.

## RESULTS

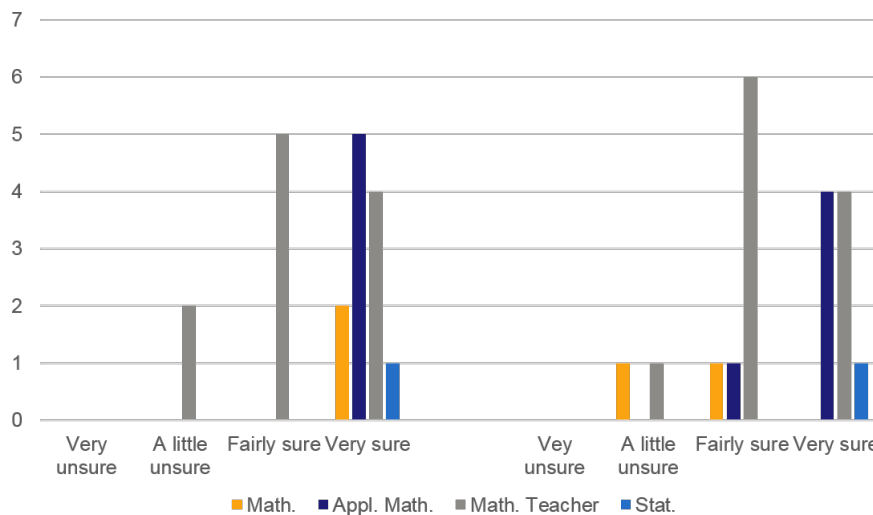
The distribution of the master thesis grades of the cohort group ( $N_0 = 53$ ), this is, mathematics and statistics major students whose master theses were accepted during the spring semester 2016, is presented in **Figure 1**. The distribution of the grades is presented separately between four specializations (mathematics, applied mathematics, mathematics teacher and statistics), and it seems to emphasize good grades, the lowest two grades *approbatur* (a) and *lubenter approbatur* (lub) are not used at all. We observe in **Figure 1** that mathematics teacher specialization has used a bit lower grades than other specializations.

The distribution of the master thesis grades of the sample group ( $N = 19$ ) is presented also in **Figure 1**. The distribution in the sample group is not divided into specializations, since the division would be too thin and several divided segments would be empty. The sample group represents the cohort group well since the shapes of the grade distributions are rather similar. However, the sample group is too small to make any significant conclusions concerning the cohort group or mathematics and statistics graduates in general.

The distribution of the active time used for making the master thesis in the sample group varied a lot. Five students completed their master theses in less than 10 weeks, six students used 3–5 months, two students used half a year, four students used 7–10 months and one student used more than two years to complete the thesis. There are no significant differences between specializations.



**Figure 1.** Distribution of the master thesis grades of the cohort group (mathematics, applied mathematics, mathematics teacher and statistics specializations separately) and the sample group

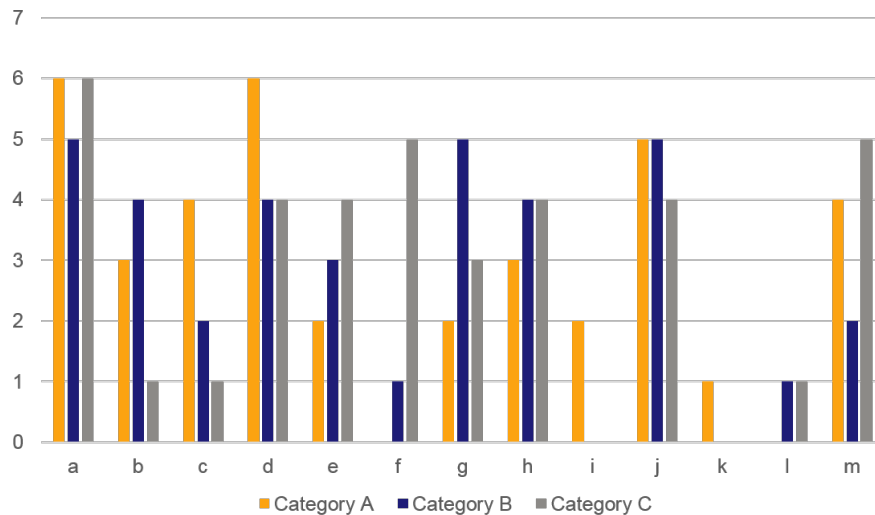


**Figure 2.** Sample group certainty of the selections of the master thesis supervisor (left) and the master thesis topic (right)

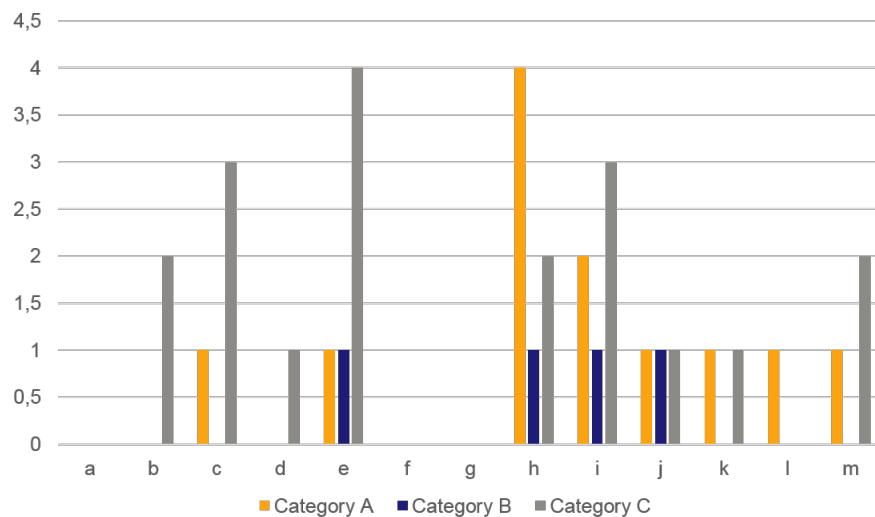
Certainty of the selections of the master thesis supervisor and the master thesis topic in the sample group is presented in **Figure 2**. In this figure the sample group is separated to four specializations (mathematics, applied mathematics, mathematics teacher and statistics) but in the sequel this separation is omitted. We observe that mathematics specialization students were not so sure about the thesis topic than the students in other specializations. On the other hand, it can be seen that all students of the mathematics, applied mathematics and statistics specializations were very sure about the thesis supervisor but more than half of the students in the mathematics teacher specialization hesitated at least a bit of their master thesis supervisor selection.

Classification of the sample group into three categories produced 8 students in category A, 5 students in category B and 6 students in category C. In this study we do not separate students based on their specializations regarding the selection of the topic and the supervisor of the master thesis.

The students in category A were very sure (answer 4) about both the topic and the supervisor of the master thesis. Category A consists of 8 students in the sample group. Altogether they chose 39 options supporting and 12 options preventing the master thesis progress (**Figures 3 and 4**). On average they mentioned 4.9 supporting and 1.5 preventing factors.



**Figure 3.** Factors supporting the master thesis progress in categories A, B and C. Coding: (a) attractiveness of the topic, (b) difficulty level of the topic, (c) restricting the topic, (d) supervisor, (e) time management, (f) peer support, (g) earlier study success, (h) life situation, (i) working, (j) motivation, (k) overlapping other studies, (l) social networks and (m) hurry to graduate.



**Figure 4.** Factors preventing the master thesis progress in categories A, B and C (coding as in **Figure 3**)

In category A attractiveness of the topic ( $n = 6$ ), supervisor ( $n = 6$ ) and motivation ( $n = 5$ ) were mentioned most commonly as factors supporting the master thesis progress. Peer support and social networks were not mentioned at all, and overlapping with other studies was mentioned only once as a supporting factor. Life situation ( $n = 4$ ) and working ( $n = 2$ ) were mentioned most commonly as factors preventing the progress. Attractiveness of the topic, difficulty level of the topic, supervisor, peer support and earlier study success were not mentioned as preventing factors. Four students in category A were very satisfied to the guidance they got, the rest four students were fairly satisfied. Five students were very satisfied with their thesis-writing skills, two students were fairly satisfied and one student was a little unsatisfied.

The students in category B were very sure (answer 4) about the topic and selecting the supervisor but a little unsure (answer 2) or fairly sure (answer 2) about the other ones. Category B consists of 5 students in the sample group. Altogether they chose 36 options supporting and 4 options preventing the master thesis progress (**Figures 3** and **4**). On average they mentioned 7.2 supporting and 0.8 preventing factors.

All students in category B chose attractiveness of the topic, earlier study success and motivation as a factor supporting the master thesis progress. Difficulty level of the topic, supervisor and life situation were mentioned four times each. Working and overlapping other studies were not mentioned and peer support and

**Table 1.** Cross tabulation of the factors supporting and preventing the master thesis progress in categories A, B and C. (Supp. = percentage of supporting factors, Prev. = percentage of preventing factors, Diff. = Supp. – Prev. = difference between percentages of supporting and preventing factors.)

	Supp.	Prev.	Diff.	Supp.	Prev.	Diff.	Supp.	Prev.	Diff.
Attractiveness of the topic	75	0	75	100	0	100	100	0	100
Difficulty level of the topic	37.5	0	37.5	80	0	80	16.8	33.3	-16.5
Restricting the topic	50	12.5	37.5	40	0	40	16.8	50	-33.2
Supervisor	75	0	75	80	0	80	66.7	16.8	49.9
Time management	25	12.5	12.5	60	20	40	66.7	66.7	0
Peer support	0	0	0	20	0	20	83.3	0	83.3
Earlier study success	25	0	25	100	0	100	50	0	50
Life situation	37.5	50	-12.5	80	20	60	66.7	33.3	33.4
Working	25	25	0	0	20	-20	0	50	-50
Motivation	62.5	12.5	50	100	20	80	66.7	16.8	49.9
Overlapping other studies	12.5	12.5	0	0	0	0	0	16.8	-16.8
Social networks	0	12.5	-12.5	20	0	20	16.8	0	16.8
Hurry to graduate	50	12.5	37.5	40	0	40	83.3	33.3	50
	Category A			Category B			Category C		

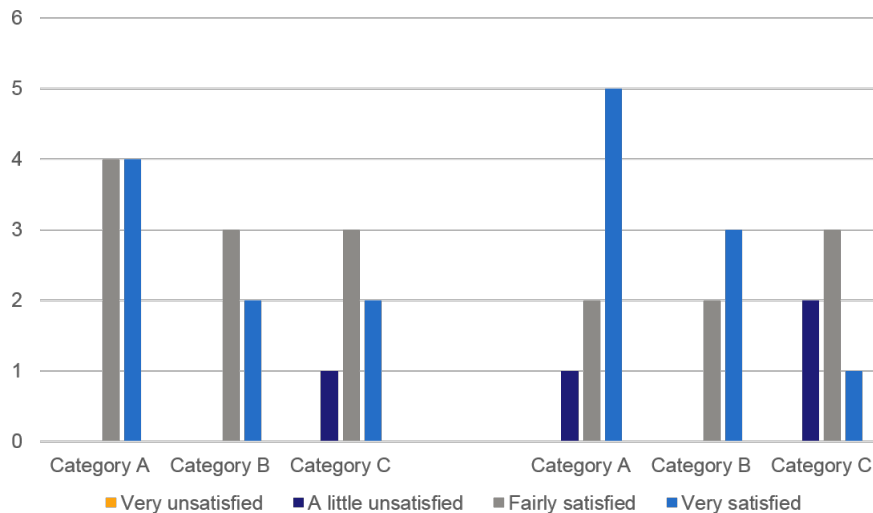
social networks were both mentioned once as a supporting factor. Time management, life situation, working and motivation were each mentioned once as factors preventing the progress. Other factors were not mentioned as a preventing factor. Two students in category B were very satisfied to the guidance they got, the rest three students were fairly satisfied. Three students were very satisfied with their thesis-writing skills, the rest two students were fairly satisfied.

The students in category C were a little unsure (answer 2) or fairly sure (answer 2) about the both the topic and the supervisor. Category C consists of 6 students in the sample group. Altogether they chose 38 options supporting and 19 options preventing the master thesis progress (Figures 3 and 4). On average they mentioned 6.3 supporting and 3.2 preventing factors.

All students in category C chose attractiveness of the topic as a factor supporting the master thesis progress. Peer support and hurry to graduate were mentioned five times both, supervisor, time management, life situation and motivation were mentioned four times each. Working and overlapping other studies were not mentioned and difficulty level of the topic, restricting the topic and social networks were each mentioned once as a supporting factor. Time management ( $n = 4$ ) was mentioned most commonly as a factor preventing the progress, restricting the topic and working were mentioned three times both and difficulty level of the topic, life situation and hurry to graduate were mentioned two times each. Attractiveness of the topic, peer support and earlier study success were not mentioned as a preventing factor, supervisor, motivation and overlapping other studies were mentioned once each. Two students in category C were very satisfied to the guidance they got, three students were fairly satisfied and one student was a little unsatisfied. One student was very satisfied with his/her thesis-writing skills, three students were fairly satisfied and two students were a little unsatisfied.

In category B there seems to be some more factors supporting and less factors preventing the master thesis progress than in categories A and C (Table 1). One-tailed Mann–Whitney U test in the significance level 0.05 ( $N_{AB} = 13$ ,  $N_{BC} = 11$ ) shows that there are statistically significant differences neither in supporting factors ( $U = 57$ ,  $p = 0.08379$ ) nor in preventing factors ( $U = 66.5$ ,  $p = 0.18406$ ). However, we observe that in the significance level 0.1 the difference in supporting factors is statistically significant. The difference between the categories B and C is not statistically significant in supporting factors ( $U = 73.5$ ,  $p = 0.2946$ ) but in preventing factors it is significant ( $U = 66.5$ ,  $p = 0.01463$ ). As a plausible consequence, the students in the category B were slightly more satisfied to the master thesis progress than the students in categories A and C.

If the number of factors supporting and preventing the master thesis progress are considered one by one, there are no significant differences between the categories A, B and C. Two-tailed Mann–Whitney U tests in the significance level 0.05 ( $N_{AB} = 13$ ,  $N_{AC} = 14$ ,  $N_{BC} = 11$ ) confirm this observation, between categories A and B ( $U = 47.5$ ,  $p = 0.06148$ ), categories A and C ( $U = 83.5$ ,  $p = 0.97606$ ) and categories B and C ( $U = 60.5$ ,  $p = 0.22628$ ). However, we notice that in the significance level 0.1 the difference in the number of factors supporting and preventing the master thesis progress is statistically significant between the categories A and B and between the categories A and C.



**Figure 5.** Sample group students' satisfaction to guidance (left) and themselves as master thesis makers (right)

One student in category A, two students in category B and one student in category C would have wanted more quantity and/or more frequently guidance from the supervisor during the thesis progress. Other 15 students in the sample group answered that they did not want more guidance. Three students who would have wanted more guidance answered the supervisor was too busy. The fourth one answered that she had herself too less time for getting guidance and not until the thesis was ready she understood that she would have wanted more guidance but she had not the courage to ask comments to a very incomplete thesis.

In category A four students were very satisfied and the rest four students were fairly satisfied to the guidance they got. In category B two students were very satisfied and the rest three students were fairly satisfied. In category C one student was a little unsatisfied but two students were very satisfied and the rest three students were fairly satisfied. See **Figure 5** (left). The only a little unsatisfied student in category C answered that he expected the supervisor to get more acquainted with the contents of the thesis and its progress, then the conversations would have been more fruitful.

In category A five students were very satisfied, two students were fairly satisfied and one student was a little unsatisfied with themselves as master thesis makers. Respectively, in category B three students were very satisfied and two students were fairly satisfied. In category C one student was very satisfied, three students were fairly satisfied and two students were a little unsatisfied to themselves. See **Figure 5** (right). A student in category C who was a little unsatisfied to himself as a master thesis maker:

*I had no other courses than the thesis, so I could have done much more work on it. I feel that I was lazy and I procrastinated and then I always made a lot in a hurry. My work left a bit incomplete, I could have gone deeper to the subject... but then the time ended.* (Student 18)

### Selected Verbal Answers

In this section we first collect some selected answers to the open question "Tell more about the factors supporting and preventing your master thesis progress".

A student who was very sure about both the topic and supervisor (both answers 4):

*Making of the master thesis progressed well, since I was allowed to do it 6 months as my work. The thesis had to be completed when my employment contract ended.* (Student 2)

A student who was very sure about the supervisor (answer 4) but a little unsure about the topic (answer 2):

*Obscurity of the future (that is, the life after graduation) did not encourage to hasten completing the thesis.* (Student 4)



A student who was fairly sure about the topic and supervisor (both answers 3):

*Restriction of the topic was so broad that it took a lot of time to specify it. Busy life situation both hampered and helped – I used effectively those few weeks which I was able to use full-time for my thesis. (Student 10)*

A student who was fairly sure about the supervisor (answer 3) but a little unsure about the topic (answer 2):

*In the beginning the time management or the lack of it disturbed the thesis progress, since I was not able to block my working properly. In the end it turned to profit, since I was forced to complete my thesis by a certain deadline. Indeed, I needed to work long days at my computer, but finally I did so with pleasure, since I wanted my thoughts away from my other life. (Student 14)*

A student who was fairly sure about the topic (answer 3) but a little unsure about the supervisor (answer 2):

*Hurry to graduate stressed and that is why my work left a bit unfinished, but anyway it helped to work during the last weeks. My supervisor helped a lot, but because of his own scramble he did not always find time to make corrections, which is comprehensible but still confused my timetables, since I had temporary working posts at the same time. (Student 18)*

Two selected answers to the last open question “Finally, how would you improve making, supervision and evaluation of master theses in mathematics and statistics?”:

*Asking a thesis supervisor was socially a very exciting occasion. It was not easy to send e-mails or to go to talk. However, I don't know how to improve it, since it was only because of my own character. (Student 18)*

*It would be important to emphasize that it is possible to start master thesis early before graduation. Then there is certainly less stress and it is easier to take a break from the work if it feels too demanding. (Student 15)*

## DISCUSSION

The sample group ( $N = 19$ ) is probably too small to make any reliable conclusions from the results. The reliability of the results is not good but the validity is better. The good validity was ensured by choosing the pre-given supporting or preventing factors so that they largely cover various areas which may have an effect on the master thesis progress. The factors were discussed and tested in a small group of experts before the questionnaire was launched. The study is repeatable which strengthens the reliability of the results.

**Table 1** verifies that there are some more factors supporting and less factors preventing the master thesis progress in category B than in categories A and C. This observation can be interpreted so that the category B students were slightly more satisfied to the master thesis progress than the category A and C students. What reasons could be behind this interpretation? The results of the study and the students' answers to the open questions do not give any clear answer. The students in category A who were very sure about both the topic and the supervisor could be more demanding than the students in other categories. On the other hand, the students in category C who were unsure of both the topic and the supervisor, probably were the weakest students in the sample group and therefore needed more guidance and support than the others. Speculatively, the category A and C students supposed to get intensive and qualified supervision during the progress and they did not get it enough. However, only four students answered that they would have wanted more guidance than they got and they divide to all categories (1 student in category A, 2 students in category B and 1 student in category C). This indicates that the quality of guidance explains the students' satisfaction more than the amount of it.

It is possible that the students in categories A and C have been less satisfied to their thesis topics than the students in category B. The category C students were not very sure of the thesis topic when they chose it, and it is probable that some topic selections were not optimal.

It is remarkable that all students in category B were at least fairly satisfied to both the guidance and themselves as master thesis makers. This is not the case in categories A and C. In category C one student was a little unsatisfied to the guidance. In category A one student and in category C two students were a little unsatisfied to themselves as master thesis makers. This observation regarding dissatisfaction in categories A and C is a potential explanation to our earlier discussion about the amount of factors supporting and preventing the master thesis progress.

An interesting observation is that there are factors which support the master thesis progress of some students but prevent the progress of some other students. Especially time management, life situation and motivation seem to be such factors which may be both supportive and preventive in the master thesis progress. All of these factors are such that there are considerable individual differences.

The answer to the first research question seems to be no. Certainty of the supervisor and thesis topic selections does not predict smoother thesis progress than uncertainty of the selections. The answer to the second research question could be tentative yes, however, it is safer to answer no but not so strictly than to the first research question. If a student is very sure about both the thesis supervisor and the topic selections, he or she will provisionally meet less supporting factors and more preventing factors than a student who is not very sure but still fairly sure about the selections.

A general answer to the third research question is no as well. However, we observe some specific areas of the master thesis process where the mathematics teacher specialization students' experience differs from the other specializations. Mathematics teacher specialization students earned a bit lower grades of the master thesis than other specialization students. Moreover, mathematics teacher specialization students hesitated more their master thesis supervisor selection than the other specializations students did.

Master theses of 53 students were accepted during the spring 2016 and 19 students answered to the questionnaire, which means that 34 students did not answer to the questionnaire. All students received an e-mail message where they were asked to answer to the questionnaire. If someone did not answer in about one month, he or she received a reminder. It cannot be recognized any homogeneous group of students who answered or did not answer. Since the master thesis is the final academic credit for most students, they disappear quickly from the university and try to leave university behind them to start a new life in private or public sector jobs outside the university. This is probably one reason for being unresponsive to the request to answer to the questionnaire. The biggest group of students who answered were mathematics teachers, 11 students is more than half of the sample group 19 students. Mathematics teachers are, in general, more interested in studies of mathematics learning and pedagogy than mathematics, applied mathematics and statistics specialization students, and therefore they are more inclined to take part in pedagogy studies. Most importantly, students of mathematics teacher specialization were the biggest group in the cohort group (26 of 53 students), and hence it is not surprising to receive most answers from this group.

## CONCLUSION

A motivation to study the master thesis progress was that the researcher wanted to know if it is profitable for a student to select a thesis topic and a supervisor early during the university studies. This study suggests that it is not important and definitely beneficial to make these selections early and therefore to be very sure about the both selections when starting to write the master thesis. It seems to be as favourable to make the selections just when the other studies are behind and it is time to start the master thesis project.

## ACKNOWLEDGEMENT

The author would like to thank Professor Sari Lindblom for her kind guidance and for the comments which helped a lot to amend the final version of this article.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Notes on contributors

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## APPENDIX

<https://elomake.helsinki.fi/lomakkeet/67847/lomake.html> (translation from Finnish into English)

## Mathematics and Statistics Master Thesis Questionnaire

## Basic data

Your name?

When did you start your studies at the Department of Mathematics and Statistics?

2015    2014    2013    ...    1995    Earlier

Have there been significant breaks in your studies after the beginning of them?

No    Yes

If yes, what was the reason for the break (parental leave, military/civilian service, working, etc.)?

Your major subject?

Mathematics    Applied Mathematics    Mathematics Teacher    Statistics    Other

## Start of the master thesis

When did you choose the topic and the supervisor of your master thesis?

Year 2016    2015    2014    ...    2005    Earlier

Month    January    February    March    ...    November    December

Additional information?

How confident were you about the selection of your supervisor?

Very unsure    A little unsure    Fairly sure    Very sure

What factors had an effect on the selection of your thesis supervisor?

How confident were you about the selection of your thesis topic?

Very unsure    A little unsure    Fairly sure    Very sure

What factors had an effect on the selection of your thesis topic?

**Progress of the master thesis**

Approximate how many weeks did you use actively working on the master thesis?

1 2 3 ... 51 52 53–56 57–60 ... 93–96 97–100 More

How often did you get guidance from your supervisor for making the master thesis?

Weekly                      2–3 times in a month      Once in a month

Once in two months    Once in 3–4 months      Once in 5–6 months

Once in 7–9 months    Once in 10–12 months    Less frequently

Would you have liked to get guidance more and/or more often?

No      Yes

If yes, why did you not get guidance so much that you wanted?

How satisfied are you to the guidance you got?

Very unsatisfied    A little unsatisfied    Fairly satisfied    Very satisfied

Why are you unsatisfied or satisfied to the guidance?

How satisfied are you to yourself as a master thesis maker?

Very unsatisfied    A little unsatisfied    Fairly satisfied    Very satisfied

Why are you unsatisfied or satisfied to yourself?

Which ones of the following factors did support your master thesis progress?

Attractiveness of the topic

Difficulty level of the topic

Restricting the topic

Supervisor

Time management

Peer support

Earlier study success

Life situation

Working

Motivation

Overlapping other studies

Social networks

Hurry to graduate

Which ones of the following factors did prevent your master thesis progress?

Attractiveness of the topic

Difficulty level of the topic

Restricting the topic

Supervisor

Time management

Peer support

Earlier study success

Life situation

Working

Motivation

Overlapping other studies

Social networks

Hurry to graduate

Tell more about the just chosen or other factors supporting and preventing your master thesis progress.

**Completion of the master thesis**

How long did the evaluation of your master thesis take?

Less than a week      1 week   2 weeks ... 10 weeks      Longer

How satisfied are you to the evaluation process?

Very unsatisfied   A little unsatisfied   Fairly satisfied   Very satisfied

Why are you unsatisfied or satisfied to the evaluation process?

How satisfied are you to the grade of your master thesis?

Very unsatisfied   A little unsatisfied   Fairly satisfied   Very satisfied

Why are you unsatisfied or satisfied to the grade of your master thesis?

Finally, how would you improve making, supervision and evaluation of master theses in mathematics and statistics?

<http://www.iejme.com>