Summary report on doctoral experience in UniOGS graduate school at the University of Oulu

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Abstract

This report is part of the research-based development of doctoral training in the UniOGS graduate school, at the University of Oulu. It aims to contribute research-based evidence pertaining to the development of doctoral education in the UniOGS graduate school at the University of Oulu by exploring the doctoral experience in the UniOGS, and the primary regulators of the doctoral journey. The data reported here were collected with the doctoral experience survey from doctoral students of UniOGS graduate school. Doctoral students' experiences of doctoral training were analysed in terms of three complementary aspects of the training: the doctoral dissertation process, supervision, and doctoral studies. The report consists of a summary of the results based on data collected from doctoral students at the University of Oulu in April 2015.

Keywords: doctoral education, doctoral experience, researcher community, supervision, University of Oulu Graduate School

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Tiivistelmä

Tämä raportti on osa Oulun yliopiston tutkimusperustaista tohtorinkoulutuksen kehittämistä. Sen tavoitteena on ymmärtää aiempaa paremmin tohtoriopiskeluprosessia ja kartoittaa sitä säätteleviä tekijöitä, ja tukea näin tutkimusperustaista tohtorikoulutuksen kehittämistyötä UniOGS -tutkijakoulussa. Raportin taustalla ovat tieteelliset tutkimusprojektit tohtorikoulutuksesta. Raportin aineisto kerättiin Tohtoriopiskelija -kyselyllä kaikilta UniOGS -tutkijakoulun jatko-opiskelijoilta keväällä 2015 Kyselyllä kartoitettiin tohtoriopiskelijoiden kokemuksia väitöskirjaprosessista, ohjauksesta, tiedeyhteisöstä ja jatko-opinnoista.

Asiasanat: jatko-opiskelija, ohjaus, tiedeyhteisö, tohtorinkoulutus, UniOGS-tutkijakoulu

Acknowledgements

I would like to thank all the doctoral students who responded to the Doctoral experience –survey, and made the study possible. I am also grateful to my research team, and all of those who have contributed to the project. The University of Oulu Research Council provided funding for the pilot study and the report.

11.12.2015 Prof. Kirsi Pyhältö

Contents

1 Introduction

The University of Oulu is an international multidisciplinary research-intensive university with a high profile in research and researcher education. In the Strategic Plan and Research Policy for the University of Oulu 2012–2015, the University committed to the principles of research-based teaching, continuous re-assessment of its operations, and developing academic careers and doctoral education.

University of Oulu Graduate School, (abbreviation UniOGS), is a university-wide graduate school that was launched at the beginning of August 2011. The main goal of the UniOGS is to provide the framework and conditions for high-quality, research-driven doctoral education for all the doctoral students of the University of Oulu. By promoting the development of effective student-supervisor relationships, founded on both motivation and commitment, UniOGS aims to create a favourable environment for the planning, execution and timely completion of doctoral education tailored to each student. In UniOGS, students acquire a proficiency to work on doctoral level tasks.

The Graduate School structure consists of three Doctoral Training Committees in the fields of *Human Sciences, Technology and Natural Sciences,* and *Health and Biosciences*. The Committee responsibilities entail student admissions processes, appointing supervisors and follow-up groups, acceptance of Doctoral Training Plans, recommending degree requirements, and thesis examination processes and grading. Each of the doctoral students belongs to one Committee. The doctoral degree is expected to be completed in four years when studying full-time.

This report is part of the research-based development of doctoral training in the UniOGS graduate school, at the University of Oulu. It aims to contribute research-based evidence pertaining to the development of doctoral education in the UniOGS graduate school at the University of Oulu by exploring the doctoral experience in the UniOGS, and the primary regulators of the doctoral journey.

Doctoral students' experiences of doctoral training were analysed in terms of three complementary aspects of the training: the doctoral dissertation process, supervision, and doctoral studies. The report consists of a summary of the results based on data collected from doctoral students at the University of Oulu in April 2015.

The doctoral experience survey has been validated in prior studies (e.g. Pyhältö, Stubb & Lonka, 2009; Pyhältö, Vekkaila & Keskinen, 2015; Sakurai, Vekkaila & Pyhältö, submitted). Academy of Finland fellow, Erika Löfström, prof. Auli Toom, doctoral student Solveig Corner, and MA, Jonas Lindholm contributed to the pilot

study. The summary report was compiled by prof. Kirsi Pyhältö, university lecturer, Jouni Peltonen, post-doctoral researcher, Pauliina Rautio, doctoral student, Kaisa Haverinen, MA, Maija Laatikainen, and pedagogical university lecturer, Jenna Vekkaila. Dean of the graduate school, Markku Juntti, research school coordinators, Titta Kallio-Seppä, Annu Perttunen, Anthony Heape and Minna Silfverhuth commented on the survey. The survey was also commented on by the members of UniOGS's educational development group consisting of prof. Tellervo Tervonen, prof. Netta Iivari, research professor, Arja Rautio, doctoral student, Hanna Kähäri, researcher, Timo Tuovinen and doctoral student, Virpi Timonen.

2 Participants and data collection

2.1 Data collection

The data reported here were collected through the online surveys in April 2015. The doctoral experience student survey employed Likert-type statements and open-ended questions concerning three themes: (1) the thesis process, (2) supervision, and (3) doctoral studies, and background questions. The questionnaire was available in Finnish and in English. The doctoral experience survey was sent to all registered doctoral students (N = 1580) in the UniOGS graduate school at the University of Oulu. The data reported here were analysed using qualitative content analysis and statistical measures including cross-tabulation and chi-squared statistical testing, testing mean differences with parametric and non-parametric tests and correlation analysis. The scales on *reasons for undertaking doctoral studies, the supervisory and researcher community experiences* were analysed with the exploratory factor analysis to explore the structures and different dimensions measured by the scales.

2.2 Doctoral students

Altogether 402 doctoral students (62% women, 38% men, mode: 30–34 years) from the UniOGS, including all the 10 faculties of the university, responded to the survey. The doctoral students were typically between 30–34 years old[1]. In terms of age distribution and the doctoral training committees the sample represented the whole population well. Women were slightly overrepresented in the data. This is likely due to the fact that the students from the faculty of the information technology and electric engineering were underrepresented. Otherwise, also the disciplinary distribution represented well the whole population. Altogether, 57 international and 341 Finnish students responded to the survey. The response rate was 25.4%. According to self-reports, the majority of the participants (58%) were in the final third of their studies, whereas 17% were in the middle, and one-fourth at the beginning (25%).

On average, doctoral students expected graduate within 5.6 years. Altogether, 40% of the doctoral students expected to finish their doctoral degree within 4 years.

[1] However, the youngest respondents were under 25 years old, but also a proportion of the students who were 50 years or older was relatively large.

There were no significant differences in the estimated graduation time between the three doctoral training committees. The majority of students reported working full-time on their thesis (55%). The committees differed significantly from each other in terms of the number of students working full- and part-time on their doctoral dissertations ($\chi 2(2, N = 385) = 21.20, p < .001$). In the Doctoral Training Committee for Technology and Natural Sciences it was more typical to work full-time on the doctoral studies (68%), whereas in the Doctoral Training Committee for Health and Biosciences it was typical to work part-time (60%). Estimated graduation time among full-time students was significantly shorter ($M = 5.22$, $SD = 4.37$) than among part-time students ($M = 6.89$, $SD = 4.37$, $p < .001$). The doctoral students typically funded their doctoral education through several different sources. The most typical forms of funding were doctoral student posts in doctoral programmes or faculties, personal grants, and work outside the university.

Table 1. Estimated completion time, and full-time/part-time.

Faculty	N	Completing doctorate		Estimated completion time	
		Full-time	Part-time	M	SD
Oulu Mining School	2	100%	0%	4.50	0.71
Oulu Business School	15	80%	20%	4.64	0.93
Faculty of Science	61	70%	30%	4.81	1.72
Faculty of Technology	62	63%	37%	4.93	1.88
Faculty of Biochemistry and Molecular Medicine	23	87%	13%	5.59	1.97
Faculty of Education	32	47%	53%	5.60	2.19
Faculty of Information Technology and Electrical Engineering	31	71%	29%	5.84	2.37
Faculty of Medicine	85	31%	69%	6.04	2.45
Oulu School of Architecture	5	40%	60%	6.75	3.20
Faculty of Humanities	55	45%	55%	6.78	2.68
Other	7	57%	43%	4.33	0.52

The majority of students were conducting their thesis in the form of compilation of articles (70%), and 23% as a monograph, while 7% reported that they did not know in which form they would write their thesis. 57% of doctoral students had already published their research. Monographs were the most typical form of theses in the Faculties of Humanities and Education and in the Oulu School of Architecture, whereas a compilation of articles was the most typical thesis form in the Faculties of Biochemistry and Molecular Medicine, Science, Medicine and Technology and

in the Oulu Business School. There were no differences between the international and Finnish students in terms of thesis form. Altogether 67% of doctoral students were native Finns writing their thesis in English. The form of the dissertation was related to estimated duration of studies ($F(2, 327) = 11.72$, $p < .001$). Students who were completing their dissertations as a summary of articles ($M = 5.41$, $SD = 2.41$) estimated to complete their studies in a shorter time than the students who were writing a monograph ($M = 7.41$, $SD = 4.02$).

The majority of the doctoral students (68%) reported working on their doctoral dissertation mainly alone, and a minority (7%) in a group. About a fourth of the students (26%) reported conducting their work both alone and in a group. There were, however, some differences between faculties. Doctoral students of the Faculty of Humanities most often reported working on their theses mainly alone (91%), whereas doctoral students of the Faculty of Biochemistry and Molecular Medicine more often reported working on their thesis in a research group (41%).

Table 2. Faculty, form of thesis, and research group status (alone/group/both).

Faculty	N	Form of thesis		Research groups status		
		Monograph	Article	Alone	Group	Both
Oulu School of Architecture	5	60%	20%	80%	0%	20%
Faculty of Biochemistry and Molecular Medicine	23	19%	48%	32%	41%	27%
Faculty of Humanities	55	54%	43%	91%	0%	9%
Oulu Mining School	2	0%	100%	100%	0%	0%
Faculty of Education	32	59%	41%	85%	6%	9%
Faculty of Science	61	7%	88%	62%	5%	33%
Faculty of Medicine	85	4%	93%	58%	8%	34%
Oulu Business School	15	20%	80%	80%	0%	20%
Faculty of Technology	62	20%	65%	70%	5%	25%
Faculty of Information Technology and Electrical Engineering	31	13%	84%	51%	7%	42%
Other	7	14%	86%	71%	0%	29%

*Form of thesis: I don't know answers 7.0%.

Further investigation showed that both the thesis format ($F(2, 378) = 10.22$, $p < .001$) and research group status ($F(2, 387(= 4.94$, $p < .01$) were associated with satisfaction with supervision. Those students who were writing their thesis in the form of a summary of articles ($M = 5.41$, $SD = 1.48$) were more satisfied than students who were writing a monograph thesis ($M = 4.82$, $SD = 1.91$). Moreover,

those students who were working as much on their own as with a research team or primarily in teams were more satisfied with their supervision ($M = 5.61$, $SD = 1.37$, $p = .002$) than those who were working on their dissertation mainly on their own ($M = 5.01$, $SD = 1.77$).

3 Doctoral experience

3.1 Reasons for undertaking doctoral studies

Doctoral students reported various reasons for undertaking doctoral studies. Table 3 shows that students emphasized especially *research and development interests*, including enjoying intellectual challenges, inspiration related to their research topic, fascination of finding new things as well as desire to develop their skills and to develop themselves, as the main reasons for undertaking doctoral studies. Also *instrumental interest*, such as getting a better position or better salary, was perceived as a significant driver for undertaking doctoral studies. The *professional interest*, both within and outside academia, entailing the desire to work in a research community, possibly in a post-doc position at university, or finding the job prospects better after gaining a doctoral degree, was emphasized less than the research and development-related reasons for undertaking doctoral studies, although the mean was still relatively high (see Table 3). Not having other career prospects in sight was rarely emphasized as a reason for doctoral studies. In general, high levels of interest were related to high levels of experienced engagement in doctoral research, high levels of satisfaction with supervision and overall doctoral studies, and reduced levels of experienced burnout in their studies. Moreover, students with high levels of interest in their studies were less likely to consider dropping out from the doctoral studies compared to those showing low levels of interest.

Table 3. Doctoral students' reasons for conducting doctoral studies.

Dimension	N of items	Alpha	Mean	SD	Min	Max
Research and development interest	9	0.86	6.02	0.77	3.56	7
Instrumental interest	2	0.76	4.92	1.52	1	7
Professional interest	4	0.73	4.38	1.37	1	7

Further investigation showed that students emphasizing research and development interest were most satisfied with their supervision, experienced the lowest levels of exhaustion, cynicism, inadequacy and stress, and the highest levels of engagement in their doctoral research. Students emphasizing professional interest were most satisfied with their doctoral studies. Professional interest was emphasized more ($t(389) = 4.70$, $p = .000$) by full-time doctoral students ($M = 4.67$, $SD = 1.30$) than those who worked part-time on their thesis ($M = 4.03$, $SD = 1.38$). Also, a higher

level of professional interest was reported among those student who received supervision more frequently ((N = 397) = 1.29, p < .05). Lower levels of instrumental interest were reported (t(347) = 1.95, p = .052) among the doctoral students whose studies were prolonged (10 or more years) (M = 4.32, SD = 1.66) compared to those students whose studies were not prolonged (M = 4.90, SD = 1.49).

Some differences occurred between the Finnish and international students, and students from different faculties. The international students showed higher levels of instrumental (t(395) = -1.99, p < .05) and professional interest (t(396) = -5.32, p < .001) than Finnish students. Moreover, students in the Faculty of Humanities (M = 6.32, SD = 0.51) showed significantly higher levels of research and development interest in their studies than their counterparts in the Faculties of Science (M = 5.83, SD = 0.74, p < .01) and Technology (M = 5.88, SD = 0.83, p < .05).

There were no differences in experienced interest either between the students who were at the different phases of their doctoral studies nor the students who were conducting their thesis in different forms (monograph versus article compilation).

3.2 Temporal locations of doctoral students' positive and negative key experiences

Doctoral students reported a variety of positive (f = 363) and negative (f = 325) key experiences embedded throughout their doctoral studies. Some experiences had more fundamentally changing impacts on the doctoral journey than others. The intensity, duration and personal significance of reported episodes varied. Both positive and negative key experiences occurred throughout the course of doctoral studies. The milestones related to the progress of the doctoral research were emphasised in students' answers. Figure 1 shows that over 75 % (f = 532) of meaningful positive and negative experiences occurred during the first three years of doctoral studies. The number of both positive and negative events reported by the doctoral students was, especially high in the first year of doctoral studies.

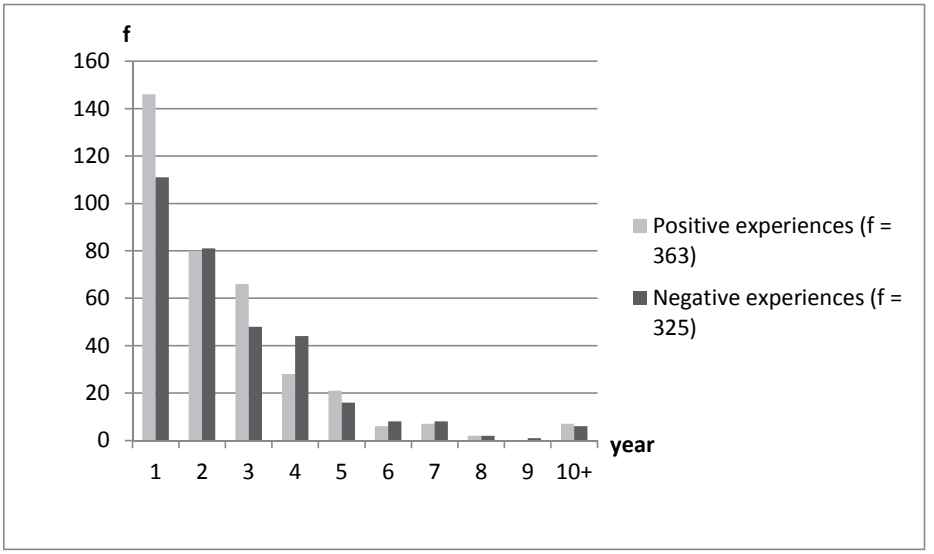

Fig. 1. The temporal location of the positive and negative key experiences.

There were no statistically significant differences in temporal location of the positive experiences between faculties or doctoral training committees. However, there were some differences in temporal location of negative experiences ($\chi 2(81, N = 305) = 105.89$, $p < .05$). More negative experiences were reported in the Oulu School of Architecture in the sixth (20%, adjusted residual 2.2) and eighth year (20%, adj. res. 5.4), Faculty of Humanities in the fifth year (11%, adj. res. 2.1), Faculty of Education during the tenth year or later (10%, adj. res. 3.4), the Oulu Business School in the third year (36%, adj. res. 2.2) and Faculty of Information Technology and Electrical Engineering in the ninth year (4%, adj. res. 3.3). In general, comparison between the disciplines showed that in Human Sciences positive experiences were located later within doctoral studies than in Natural Sciences and Health Sciences.

3.3 The quality of the key experiences

Both the positive and the negative key experiences were embedded in five aspects of doctoral experience, including *supervision, scholarly community, doctoral research, development as a scholar, and structures and resources*. Table 4 shows that the most typical positive experiences (39%) were related to their *doctoral*

research project which entailed reaching significant milestones such as getting published, overcoming problems related to research work, making discoveries and learning how to use new methods. The most frequently reported research-related positive experience was getting published. In turn, about one-fifth (19%) of the negative experiences were related to conducting *doctoral research projects*, including problems in getting published, failed experiments, challenges in getting data or results, and problems in research designs and research instruments. The most frequently reported negative key experiences were related to *structures and resources* (45%), in particular to an unsecure financial situation and high level of bureaucracy of the doctoral programme. Also short-term doctoral student posts, the weak position of grant researchers at the university, and unsecure future career prospects at the university after earning the PhD were reported as highly problematic. The students also described problems in balancing doctoral studies with other academic duties such as administration and teaching duties, with full-time work or with personal life challenges (problems with health, death of a friend or family member causing distress. At the same time, slightly under one-fourth (24%) of the positive experiences reported by the doctoral students were related to *structures and resources* especially, having funding, adequate research facilities and a good balance between research and other academic duties were considered valuable assets by the students.

Table 4. Positive and negative experiences within the doctoral journey.

Positive and negative experiences	Positive		Negative	
	f	%	f	%
Doctoral research	136	39	60	19
Structures and resources	84	24	144	45
Scholarly community	77	22	48	15
Supervision	29	8	45	14
Development as a scholar	27	7	23	7
Total	353	100	320	100

Participation in *scholarly communities* such as working in a research group, peer interaction, and in particular the ability to participate in international conferences and networking with other researchers were reported as sources of positive experiences by slightly over one-fifth of the doctoral students (22%). In turn, being an outsider, destructive feedback from senior researchers, a lack of support from others, and destructive friction in the scholarly community such as a competitive or a hostile academic atmosphere and conflicts between students and other

members of the community, were perceived as impediments and source of distress in the doctoral process (15%).

Key experiences related to *supervision* were occasionally reported. Negative experiences related to supervision (14%) such as insufficient supervision, a lack of encouragement, interest and support from the supervisors as well as and problems in the supervisory relationship, such as supervisors' discouraging comments or lacking expertise, were more often reported than positive experiences related to supervision. In turn, the encouragement, support, and constructive feedback received from the supervisors, as well as supervisors' expertise and commitment to the supervisory relationship, typically constituted the positive key experiences embedded in supervision.

The key experiences within the doctoral journey were rarely related to *development as a scholar*. Those students who describe these experiences, typically perceived learning of work-related competences (both academic and non-academic), and becoming more autonomous and skilled as a researcher as highly positively (7%). In turn, experiencing lack of abilities required in a researcher career, insufficient knowledge and skills to carry out doctoral studies and research, and challenges with regulating own work processes were occasionally considered as negative experiences (7%).

Further investigation showed that the positive experiences were related to doctoral students' satisfaction with supervision ($F(4, 341) = 4.31$, $p < .01$) and engagement in doctoral research, including experiencing vigour ($F(4, 347) = 3.85$, $p < .01$), dedication ($F(4, 348) = 3.28$, $p < .05$) and absorption ($F(4, 348) = 2.50$, $p < .05$). The students who reported a significant positive experience related to their doctoral research were more satisfied with their supervision ($M = 5.50$, $SD = 1.45$, $p < .01$) than those students who emphasized positive experiences related to the scholarly community ($M = 4.64$, $SD = 1.84$). Moreover, the students who reported a significant positive experience related to supervision experienced more vigour ($M = 5.68$, $SD = 0.94$) than those who describe positive experiences related to the scholarly community ($M = 4.74$, $SD = 1.40$, $p < .01$), development as a scholar ($M = 4.54$, $SD = 1.46$, $p < .05$), and to the doctoral research ($M = 4.95$, SD = 1.10, $p < .01$). Positive experiences in supervision were also related to higher levels of experienced dedication ($M = 5.75$, $SD = 1.40$, $p < .05$) in comparison with positive experiences embedded in developing as a scholar ($M = 4.68$, $SD = 1.48$).

4 Doctoral supervision and researcher community interaction

4.1 Source of supervision

The majority of doctoral students (56%) had two or more supervisors, whereas 41% had one supervisor. Students rarely (2%) reported not having a supervisor. The source of supervision was related to satisfaction with supervision ($F(3, 390) = 5.73$, $p = .001$). Doctoral students with no supervisor ($M = 3.25$, $SD = 1.75$) were less satisfied with their supervision than the students with one ($MD = 5.18$, $SD = 1.77$) or more ($MD = 5.29$, $SD = 1.54$) supervisors. There were no significant differences between full-time and part-time doctoral students or between Finnish and international doctoral students in the source of supervision.

Table 5. Source of supervision.

Main supervisor	f	%
One supervisor	166	41
Two or more supervisors	224	56
I have no supervisor	8	2
Someone else	3	1
Total	401	100

Further investigations showed that there were some differences between the faculties in the source of supervision (*2(10, $N = 367$) = 18.94, $p = .04$). In the faculties of Medicine (70%) and Education (56%) the doctoral students typically had two or more supervisors, while in the faculties of Biochemistry and Molecular Medicine, Humanities, Science, Technology, Information Technology and Electrical Engineering, and in the Oulu Business School, approximately half of the doctoral students had only one supervisor.

The majority (62%) of students had a follow-up group. A majority of students who had already had a meeting with their follow-up group considered the meeting at least somewhat useful for them, however there was considerable variation in the students' experiences on the usefulness of the meeting. Students who had started their doctoral studies after UniOGS was launched (2012 or later) ($M = 4.37$, $SD = 1.91$) found the meeting more useful ($t(158) = -2.10$, $p < .05$) than students who had started their studies before the launch of the UniOGS graduate school ($M = 3.70$, $SD = 1.94$).

4.2 Frequency of supervision

The students' perceptions of frequency of supervision varied from it taking place daily to less than once (in) every six months. A majority of doctoral students (65%) reported receiving supervision at least once in a month. Students received supervision most typically either weekly (31%) or monthly (30%). About one-third of the doctoral students reported receiving supervision more seldom than once a month.

Table 6. Frequency of supervision.

Frequency of supervision	f	%
Daily	17	4
Weekly	124	31
Once a month	120	30
Once every two months	56	14
Once every six months	37	10
Less frequently	43	11
Total	397	100

The students who received more frequent supervision, were less likely to consider dropping out from their studies (*2 (5, $N = 389$) = 20.48, $p = .001$), and were less likely to have prolonged study periods (*2 (5, $N = 347$) = 27.01, $p < .001$). Frequent supervision was also related to higher levels of satisfaction with both supervision ($r(388) = .445$, $p < .001$) and doctoral studies ($r(391) = .277$, $p < .001$). More frequent supervision was also associated with more timely completion of doctoral studies. The students who received frequent supervision took less time in their studies ($r(345) = -.291$, $p < .001$), and were predicted to complete their doctoral degree sooner than their counterparts who received supervision less frequently ($r(330) = -.264$, $p < .001$). No gender differences were detected in terms of the frequency of supervision.

Moreover, the doctoral students who reported working full-time on their theses received, on average, supervision more often than those who worked part-time. ($U(N = 387) = 24172.50, p < .001$). Doctoral students who reported working mainly on their own had less frequent supervision than those working in at least partly in a research group (*2(2, $N = 392$) = 43.75 , $p = .001$).

There were also considerable differences between doctoral training committees (*2 (10, $N = 391$) = 26.74, $p = .003$). Doctoral students within the Committee for Health and Biosciences reported receiving supervision most frequently. Almost half

(46.8 %) of the students within this Committee reported receiving supervision at least weekly. Doctoral students belonging to the Committee for Human Sciences received supervision less often than their counterparts in Technology and Natural Sciences and in Health and Biosciences (See Appendix 1).

4.3 The quality of supervision and researcher community support

Doctoral students described *basic prerequisites, informational support, emotional support and instrumental support* as the primary qualities of high-quality supervision. Especially, the basic prerequisites of supervision (37%) such as supervisory commitment, frequent meetings and being available, were emphasized by the students. Students also highlighted *informational support* (33%), including giving practical help and advice concerning the research topic and research methods, as well as planning the research and reporting on it as an important element of good supervision. Moreover, receiving *emotional support* (25%) from the supervisor, including encouragement, constructive feedback and promoting student active agency, were also often described to be important. The students described *instrumental support* (5%) such as providing research facilities or writing recommendations less often as central aspects of good supervision. According to students these elements often complemented each other, constituting the body of high-quality supervision. There were no significant differences between the students of different doctoral committees.

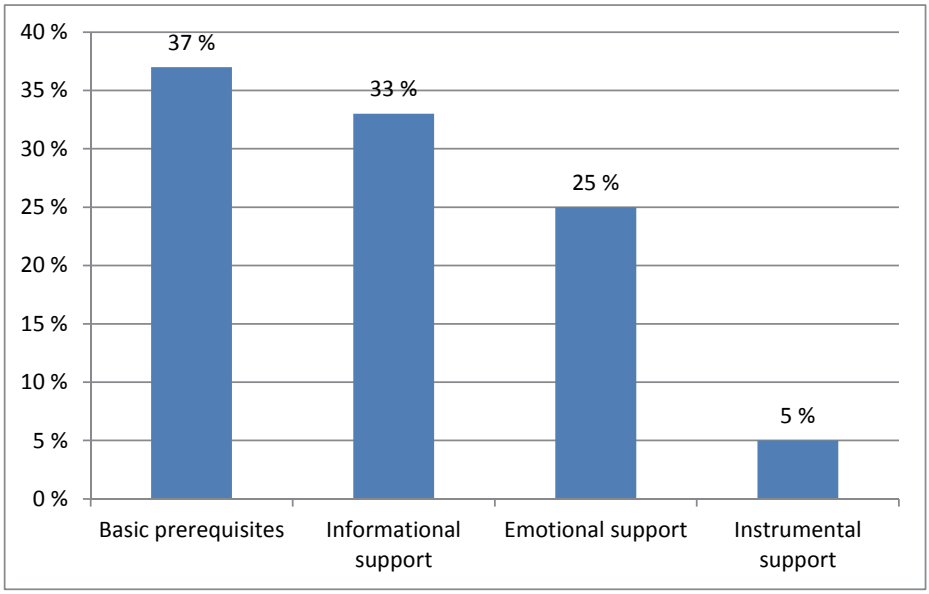

Fig. 2. Doctoral students' perceptions about good supervision.

In general, the doctoral students were quite satisfied with the supervision ($M = 5.19$, $SD = 1.67$) (see Appendix 2). Yet, there were significant differences in students' satisfaction levels with supervision across the faculties ($F(10, 361) = 2.40$, $p = .009$). The comparison indicated that the students of the Oulu Business School ($M = 6.33$, $SD = .72$) were more satisfied with supervision than their counter partners in Medicine ($M = 5.40$, $SD = 1.51$, $p = .030$), Science ($M = 5.27$, $SD = 1.68$, $p = .027$), Humanities ($M = 5.11$, $SD = 1.71$, $p = .007$), and Technology ($M = 4.46$, $SD = 1.85$, $p < .001$).

Altogether 13% had changed their supervisor during the doctoral process, whereas 15% had considered it. The most common reasons for a supervisor change were external reasons (62%) such as supervisor retirement or changing their place of work. Other reasons such as changing the thesis topic or problems in the supervisory relationship were less often reported. Doctoral students in faculties of Humanities (2.7%), Education (2.4%) and Medicine (2.4%) had most often changed their supervisor either on their own initiative or for some other reason. The relations between satisfaction with supervision and faculty, and between changing a supervisor and faculty were statistically significant.

The students who had considered changing their primary supervisor were less satisfied (M = 3.17, SD = 1.72) with supervision than the students with no such intentions (M = 5.56, SD = 1.39, t(71.13, N = 380) = 11.55, p < .001). Moreover, those students who were less satisfied with their supervision (M = 4.46, SD = 1.88) were more likely to consider dropping out than those who were more satisfied with it (M = 5.58, SD = 1.41, t(216,43, N = 387) = 6.11, p < .001). There were no differences in satisfaction with supervision between full- and part-time students, native and foreign students or women and men.

On average, the doctoral students perceived that they received adequate support from their *supervisors* (M = 5.28) and their *researcher community* (M = 4.59) (see Table 7). Accordingly, doctoral students reported that they were treated with respect by their supervisors, were able to discuss openly the problems related to their doctoral studies with their supervisors, that the supervisors were interested in their work, and that they received encouragement, advice and constructive criticism when needed. They also experienced that they were accepted and appreciated by the researcher community, receiving encouragement and support from other doctoral students and that there was a good sense of collegiality between the researchers. At the same time they somewhat rarely reported experiencing *destructive friction* (M = 2.21) in the supervisory relationship or within their researcher community such as exploitation of their ideas, bullying, or unfair treatment.

Table 7. Doctoral student perceptions about supervisory and researcher community support.

Factor	N of items	Alpha	Mean	SD	Min	Max
Supervisory Support	13	0.94	5.28	2.13	1	7
Community Support	9	0.71	4.59	0.90	1.11	7
Destructive frictions	5	0.70	2.21	1.10	1	7

Students from different doctoral training committees had some differences in their perceptions about supervisory support and destructive friction. Students of Human Sciences (M = 5.53, SD = 1.12) were slightly more satisfied with supervision (F(2, 350) = 4,33, p < .05) than students of Technology and Natural Sciences (M = 5.07, SD = 1.28). Also, students of human sciences (M = 1.97, SD = .89) perceived less destructive friction (F(2,365) = 3.99, p > .05) than students of Technology and Natural Sciences (M = 2.33, 1.17).

High levels of supervisory and researcher community support combined with low levels of destructive frictions were related to experiencing engagement in doctoral research, satisfaction with doctoral studies and supervision, and lower levels of experienced burnout. Moreover, those students who had reported high levels of supervisory ($t(194.58) = -6.23$, $p < .001$) and researcher community support ($t(210.51) = -6.43$, $p < .001$), and low levels of destructive friction ($t(214.34) = 4.74$, $p < .001$) were less likely to consider dropping out from their studies.

Those students who worked mainly in the research group experienced higher levels of both supervisory ($F(2, 352) = 3.01$, $p = .047$) and researcher community ($F(2, 365) = 13.00$, $p < .001$) support than their counterparts working mainly on their own. Moreover, those students who conducted an article-based thesis reported higher levels of supervisory support than those who did not yet know in which form they intend to conduct their thesis ($F(2, 346) = 7.41$, $p = .001$). They also reported receiving more community support than those students who were writing a monograph ($F(2, 359) = 7.04$, $p = .001$).

There were no associations between the supervisory support, researcher community support and destructive friction with productivity, prolongation of studies, and number of publications, excluding a weak positive association between the experienced destructive friction and the number of publications ($r = .18$, $p < .001$).

4.4 International and national researcher collaboration

The most typical form of researcher collaboration was participation in international and national conferences. Attending the international conferences was slightly more common (62%) than participating in national ones (59%). About one-third of the students had co-authored papers with international researchers and participated in international courses and summer schools. A minority of the students had participated in researcher exchange during their studies (see Table 8).

Table 8. National and international researcher collaboration.

Item	Yes		No	
	f	%	f	%
I have presented at international conferences	244	62	150	38
I have presented at national conferences.	232	59	159	41
I have participated in international courses or summer schools.	148	38	244	62
I have co-authored papers with international researchers.	124	32	268	68
I have participated in researcher exchange during my doctoral studies.	50	13	340	87

The doctoral students writing an article-based thesis had attended more frequently international conferences than those who were writing a monograph thesis ($\chi 2(2, N = 380) = 8.12, p < .05$). Students writing the articles based thesis had also participated in international courses or summer schools more often ($\chi 2(2, N = 378) = 10.23, p < .01$) and co-authored articles with international collaborators more often ($\chi 2(2, N = 378) = 12.85, p < .01$) than students who wrote a monograph.

There were also differences in international experiences between full-time and part-time students. Full-time students had participated in international courses or summer schools more frequently than part-time students ($\chi 2(1, N = 381) = 8.31, p < .01$). They had co-authored papers with international researchers more often ($\chi 2(1, N = 381) = 6.61, p < .05$) and participated in researcher exchange more often ($\chi 2(1, N = 379) = 8.53, p < .01$) than part-time students.

Also the research group status was related to international experiences. Those who worked primarily within the research group or both within the group and alone had more experience in co-authoring paper with international collaborators than those who reported to work mainly on their own ($\chi 2(2, N = 387) = 15.50, p < .001$). Furthermore, those who worked both within a research group and alone had participated in international courses or summer schools more often than those who worked mainly on their own or mainly in a research group ($\chi 2(2, N = 387) = 6.70, p < .05$).

Moreover, international doctoral students participated in international courses or summer schools more than Finnish students ($\chi 2(1, N = 388) = 9.17, p < .01$). They also had more experience of co-authoring papers with international researchers than Finnish students ($\chi 2(1, N = 388) = 11.83, p < .01$). International students had also participated in researcher exchange more often than Finnish students ($\chi 2(1, N = 386) = 4.17, p < .05$).

5 Doctoral studies

5.1 Satisfaction with doctoral studies and dropping out

Overall the doctoral students were somewhat satisfied (mean 4.44 out of 7) with their doctoral studies. A majority of the students (65%) did not have attrition intentions. International students were more satisfied with doctoral studies than Finnish students ($t(392) = 2.94, p < .01$). Moreover, full-time doctoral students were more satisfied than part-time students ($t(384) = 3.67, p < .001$).

Table 9. Satisfaction with doctoral studies and consideration of dropping out by faculty.

Faculty	N	Satisfaction		Considering dropping out	
		Mean	SD	Yes (f/%)	No (f/%)
Oulu Business School	15	5.07	1.16	4 (27%)	11 (73%)
Faculty of Education	31	5.03	1.20	7 (23%)	24 (77%)
Oulu Mining School	2	5.00	2.83	1 (50%)	1 (50%)
Faculty of Biochemistry and Molecular Medicine	23	4.83	1.30	5 (22%)	18 (78%)
Faculty of Information Technology and Electrical Engineering	30	4.77	1.19	9 (30%)	21 (70%)
Faculty of Medicine	83	4.40	1.39	25 (30%)	58 (70%)
Faculty of Science	61	4.26	1.46	28 (46%)	33 (54%)
Faculty of Technology	62	4.19	1.50	26 (43%)	34 (57%)
Faculty of Humanities	55	4.18	1.35	16 (30%)	38 (70%)
Other	7	4.71	1.80	3 (50%)	3 (50%)
Total	374	4.46	1.40	128 (35%)	242 (65%)

There were no statistically significant differences in satisfaction with doctoral studies or consideration of dropping out of doctoral studies between the faculties. However, some differences in attrition intentions were detected between the doctoral training committees ($\chi 2(2, N = 386) = 8.22, p = .016$). Doctoral students in the field of Technology and Natural Sciences had considered dropping out from their doctoral studies more often (44%, adjusted residual 2.8) than students of other committees.

Those doctoral students who had considered dropping out were less satisfied with their studies than students who had not considered dropping out ($t(239.17) = -8.61, p < .001$). Students with attrition intentions also suffered more from exhaustion ($t(233.83) = 3.52, p < .01$), cynicism ($t(214.02) = 10.12, p < .001$),

feelings of inadequacy ($t(245.66) = 6.25$, $p < .001$) and stress ($t(381) = 3.05$, $p < .01$). Considering dropping out was also associated with experiencing lower levels of engagement in doctoral research, including experiences of vigour ($t(214.12) = -5.26$, $p < .001$), dedication ($t(208.77) = -7.29$, $p < .001$) and absorption ($t(224.79) = -4.44$, $p < .001$) in comparison with students who had not considered dropping out.

5.2 Coursework and practices of UniOGS

In addition to writing a doctoral thesis, a doctoral degree at the University of Oulu includes courses, seminars, and a public thesis defence. The requirements for a doctoral degree include 20–50 credits of postgraduate studies. In terms of doctoral studies and assessment of a thesis, the University of Oulu is committed to the following policies and practices: doctoral studies must support the dissertation and provide the knowledge and skills required for research work and other demanding expert assignments; admissions decisions are based on pre-determined and published criteria and systematic admissions; all doctoral students draw up a personal study plan consisting of a research plan and a study progress plan; the study plan is updated once a year with the supervisor, and in the follow-up group meeting (the follow-up group consists of at least two external senior scholars from the Faculty); and the assessment criteria for each grade must be clearly described.

Table 10. Satisfaction with the coursework and practices of UniOGS doctoral school

Item	N	Mean	SD
Guidance and help related to doctoral studies is available, if needed.	393	4.72	1.61
The instructions and forms related to doctoral studies are easily available.	395	4.32	1.71
I know what to do (e.g. from whom to ask advice) if I face problems in my doctoral studies.	391	4.32	1.90
The courses provided by the Faculty/major are in line with my needs.	387	4.16	1.70
The instructions and forms related to doctoral studies are clear.	394	3.77	1.74
The courses provided by the doctoral programme are in line with my needs.	378	3.73	1.59
The courses provided by the UniOGS are in line with my needs.	384	3.54	1.62

Note: Scale 1–7.

Doctoral students typically reported that the courses provided were sufficiently in line with their needs (see Table 10). Yet, they perceived that there was a better fit between the courses provided by their Faculty and their needs, than the courses provided by UniOGS and the doctoral programme. There was also considerable variation in students' perceptions about the usefulness of the courses. Doctoral students were quite satisfied with the availability of guidance and help, and the instructions and forms related to the doctoral studies. They also knew where to seek help when facing problems, although the variation in the answers was considerable. However, they were a bit less satisfied with the clarity of the instructions.

Doctoral students' preferences in term of courses ranged from *domain-specific courses* to *generic* ones. They also described different forms of instruction. Especially the *domain-specific courses* (51%), such as research methods and courses related to their field of study and thesis topic, were perceived as useful. The students also described *generic courses* (34%) including courses on scientific writing and publishing, applying funding, language, employability and entrepreneurship, time and project management as well as presentation skills as being important. Moreover, they appreciated different *forms of instruction* (15%) such as the flexibility of online courses, intensive and small group courses, courses in English, workshops and collaboration with other universities as meaningful learning opportunities.

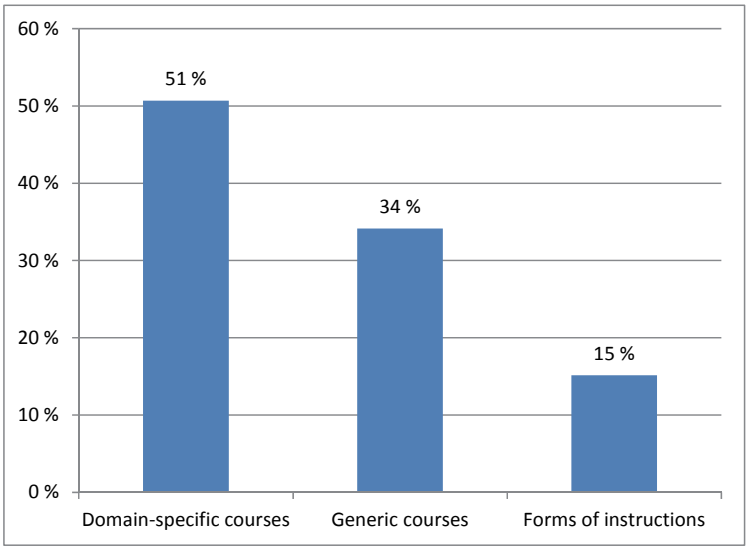

Fig. 3. PhD students' preferences in terms of doctoral courses.

5.3 Doctoral students' suggestions for developing doctoral education

About a half of the doctoral students (*n* = 202/402, 50%) made suggestions on how to develop doctoral education. The students emphasized the *development of structures* for doctoral education (*f* = 96/202, 48%) typically in terms of developing the practices of the UniOGS doctoral programme by reducing bureaucracy, providing transparent and consistent guidelines and structures, and developing the follow-up group procedures, for example, by explicating the function of the group more clearly. Doctoral students emphasized the importance of providing more secured funding, developing tighter selection processes and a clearer time limit for earning a degree, as well as enabling more flexible ways to earn a doctorate and the equal treatment of all doctoral students.

The doctoral students also highlighted the significance of developing more explicit *aims and contents* for doctoral education (*f* = 65/202, 32%), such as developing the courses provided for the doctoral students, for instance, by providing high-quality courses focusing on the research domain, providing specific courses such as academic writing, funding application or methodological courses and keeping the amount of the courses reasonable and providing more information about the courses. Also work-life relevance and career planning were emphasized.

Moreover, the development of *supervision and the practices of scholarly communities* (*f* = 41/202, 20%) in terms of providing sufficient and systematic supervision, focusing of supervision resources, providing training for supervisors and enabling shared understanding and practices between supervisors and doctoral students about supervision, were considered important. Also the significance of promoting doctoral students' participation in the scholarly communities, for instance, by enabling more peer support and collaboration between researchers was highlighted.

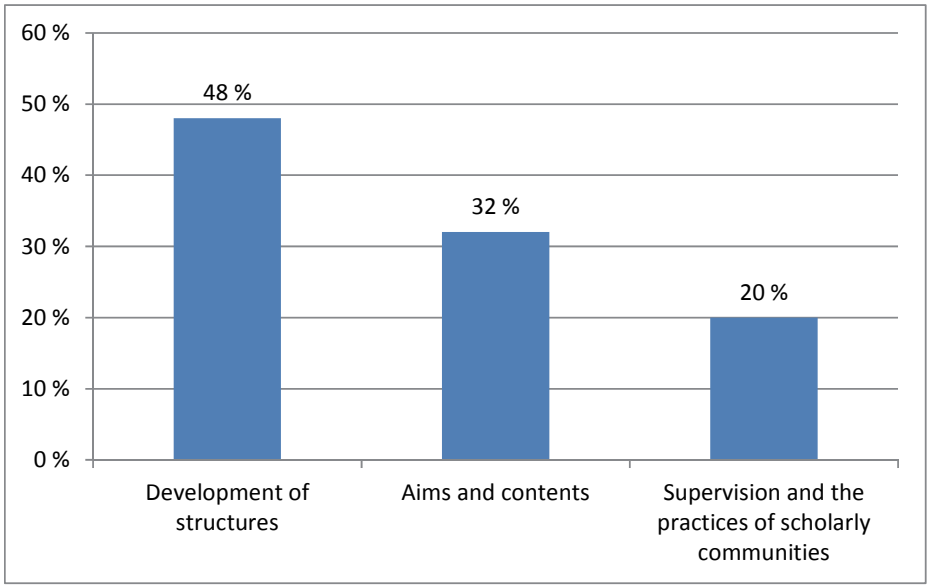

Fig. 4. Doctoral students' suggestions for developing doctoral education.

6 Career plans

A majority of doctoral students were interested in academic careers (79%), whereas 21% preferred a career outside of academia. Those who preferred academic careers were typically interested in either both research and teaching (62%) or mainly research (33%). A minority of students were interested mainly in teaching (6%).

Some differences between the student groups were detected. Full-time students were more typically interested in an academic career than part-time students ($\chi 2(1, N = 384) = 28.37, p < .001$). Furthermore, full-time students typically preferred a research-oriented career over a teaching-oriented career in comparison with part-time students ($\chi 2(3, N = 315) = 50.03, p < .001$). Men were more interested in academic careers than women ($\chi 2(1, N = 392) = 4.31, p < .05$). Also, students within the Doctoral Training Committee for Technology and Natural Sciences were more typically interested in pursuing an academic career, whereas students in Health and Biosciences were less interested in academic careers ($\chi 2(2, N = 387) = 7.70, p < .05$). Moreover, students who were writing a summary of articles primarily preferred research-oriented careers over teaching compared to their counterparts conducting a monograph ($\chi 2(6, N = 314) = 24.82, p < .001$).

Further investigation showed that most of the doctoral students (47%, $f = 188$) preferred a certain choice of career. Doctoral students, for instance, described careers as entrepreneurs, administrative and leadership tasks, expert advisory and consultant tasks, researchers, teachers as well as developers. A third of the students (33%, $f = 132$) had either several alternative career plans or preferred combinations of diverse tasks to comprise a career. However, a fifth of the students (20%, $f = 82$) had no specific plans after completing the doctoral degree.

7 Summary of the results

The results presented in this report provide information concerning how doctoral students at the University of Oulu perceived their *doctoral dissertation process, supervision,* and *doctoral studies*, including interest in doctoral studies, key experiences in the doctoral journey, quality and quantity of supervision, researcher community support, international collaboration, scientific writing, well-being, and the challenges involved with further developing doctoral education at the University. It sheds light on the primary regulators of the doctoral journey, and how doctoral students have experienced the learning environment provided by the University. The main findings can be summarized as follows:

Motivation: In general, high levels of motivation were related to high levels of satisfaction with supervision and overall doctoral studies, experienced engagement in doctoral research, reduced risk of experiencing burnout, and not having attrition intentions. Students with high research and development interest were most satisfied with their supervision, experienced the lowest levels of exhaustion, cynicism, inadequacy and stress and the highest levels of engagement in their research. In general students experienced high levels of research and development interest.

Key experiences: The beginning of the doctoral journey was highly significant for doctoral students. A majority of both positive and negative turning points occurred during the first years of studies. The positive experiences most typically consisted of reaching significant milestones in the doctoral research process such as getting published, overcoming problems related to research work, making discoveries and learning how to use new methods. Positive experiences related to engaging in the researcher community, and structures and resources were also frequently reported. The quality of positive experiences was related to doctoral students' satisfaction with supervision and engagement in doctoral research. The key negative experiences most typically were comprised of problems related to structures and resources such as an unsecure financial situation and heavy bureaucracy of the doctoral programme, short-term doctoral student posts, the weak position of grant researchers at the university, and unsecure future career prospects at the university after earning a PhD. On average, doctoral students were fairly satisfied with their doctoral studies.

Supervision: Both the quality and the quantity of supervision were central determinants of doctoral studies. The frequent supervision was related to several positive attributes, including shorter time spent on studies, satisfaction with

supervision, satisfaction with doctoral studies, not having attrition intentions, and less likely to be prolonged with doctoral studies. Majority of doctoral students (65%) received supervision at least once a month. Moreover, high-quality supervisory support was related to experiencing engagement in doctoral research, satisfaction with doctoral studies, reduced risk of burnout and not considering attrition, among the doctoral students. The students emphasized, especially basic prerequisites of supervision as well as informational and emotional support as central characteristic of high-quality supervision.

Researcher community: Engaging in the researcher community and receiving community support had several benefits. Doctoral students who worked in a group received supervision more frequently, experienced higher levels of supervisory and researcher community support, and were more satisfied with the supervision than their counterparts working alone on their dissertation. Researcher community support was related to experiencing higher levels of engagement in doctoral research, satisfaction with doctoral studies, lower levels of burnout, and not considering attrition in doctoral studies. Moreover, those working in a group had more experiences in international collaboration, including co-authoring papers, international courses, and summer schools than students who worked primarily alone. One-third of the doctoral students reported working at least partly in the research group.

Appendices

Appendix 1: How often do you receive supervision?
Appendix 2: Satisfaction with supervision, changing supervisor and considering changing supervisor.

Appendix 1.

Table 11. How often do you receive supervision?

Doctoral training committee	N	Daily	Weekly	Once a month	Once every two months	Once every six months	Less frequently
Human Sciences	125	1%	25%	29%	20%	13%	12%
Technology and Natural Sciences	155	6%	30%	30%	10%	9%	15%
Health and Biosciences	111	6%	40%	32%	12%	5%	5%
All doctoral training committees	391	4%	31%	30%	14%	10%	11%

Appendix 2.

Table 12. Satisfaction with supervision, changing supervisor and considering changing supervisor.

Faculty	N	Satisfaction		Changed		Considered	
		Mean	SD	Yes (f/%)	No (f/%)	Yes (f/%)	No (f/%)
Oulu Business School	15	6.33	0.72	3 (20%)	12 (80%)	1 (7%)	14 (93%)
Oulu Mining School	2	5.50	0.71	0 (0%)	2 (100%)	0 (0%)	2 (100%)
Faculty of Information Technology and Electrical Engineering	31	5.48	1.39	2 (6%)	29 (94%)	5 (16%)	26 (84%)
Faculty of Medicine	84	5.40	1.51	9 (11%)	76 (89%)	6 (7%)	79 (93%)
Faculty of Education	32	5.28	1.67	9 (28%)	23 (72%)	7 (23%)	24 (77%)
Faculty of Science	59	5.27	1.68	8 (13%)	52 (87%)	6 (10%)	52 (90%)
Faculty of Humanities	54	5.11	1.71	10 (18%)	45 (82%)	13 (24%)	41 (76%)
Faculty of Biochemistry and Molecular Medicine	22	5.09	1.63	0 (0%)	23 (100%)	2 (9%)	21 (91%)
Faculty of Technology	61	4.46	1.85	6 (10%)	55 (90%)	10 (17%)	47 (83%)
Oulu School of Architecture	5	4.20	2.49	1 (20%)	4 (80%)	2 (40%)	3 (60%)
Other	7	5.29	2.36	0 (0%)	7 (100%)	1 (14%)	6 (86%)
Total	372	5.18	1.68	48 (13%)	328 (87%)	53 (14%)	312 (86%)

Note: Scale 1–7 (Satisfaction with supervision).

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