QUALITY IN THE **PHD** PROCESS

A survey among PhD students at Aarhus University

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AARHUS UNIVERSITY

QUALITY IN THE PHD PROCESS

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Related reports

The Dimensionality of the Aarhus University Quality in the PhD Process Survey at http://www.au.dk/fileadmin/www.au.dk/kvalitetiphd/factoranalysis.pdf .

Abbreviations

AU	Aarhus University
AR	Faculty of Arts
BSS	School of Business and Social Sciences
HE	Faculty of Health
ST	Faculty of Science and Technology

In accordance with international terminology, use is made of 'soft' subject areas as a generic term for AR and BSS, while 'hard' subject areas covers HE and ST. These terms are derived from the Biglan model of faculty subcultures (Biglan, 1973).

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PREFACE

Solidum petit in profundis – Seek a firm footing in the depths is the motto that has accompanied the university's official seal since Aarhus University's inauguration. As a metaphor the idea of 'moving in the depths' is also a striking description of the researcher's most important task: to shed light on areas that have not been yet been illuminated and to contribute with new knowledge based on systematic inquiry.

The metaphor is especially pertinent for the university's young researchers, the PhD students, and the transition from graduate to PhD student to researcher can in many ways be described as a journey into the gradually deeper water, as is illustrated by the cover of this report. As this report will show, there are many ways of organising this gradual transition, just as the journey into the depths is perceived very differently by the PhD students.

We would like to thank the university's many PhD students for their participation in the survey, and for thereby allowing us for the first time to shed some light on how the PhD process at Aarhus University is experienced.

CHAPTER 1. MAIN CONCLUSIONS

BACKGROUND AND PURPOSE

The PhD degree programme at Aarhus University is similar to those at the other Danish and many foreign universities in that it has gone through a significant development over the past decade. The intake of PhD students has more than doubled, and the PhD programmes is more structured, with requirements for additional compulsory programme elements such as courses, study abroad and knowledge dissemination activities. There is also a new organisation and administration of the PhD degree programme at Aarhus University, which was introduced in connection with the academic development process in 2011, when the previous eight graduate schools were merged into four new graduate schools.

Aarhus University currently has more than 2,000 enrolled PhD students and the PhD degree programme is a high priority area for the university. The PhD students comprise both a very large resource but also a large investment, and the question is whether both students and the university are deriving optimal benefit from doctoral degree programmes.

The question is illuminated in this survey of Q*uality in the PhD process*. The purpose of the survey is to support the development of the university's four graduate schools and at the same time contribute to international research on PhD degree programmes. The survey was carried out in 2013 and was financed by interdisciplinary strategic funding from the Aarhus University's Talent Development Committee.

READING GUIDE

This first chapter summarises the most important conclusions from the survey. *Chapter 2* presents a review of the survey methods. The following 14 chapters then explain separate themes regarding the PhD students' experience of the process. The themes are organised chronologically from recruitment to career plans for the time after the PhD degree has been attained. In each chapter we will briefly describe the existing research literature in the area before reporting the quantitative results. In some chapters (in particular chapters four, eight and ten) the PhD stu-

dent's open comments are analysed. Each chapter concludes with a summary of the most important results.

The report's final appendices contains a report of the results for the individual PhD degree programmes. The reader should also note that a separate statistical analysis of the questionnaire has been drawn up as a supplement to the report[1], which has allowed us to construct the scales that forms the basis for many of the surveys analyses.

DATA AND ANALYSIS

The study is based on data from an electronic questionnaire which was sent out in September 2013 to all enrolled PhD students with dates of enrolment from 2005 and thereafter, as well as to PhD graduates who had been awarded their PhD degree from 1 February 2013 and onwards. The questionnaire was sent to 2,244 PhD students, and 1,780 PhD students submitted valid answers. This provides a response rate of 79, which is very satisfactory for this type of study. A more detailed description of the response rate and the method may be found in *Chapter 2*. A description of the criteria for including the PhD student's open comments as a supplement to the figures may also be found here.

The results are mainly reported on a main academic area level, i.e. for Aarhus University as a whole as well as for each of the four graduate schools. The reader should note that the figures for the individual graduate schools are aggregated and that there is a third level below the main academic area level, i.e. the PhD degree programmes. There is not enough space to allow us to show analyses both on a graduate school level and a PhD degree programme level. We have noted in the text where the figures at graduate school level cover very large differences between the individual PhD degree programmes.

RESEARCH INTO THE PHD PROCESS

Research into the PhD process is a relatively new but rapidly growing field within international educational research. Despite a young research tradition, the existing literature paints a clear picture of a complex area in which the subject of *quality in the PhD process* can be defined and analysed in different ways.

The answer to the question of what characterises quality in a PhD process is to a high degree dependent on how you operationalise *quality*, and which themes you select as relevant for illuminating the overall *study programme*. Based on the international research literature we have selected the following parameters for success in operationalisation of *quality:* 1) Satisfaction, 2) Well-being, 3) Research self-efficacy, 4) Progress in the project, 5) Publication, and 6) Career plans. The reason

[1] see *The Dimensionality of the Aarhus University Quality in the PhD Process Survey* at http://www.au.dk/fileadmin/www.au.dk/kvalitetiphd/factoranalysis.pdf .

for focusing on these parameters is partly that they are frequently used in studies of the PhD process, and partly that when taken together they cover a continuum from socio-psychological process goals to more product-based goals.

The process of identifying relevant themes to illustrate a *PhD process* has also been based on the international research literature. We have identified the following themes in order to be able to illustrate the process as a chronological activity from (1) the way into the PhD process to 2) the meeting with the PhD graduate school, 3) the supervision, and 4) the research environment. Supervision and the research environment are the two themes which are expanded the most. This is partly because these are the most widely examined themes in the research literature, and partly because according to the literature they are the best explained factors for several of the parameters for success with which we operate in our survey.

The table below provides an overview of studies that have demonstrated correlations between the importance of the research environment and the importance of the PhD supervision for the PhD student's satisfaction, well-being, research self-efficacy, progress in the project, publication and career plans.

Table 1.1. An outline of the research literature concerning the PhD process and chosen parameters of success.

	Importance of the research environment	Importance of the PhD supervision
Satisfaction		Holbrook et al., 2006; Mason, 2012; Gurr, 2001; Ives & Rowley, 2005; Wright, 2003
Well-being	Jairam & Kahl, 2012; Pyhältö et al., 2009; Stubb et al., 2011; Vekkaila et al., 2013	James & Baldwin, 1999; Lamm, 2004; Sayed et al., 1998
Research self-efficacy	Brown et al., 1996	Overall et al., 2011; Paglis et al., 2006
Progress	Bair & Haworth, 2005; De Valero, 2001; Golde, 2000; Golde, 2005; Lovitts, 2001; Provtivnak & Foss, 2009; Wao, 2011; West, 2011	Gardner, 2009; Heath, 2002; Holbrook et al., 2006; Morton & Thornley, 2001; Pole et al., 1997; Seagram et al., 1998; Sinclair, 2004; Wao, 2011; Woodward, 1993; Wright, 2003; Wright & Cochrane, 2000
Publishing		Dinham & Scott, 2001; Florence & Yore, 2004; Jones, 2013; Kamler, 2008; Lan & Willams, 2005; Lee & Kamler, 2008; McGrail et al., 2006; Robins & Kanowski, 2008
Career plans	Austin, 2002; Golde & Dore, 2004; Harman, 2002; Moorhead-Rosenberg, 1997	

MAIN RESULTS

This first chapter only has space for a description of some of the results of the survey, and the reader is encouraged to read the individual chapters for a comprehensive description of the PhD student's experience of the process. As concisely as possible the findings may be summed up as follows:

Measured on a range of parameters, Aarhus University has a large and effective graduate school. There are roughly 2,000 enrolled PhD students, many hundred of them receive their PhD degree each year and the drop-out rate is modest[2].

Once again this survey reveals that the PhD degree programme at Aarhus University - seen through the PhD student's eyes - has performed satisfactorily in many contexts. The PhD students are generally satisfied with what they learn and they are satisfied with the quality of the research work. Most - but not all - are satisfied with the quality of the research supervision (*Table 14.1*).

The survey further documents that Aarhus University has at its disposal a considerable resource by virtue of PhD students who are dedicated to their topic (*Table 3.3)*, who take ownership and responsibility for their project (*Table 9.1*), and who also have a desire to conduct research in their future career, regardless of whether this takes place on a university level or in private research institutions (*Table 15.1*).

Where Aarhus University's most recent workplace assessment showed that the PhD students work hard and invest many hours in their work (Aarhus University, 2012), this survey further shows that the work bears fruit. The vast majority of PhD students have presented their research at international conferences and many have had their research results accepted by peer-reviewed journals, despite a long review procedure (*Table 12.3*).

Part of the explanation for many of the PhD students having a mainly positive experience of the PhD degree programme is undoubtedly that the majority of PhD students are affiliated with research environments where they are collaborate on the research (*Table 5.1*), and where older researchers acknowledge the PhD student's research work (*Table 5.2*). This contributes towards many of the PhD students feeling that they are part of a research community out in the research environments (*Table 5.3*). A number of statistical analyses show that integration in a collegial research environment is positively correlated with well-being, independence, absence of loneliness, absence of uncertainty about the quality of the project, and the experience of progress (*Chapter 5*).

A good relationship between the PhD student and the supervisor that the PhD student most frequently has contact to is another significant explanation for the fact that the majority of the PhD students having a generally positive experience of the

[2] See http://talent.au.dk/phd/aboutthephdatau/ and http://www.au.dk/om/profil/nogletal/ph.d.-gennemfoerelse-og-frafald/

PhD process. The vast majority of PhD students find their supervisor to be friendly and accommodating (*Table 8.1*).

However, the survey also reveals that the PhD graduate school is a harsh school and that the PhD study program is associated with a considerable degree of uncertainty and mental strain for many of the PhD students.

Upwards of every third PhD student often feels worn out, and 13 percent of the PhD students often or almost always experience severe stress symptoms (*Table 10.1*). The majority of the PhD students are often unsure about whether their work lives up to the standards, and whether they are good enough to be PhD students (*Table 9.2*). The survey reveals that PhD students at AR and BSS generally experience a larger psychological workload than PhD students at HE, and ST (*Table 10.1*), and for some of the PhD study programmes the prevalence of exhaustion and stress is very high (see appendix).

You could argue that a certain amount of uncertainty and pressure of work is inherent in the research project. On the other hand, the analyses suggest that part of the pressure of work experienced can be attributed to a lack of integration of the PhD students in the research environments (*Chapter 5*). A significant proportion of the PhD students find that the researchers in the environment are very competitive towards one another, and some of them find that the feedback on research is harsh and negative, rather than constructive (*Table 5.2*). The analysis reveals that the PhD students at AR and BSS in particular sometimes meet very harsh research environments, and research environments where there is limited cooperation and discussion of research projects. Once again the analyses show that there are significant differences between the PhD degree programmes even within the same graduate school (see appendix). These differences indicate that a harsh tone in the research discussion is neither a prerequisite for or a characteristic of qualified research critique. The differences also call for discussions of how to invite the PhD students that experience a very harsh and closed environment on their PhD degree programme into a constructively critical research community.

Another challenge for the PhD graduate school is that many of the PhD students feel lonely. 13 percent of the PhD students feel lonely during their day at the workplace and at AR and BSS the proportion is 18 percent (*Table 10.2*). On nine of the PhD degree programmes more than one in five of the PhD students often or almost always feel lonely (see appendix). 16 percent of the PhD students feel lonely academically, which is to say that they feel alone with their project and find that they lack the necessary feedback to make progress. At BSS the figure is 22 percent (*Table 10.2*). Again, there are very large variations between the PhD degree programmes. On several of the programmes, more than one in four of the PhD students feel that they are alone with their project. The large variations between the PhD degree programmes again shows that loneliness is not inherent in the research profession (see appendix).

The subject elements of the PhD degree programmes such as change of academic environment and the courses available in generic research competencies receive predominately positive assessments. On the other hand, the interim evaluations and PhD planners are more critically assessed. Only half of the PhD students find that the interim evaluations actually are used to take stock of the PhD process together with the principal supervisor (*Table 4.1*). Only 25 percent use the PhD planner to create an overview of the progress in their project (*Table 4.1*), and many of the comments made by the PhD students contain a relatively sharp criticism of the planner (see *Chapter 4*).

Finally, it should be noted that even though most of the PhD students report on a respectful and constructive relation between supervisor and PhD student, there are still exceptions. Every tenth PhD student at HE and ST sometimes feel that their supervisor mainly views them as labour to promote their own research. One in ten of the PhD students also find that the supervisor expects a working effort that makes it difficult for the students to have a private life as well (*Table 8.3*). While this is a minority of the PhD students, the comments testify to the fact that a conflict of interests between supervisor and PhD student is experienced as a very significant source of stress for the PhD students involved, not least because of the PhD student's weak position in regard to the supervisor (*Chapter 8*).

ONE UNIVERSITY, FOUR GRADUATE SCHOOLS

The perception of the PhD process is in part dependent upon which graduate school the PhD student is enrolled in and in this context it is important to be aware of a number of organisational and structural conditions, which could explain part of the variation between the four graduate schools. Below follows a very brief description of what *particularly* characterises the four graduate schools.

The PhD students at the *Faculty of Arts* (AR) are particularly characterised by applying for the degree programme based on a very high degree of internal motivation (*Table 3.3*), just as they have a strong desire to forge a career in the university system (*Table 15.1*). The PhD students work very independently (*Table 9.1*) and are expected to work very independently. Compared with the three other graduate schools, the PhD students at AR have less frequent contact with their supervisors (*Figure 6.1*), and they experience a style of supervision where they are left to take important decisions and control the project themselves (*Table 8.2* and *Figure 8.1*). A third of the PhD students spend most of their research time outside of the research environment (*Table 5.3*), and compared to the PhD students in the hard subject areas, a relatively high proportion of the PhD students at AR find it hard to be included in the research community (*Table 5.2* and *5.3*). Almost a fifth feel lonely and almost one in five students feel that they are alone with their project without the necessary feedback to make progress (*Table 10.2*). Many PhD students experience a very heavy workload (*Table 10.1*). Many write monographs, some write in Danish

and most write alone (*Table 12.1* and *Table 12.2*). The PhD students in the last third of their programme at AR are in general very confident that they can complete a successful research project on their own (*Table 13.1*).

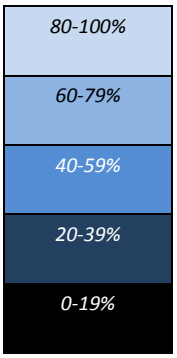
The PhD students at the *School of Business and Social Sciences* (BSS) apply based on an interest in the topic as well as for more pragmatic reasons (*Table 3.3*), and a significant proportion see themselves pursuing a career in private-sector organisations (*Table 15.1*). One in five spend most of their research time outside the university (*Table 5.3*) and many are affiliated with relatively competitive research environments (*Table 5.1*), in which there is often not a tradition for regularly discussing one another's research (*Table 5.2*). In some places the PhD students experience a very harsh tone (*Table 5.2*). The graduate school of BSS is furthermore particularly characterised by very large variations between the individual PhD degree programmes (see appendix). While there are relatively few PhD students in some places who feel socially or professionally lonely, elsewhere more than one in four feel lonely (see appendix). As is the case at AR, many of the PhD students at BSS experience a very heavy workload (*Table 10.1*). At BSS most write articles (*Table 12.1*) and the majority write in English (*Table 12.2*). Compared to other faculties, almost all PhD students at BSS expect to complete their PhD dissertation within the stipulated time (*Table 11.1*).

The graduate school at the *Faculty of Health* (HE) is particularly characterised by many PhD students applying for admission with a view to a career as a medical doctor in the hospital system (*Table 3.3* and *Table 15.1*). The PhD students' salary is often financed externally by funds that the supervisor has secured (*Table 8.4*) and many students publish together with their supervisors (*Table 12.5*). The PhD students typically have three supervisors (*Table 6.1*) and it is not rare for the PhD student to have more contact with co-supervisors than with the principal supervisor (*Table 6.2*). Compared to the soft subject areas, the research guidance is characterised by frequent meetings (*Figure 6.1*) and a certain degree of control by the supervisor (*Table 8.2* and *Figure 8.1*). The PhD students generally experience a cooperative and collegial research environment (*Table 5.2*) and a sense of loneliness is more uncommon at HE than at the university's other faculties (*Table 10.2*). Even though the PhD students at HE are the least stressed compared with the PhD students at the three other graduate schools, 11 percent nevertheless often or almost always experience severe stress symptoms (*Table 10.1*).

In addition to being driven by interest in research, a proportion of the PhD students at the *Faculty of Science and Technology* (ST) have relatively pragmatic reasons for beginning the programme (*Table 3.3*), and many expect to pursue a career outside the university - e.g. in the private sector (*Table 15.1*). The PhD students' salary is as a main rule financed by external funds that the supervisor has secured (*Table 8.4*), and supervisors and PhD students often share the same laboratory environments, which makes possible a very high degree of informal daily contact (*Figure 6.1*). The

PhD students publish in English (*Table 12.2*), and most articles are written in collaboration with the supervisor (*Table 12.5*). Compared with the other faculties, the PhD students at ST have less self-belief in their ability to complete a research project on their own (*Table 13.1* and *Figure 13.1*). Most of the PhD students feel well integrated into their research environments (*Table 5.3*), and loneliness is less prevalent than in the soft subject areas (*Table 10.2*). As at the other graduate schools, the PhD students at ST experience a considerable workload, though less than in the soft subject areas (*Table 10.1*).

Figure 1.1. Colouring of *Table 1.2*



The scale is reversed for negatively worded questions. For the questions concerning being worn out, competition and satisfaction intervals of 10% have been used. For the questions concerning loneliness, severe stress symptoms and harsh tone 5% intervals have been used.

* indicate that between 10-20 percent responded 'Don't know/not relevant'. These are not part of the calculation of the frequency.

Table 1.2. Distribution of answers on a selection of questions.

	AU	AR	BSS	HE	ST
On the way to a PhD (Important + Very important)					
I was passionate about doing research	91%	96%	89%	92%	89%
I was very interested in my topic	91%	97%	93%	88%	90%
I assumed that the PhD title would create opportunities in the job market outside the university	63%	43%	48%	75%	65%
I considered it to be a regular job with a permanent income	46%	45%	53%	38%	49%
I didn't have any other plans when I was given the opportunity	21%	13%	22%	15%	27%
Has your main supervisor applied for external funding for a project financing your salary?	45%*	20%	20%	44%	66%*
The PhD subject elements (To some degree + To a high degree)					
Do you and your main supervisor use the interim evaluations to take stock of your PhD process?	51%*	60%	54%	53%	44%*
Do you use the PhD planner to survey the progress in your project?	25%	25%	30%	17%*	29%
Does the selection of PhD courses give you the possibility of strengthening your general research qualifications?	75%	63%	77%	88%	68%
Does the selection of PhD courses give you the possibility of strengthening your research qualifications within the framework of your project?	52%	35%	48%	67%	47%
Has the work you do beyond your own project (e.g. various department work including teaching) been useful?	85%*	86%*	93%	84%*	83%*
Is the work you do beyond your own project (e.g. various department work including teaching) of such a magnitude that it affects your project?	56%*	61%*	64%	41%*	63%*
Research environment (Somewhat agree + Agree)					
I feel like I'm part of the research community here	74%	64%	58%	82%	76%
Here I feel respected as a co-researcher	82%	75%	68%	90%	83%
In this research environment, research conducted by PhD students is acknowledged although it may not be groundbreaking	77%	68%	57%*	87%	79%*
There is a sense around here that working together on research is fun	71%	56%	49%*	82%	74%
It is possible to talk openly with colleagues about successful as well as unsuccessful experiences	76%	63%	58%*	84%	80%
Here we present and discuss each other's research on a regular basis	70%	56%	53%	81%	72%
I feel that the researchers here are harsh and negative rather than constructive when giving feedback on each other's work	10%	18%	18%*	8%	7%
People seem to be very competitive	28%	40%	36%*	24%	25%

	AU	AR	BSS	HE	ST
Supervision relationship (Somewhat agree + Agree)					
My supervisor is friendly and accommodating	95%	97%	96%	95%	95%
My supervisor recognises my work	89%	94%	87%	89%	89%
My supervisor asks me about my needs and expectations regarding supervision	47%	61%	48%	46%	43%
Sometimes I have a feeling that my supervisor sees me primarily as a source of labour to advance his/her research	8%	2%	4%	9%	11%
My supervisor (either co-supervisor or main supervisor) is available when needed	91%	89%	89%	93%	91%
My supervisor makes many important choices in my project	32%	10%	19%	39%	38%
My supervisor has clear preferences for the direction my project needs to take	49%	29%	33%	57%	56%
My supervisor has a clear expectation that I will follow the advice I get	55%	41%	40%	62%	59%
My supervisor sometimes takes over the writing if I come to a standstill	16%	1%	7%	20%	23%*
Independence and control (Somewhat agree + Agree)					
I often feel insecure that what I do is good enough	59%	65%	73%	48%	61%
Sometimes I wonder if I'm good enough to be a PhD student	53%	59%	58%	47%	54%
I feel a sense of ownership of my project	84%	93%	89%	89%	76%
It is important to me that I make all the critical choices in my project	62%	82%	67%	61%	55%
Workload (Often + Almost always)					
Do you feel that your work as a PhD student takes up so much time and energy that it affects your private life?	27%	32%	29%	25%	26%
Does your work as a PhD student give you severe stress symptoms?	13%	17%	17%	11%	12%
Do you feel lonely during your day at your workplace?	13%	18%	18%	9%	11%
Do you feel that you act alone in your project and lack the necessary feedback to make progress?	16%	18%	22%	12%	16%
Satisfaction (Somewhat agree + Agree)					
Overall, I'm satisfied with what I have learned during my PhD process	89%	87%	87%	93%	87%
Overall, I'm satisfied with the quality of my research work	82%	85%	80%	91%	75%
Overall, I'm satisfied with the quality of my research super-vision	77%	79%	71%	82%	75%
I can warmly recommend my main supervisor	78%	78%	73%	78%	79%
Progress (Yes)					
Did you finish or do you realistically expect to finish your PhD degree programme within the stipulated time?	88%	80%	94%	87%	90%

POINTS OF DISCUSSION ON THE IMPORTANCE OF THE RESEARCH ENVIRONMENT

As described above, the survey shows that the majority of the PhD students at Aarhus University feel that they are integrated and respected out in the research environments. At the same time the survey shows that the PhD students at HE and ST feel themselves to be better integrated in the research environments than their fellow students at AR and BSS, just as the PhD students at ST and HE to a higher degree experience the research environments as collegial. This difference is important to note, as the statistical analyses point to integration and collegial spirit in the research environment as significant explanatory factors for a number of success parameters in the PhD process. *Chapter 5* shows that PhD students who feel themselves to be part of a collegial research environment are less worn out, less insecure about the quality of their work, are less alone with their project, having a greater feeling of independence, and are more satisfied with the progress in the project.

- The findings are a reason for all four graduate schools to focus systematically on the importance of the research environment.

At AR and BSS there seems to be a special need to consider how they can more effectively integrate the students in the environments. According to the survey there are several parameters that the environments can adjust relatively simply. For example, only around half of the students at AR and BSS state that they regularly present and discuss on another research in the actual research environments (*Table 5.1*). Similarly more than a third of the PhD students from AR and BSS find that people are very competitive towards each other in the environments (*Table 5.2*), and approx. one in five of the PhD students from these areas finds that there is a harsh and negative form of feedback in the environments (*Table 5.2*). These figures do however vary considerably and can even be very high for individual PhD degree programmes (see appendix).

- The results thus provide reason to recommend that most of the environments at AR and BSS discuss the possibility of establishing a greater degree of frequent (preferably weekly) meeting forums, where the PhD students are given the opportunity to give and receive feedback on research together with peers and more senior researchers.

The above recommendation is in line with international research literature in the area, which shows that the academic socialisation is most effective when PhD students are included and respected as co-researchers who participate in and actively contribute to authentic research activities (Golde, 2001; Vekkaila, 2012). This may be in the form of presentations for the rest of the research group, as co-organiser of professional seminars and conferences, as co-author or with similar joint research activities. According to the analyses it appears however that simply increasing the students' opportunities for participation in the research community is not sufficient. Collegial presentations and feedback also require a constructive tone and

an atmosphere that stimulates cooperation rather than competition against each other.

- The environments at AR and BSS can also benefit from discussing the atmosphere that characterises relations and cooperation.

HE and ST already have a well-established tradition of working closely together in teams and view the PhD students as competent colleagues who contribute to the research community. Despite this a proportion of the PhD students still feel lonely and alone with their project (*Table 10.2*). There is also significant variation between the individual programmes regarding how competitive the students find the environments to be and how often they meet to present and discuss one another's research (see appendix).

- In light of these variations and in light of the positive significance that the research environments have for the students' well-being, progress and sense of security and independence, it is recommended that the individual environments at HE and ST discuss how the current practice can be maintained or further strengthened.

POINTS OF DISCUSSION ON THE IMPORTANCE OF THE SUPERVISION

The survey shows that the quality of the PhD supervision is also an important explanatory factor for the PhD students' well-being and academic performance. *Chapter 8* shows that PhD students who are satisfied with their supervision are less uncertain about the quality of their research work, feel greater independence, have greater research self-efficacy, feel less worn out and are more satisfied with the progress in their project. When viewed thus, it is positive that the majority of the PhD students are overall satisfied with the quality of the supervision. At the same time it should be noted that every eighth PhD student states that they are not satisfied with the research supervision (*Figure 14.2*) and every sixth often finds that they are all alone with their project and lack the necessary feedback to make progress (*Table 10.2*). The figures do however cover considerable variations internally at the four graduate schools (see appendix).

- All four graduate schools can benefit from discussing how the current PhD supervision practice can be strengthened and developed with respect for the different academic practices and research traditions of the individual programmes.

PhD supervision across all four graduate schools is generally characterised by strong subject-based academic supervision. Direct research-related topics such as e.g. formulation of research questions, analysis and academic writing constitute the main content of the PhD supervision. This is both understandable and desirable, but the question is whether topics such as project management, teaching and more

personal problems are sufficiently addressed during the supervision. Three-quarters of the PhD students state that they have received some or no project management supervision (*Figure 7.1*). At the same time, it should be noted that one of the most frequent causes of delays is the feeling that the project has become too large and incomprehensible (*Table 11.2*). Teaching is the topic where the students state they receive least supervision. It is also a compulsory element in the PhD degree programme which more than half of the students experience as being a time-consuming task (*Figure 4.1*). For some of the students it is also a task they do not feel adequately equipped to perform. Personal matters – including career wishes and the balance between work and private life – are also only touched upon to a limited extent in the supervision (*Figure 7.1*). In the light of the fact that uncertainty (*Table 9.2*) and workload (*Table 10.1*) are well-known feelings for many of the PhD students, the question is whether these topics are also sufficiently addressed during the supervision.

- The individual graduate schools and programmes must carefully consider how they ensure that their supervisors not only have the necessary academic competencies, but also supervisory competencies to build constructive working relationships, to be able to supervise in a broad sense, including teaching and careers, and to support students in managing a large project.

The statistical analyses point to a clear correlation between the students' satisfaction with the quality of the supervision and a number of characteristics of the form and scope of the supervision (*Chapter 8*). Satisfaction with the supervision is first and foremost based on the PhD student experiencing a respectful relationship with the supervisors characterised by openness and recognition. It is also based on a certain degree of process management and academic management from the supervisor's side (hands-on supervision). Process management can be e.g. seen by the supervisor establishing milestones and objectives, and formulating agendas. Academic management is e.g. shown by the supervisor providing advice and making decisions about literature, methods, analysis and writing. Finally, satisfaction is also based on frequent informal contact with the supervisors that allows for brief, ongoing discussions of the project.

- All four graduate schools can benefit from discussing how they best support their supervisors in performing a difficult task such as the task of supervision, which appears to be a human, academic and time-related investment in a joint collaboration with the students.

Even though the survey shows a clear correlation between the students' satisfaction and hands-on supervision, a high degree of control from the supervisor's side cannot be recommended as an unambiguously appropriate supervision practice. It is though a supervision practice that the students are pleased with, but which on

the other hand comes with a tendency to 'cost' on other success parameters, such as the feeling of independence and research self-efficacy (*Chapter 8*). Hands-on supervision is not surprisingly a widespread supervision practice in the hard subject areas (*Figure 8.1*), where there are strong traditions of working closely together on research tasks in teams and traditions for the students publishing together with their supervisors. According to the survey it is not abnormal practice in the hard subject areas for the supervisors to take over the student's writing if the student gets stuck (*Table 8.2*). While this product-orientated form of supervision has obvious benefits, the survey also points to a number of reservations that the graduate schools must be aware of. Hands-on-supervision is not only tied to academic traditions, but also to financing. In cases where supervisors have secured external funding for financing of the PhD students' salary there is a tendency for the supervisors to practice a greater degree of hands-on supervision regardless of the faculty (*Figure 8.2*). Even though external financing is more widespread in the hard subject areas than the soft, all four graduate schools must nonetheless deal with the fact that many supervisors increasingly take on a dual role, both as supervisor and the person with responsibility towards an external source of financing.

- All four graduate schools must discuss how they can best develop a supervision practice that can handle the dilemmas and the potential conflicts of interest that arise when the supervisors take on dual roles towards their PhD students, because they also secure the funding of the PhD projects.

- The graduate schools at AR and BSS can usefully consider how to develop a supervision practice that reduces the PhD student's uncertainty about the quality of the research and the sense of academic loneliness, without compromising on a wish to develop the students' independence.

- The graduate schools at HE and ST can usefully consider how to retain a product-oriented supervision practice based on close collaboration without the students running the risk of feeling exploited as a source of labour.

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CHAPTER 2. DATA AND METHODS

This chapter presents an account of the data and methods used in the survey, including the development of the questionnaire, data collection, quantitative analytical strategies and the analysis of open comments. It concludes with an account of conditions regarding confidentiality and ethics.

THE QUESTIONNAIRE

The questionnaire was developed in the spring and summer of 2013. The majority of questions are unique to this study and were developed based on PhD supervision theories, interviews with PhD students carried out as part of the project *Quality in the PhD Process,* as well as the authors' experience from their work as PhD supervisors and teachers on courses on the subject. Inspiration has also been found in similar international questionnaire surveys in regard to the themes that are touched upon, e.g. the PhD students' research self-efficacy (Paglis et al., 2006), the PhD students' experience of the research environment and their integration into it (Trigwell & Dunbar-Goddet, 2005; Golde & Dore, 2001; Marsh, Rowe and Martin, 2002), and the PhD students' well-being and overall satisfaction (Aarhus University, 2012; Trigwell & Dunbar-Goddet, 2005).

The questionnaire has been presented for discussion on several occasions among heads of graduate schools, heads of PhD graduate programmes, PhD students and the PhD students' association at Aarhus University. The questionnaire has been discussed at the Talent Development Committee's meetings of 16 May and 2 September 2013. It was also discussed with representatives of the graduate schools of Health (19 June 2013), Science and Technology (1 May 2013), the School of Business and Social Sciences (31 May 2013), and Arts (20 June 2013) respectively. In addition four meetings were held in August 2013 to test the questionnaire in focus-group interviews with PhD students from each of the university's four faculties. These interviews resulted in changes to wording and vocabulary where these were necessary with regard to local terminology. Some of the PhD students were e.g. unaware that a monograph referred to a book, while others were unused to having an analysis of their empirical material referred to as an analysis of 'data'.

The questionnaire in its entirety can be found on the survey website (www.au.dk/kvalitetiphd/table).

THE SURVEY POPULATION

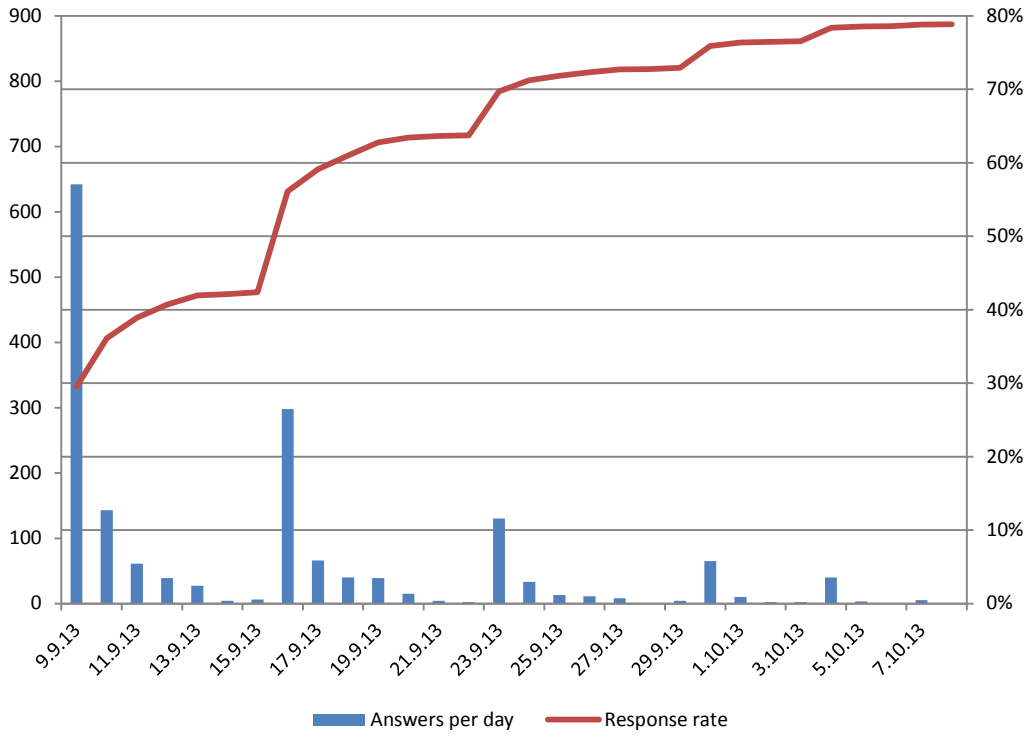
The study comprised current PhD students as well as PhD students who had recently obtained their PhD degree. This group comprises the survey population, which should not be confused with currently enrolled and active PhD students. More precisely the survey comprised a) enrolled PhD students with an enrolment date from 2005 onwards, and b) PhD graduates who had been awarded their PhD degree after February 1 2013. The latter group comprised 9 percent of the survey population.

The list of PhD students was extracted from the PhD planner in August 2013 and contained a total of 2,322 respondents. Some of these respondents were omitted during the data collection phase (69 PhD students), typically because they were on maternity/paternity leave or were otherwise absent. A few were omitted because, as newly-started PhD students, they did not feel able to complete the questionnaire satisfactorily. One respondent was added. The gross list of 2,322 thus ended up as a net list with 2,244 possible respondents.

DATA COLLECTION

Prior to the survey all PhD students with a Danish postal address received a letter signed by the chairman of the Talent Development Committee. In the letter the students were informed about the purpose of the survey and when it would take place. There was also contact information for the people behind the survey in cases where the PhD student did not receive an email (for example because the registered email address in the PhD planner was invalid or not used). The PhD students were also informed that the data - in addition to development of the university's talent work - would be included in research. An email with a link to the survey was sent on 9 September 2013. Those PhD students who did not answer the survey received follow-up emails on 16, 23 and 30 September and 4 October. *Figure 2.1* shows the development in the collection of responses during the data collection period

Figure 2.1. Overview of the data collection.



RESPONSE RATES

1,715 PhD students completed the whole questionnaire and 95 completed part of the questionnaire. Of these 95, 65 completed so much of the questionnaire that their answers were included to avoid wasting data. The sample thus ended up containing answers from a total of 1,780 PhD students at Aarhus University.

The response rate is calculated on the basis of the net list with 2,244 respondents (*Table 2.1*). The left-hand column shows the number of responses, while the right-hand column shows what the number of answers provided corresponds to as a percentage of the total number of possible answers (the response rate). The figures are shown for Aarhus University, the graduate schools as well as the individual PhD research programmes.

Table 2.1. Total response rate at PhD school level and programme level

	Number of responses	Percent		Number of responses	Percent
AU	**1,780**	**79%**	GP03: Public Health	112	77%
			GP05: Inflammation and Infection	53	82%
AR	**239**	**77%**	GP06: Cardiovascular	47	73%
Anthropology, International Area Studies and the Study of Religion	34	72%	GP07: LabMed - From Biomarker to Diagnostic Tests and clinical implications	11	52%
Art, Literature and Cultural Studies	38	78%	GP08: Neuroscience	71	74%
Didactics	34	81%	GP09: Oncology	50	72%
History, Archaeology and Classical Studies	32	78%	GP10: Translational Molecular Medicine	58	82%
ICT, Media, Communication and Journalism	21	81%	GP11: Tooth, Bone and Joint Diseases (TBJ)	34	76%
Language, Linguistics and Cognition	16	94%	GP12: Clinical Medicine	69	86%
Learning and Education	37	79%			
Theology, History of ideas and Philosophy	27	64%	**ST**	**740**	**80%**
			Agroecology	64	85%
BSS	**240**	**87%**	Animal Science	42	84%
Business Administration	34	85%	Bioscience	80	75%
Business Communication	17	89%	Chemistry	52	90%
Economics and Business	68	83%	Computer Science	60	82%
Law	30	81%	Engineering	49	82%
Political Science and Government	30	91%	Environmental Science	10	91%
Psychology and Behavioural Science	40	91%	Food Science	30	94%
Social Sciences and Business	21	95%	Geoscience	22	92%
			Mathematics	28	82%
HE	**561**	**77%**	Molecular Biology and Genetics	105	71%
GP01: Membrane Transporters and Receptors	17	74%	Nanoscience	131	74%
GP02: Endocrinology	39	78%	Physics and Astronomy	66	86%

REPRESENTATIVITY

Even though a response rate of 79 is high for a study of this type, 21 percent or almost one in five have not answered the questionnaire for unknown reasons. To see how well the sample matched the survey population, an analysis of the representativity was carried out. This is shown in *Table 2.2 below.*

Table 2.2. Comparison of the study population and sample.

	Study population	Sample
Share of women	51%	52%
Share of foreign PhDs	27%	26%
Share of Industrial PhDs	2%	2%
Share of finished PhDs	9%	6%
Age	32.1 years	31.8 years
Time since enrolment	2.1 years	2.0 years
Programme:		
- Three-year (5+3)	75%	74%
- Four-year (4+4)	22%	23%
- Five-year (3+5)	3%	3%
PhD school:		
- AR	14%	13%
- BSS	12%	14%
- HE	33%	32%
- ST	41%	42%

Note: 0.1 percent of the PhD students under other schemes (Section 15 (2))

As can be seen from the table, there is a very high degree of correlation between the sample's composition of variables, such as gender, nationality, age, progression in the degree programme, association with the business community, PhD programme and the composition of the survey population described with the same variables. For example, 52 percent of the survey population are women, while 51 percent of the sample respondents are women. 75 percent of the PhD students in the survey population were enrolled in a three-year programme (5+3), while the same proportion in the sample is 74 percent.

QUANTITATIVE ANALYSES

The vast majority of analyses in this report are quantitative, and the primarily descriptive analyses have been carried out in the programme SPSS version 21. Even though most of the questions are answered on five-point Likert scales, it has been

necessary for the sake of clarity - as is common practice in reporting survey data - to collate some of the response categories. For many of the questions the proportion of respondents who indicated that they agree or partly agree with a specific statement is reported. The remaining respondents have, on the other hand, indicated that they disagree, partially disagree or neither agree or disagree. For each table the annotation text clearly indicates what the proportion covers and what the remaining percentage up to 100 percent covers.

A special challenge is the questions where no answer is given or the respondents who have replied 'Don't know/not relevant'. As the vast majority of analyses are purely descriptive, no attempt has been made to replace missing answers with the average of the sample or another estimate. The missing answers remain therefore missing answers and are as a rule not included in the analyses. The missing answers are therefore *not* included in the calculation of the percentage distribution for the other (valid) response categories. An example; if 47 percent have indicated that they agree with a statement, 47 percent have indicated that they disagree and 6 percent have not provided a response or have stated that it is not possible to answer the question, then the final analysis will show that 50 percent of the PhD students who have submitted a valid answer agree.

This analytical construct may be problematic in situations where the proportion of missing responses can be described as large. We will therefore explicitly make the reader aware of this in a note for questions where more than 10 percent of answers are missing. For example, many PhD students answered 'Don't know/not relevant' to questions about the period abroad and changes of academic environment, as they have not yet been abroad. *Table 5.1* therefore reports the distribution of responses for the PhD students who have been able to provide a reply. A note makes the reader aware that a significant proportion of respondents have not been able to answer. It is possible to obtain further descriptive analyses from the authors of the report, should the reader wish to view the calculation of response rates including missing answers (the raw percentage distribution).

PROCESSING OF OPEN COMMENTS

The PhD students had an opportunity to write more in-depth comments at the end of the questionnaire. A total of 341 PhD students made use of this opportunity, which corresponds to 19 percent of respondents. The comments were encoded in the programme Nvivo10 using 17 predefined codes. These codes on the whole follow the themes that form the basis of the structure of the chapters in this report. Furthermore, the comments have been categorised according to the graduate school that the PhD student is from.

Table 2.3 An outline of themes and number of comments per theme.

Theme (code in Nvivo)	Number
Workload	30
Loneliness	6
Financing	4
Progress or lack of progress	14
Sense of security or insecurity	4
Overall satisfaction	10
Integration in the research environment	15
Integration in the PhD environment	4
Career plans	14
Motivation for the PhD study	6
The PhD school	66
Recruitment process	2
Writing and publishing	19
The questionnaire	77
Research self-efficacy	1
Left over	23
Supervision	102

The thematically relevant comments for each chapter have been read through by the authors. The comments were included based on the following criteria: a) the comments are in enough detail to contribute qualitatively to understanding the figures, and b) the comments are only included if they represent statements from several PhD students. This is not a case of these criteria ensuring generalisability in a statistical sense, but solely a way of making sure that insights from the open comments are not based on isolated, terse comments (Miles & Huberman, 2005). To avoid revealing the identity of the PhD students we have slightly rewritten some of the quotations, e.g. by correcting spelling and grammar errors and masking the gender of the supervisor and PhD student. We have been able to do so without altering the meaning and essence of the statements (Kvale 1994: 250).

ANONYMITY AND ETHICAL CONDITIONS

Prior to the data collection period the Danish Data Protection Agency was notified about the survey to ensure that the survey was in conformance with current Danish law in the area. Via correspondence with the Danish Data Protection Agency the analysis group was made aware by the Agency that the survey was already covered

by Aarhus University's right to administrative processing of data on the PhD students.

The PhD students were informed of the purpose of the survey by letter as well as emails, including that the survey will be used for both evaluation and research. The PhD students were not asked to approve the analysis group's processing of the data, which according to guidelines from the *American Psychological Association* (2010) is not required for this type of study.

The students were also informed that their answers would be treated with complete confidentiality and that analyses of the data would at no time make it possible to identify individuals. Due to the anonymity of the PhD students, results are not shown in the cases where fewer than 10 responses form the basis of the calculation. A further description of the anonymity can be found at the survey website (http://www.au.dk/kvalitetiphd/anonymitet).

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CHAPTER 3. ENTERING THE PHD PROCESS

The PhD students' entry into the PhD process deals partly with their motivation for starting on the degree programme and partly with the recruitment process. Danish and international studies show that the majority of the PhD students start on a PhD programme because they find the academic subject interesting and find the possibility of specialisation and research work attractive (Anderson & Swazey, 1998; Frame & Allen, 2002; Golde & Dore, 2001; Dansk Magisterforening [The Danish Association of Masters and PhDs], 2011; Neumann, 2003). According to these studies the motivation for becoming a PhD student is thus predominately inner. Intrinsic motivation is defined in psychological research as a motivation that exists within the individual and which is driven by an interest or pleasure in the task itself, rather than being based on external rewards (Ryan & Deci, 2000). Psychological-educational research has in recent decades documented that intrinsic motivation is a predictor of better and more creative performances and a higher degree of willingness to take risks and persistence in solving tasks (Ryan & Deci, 2000). A study has shown that PhD supervisors consider the PhD student's intrinsic motivation as the most important prerequisite for a successful process (Lovitts, 2008). Another study has shown that many supervisors not only recruit on the basis of the student's academic competencies, but that recruitment of PhD students is just as much based on personal competencies such as intrinsic motivation, perseverance, curiosity, enthusiasm and independence (Neumann, 2003).

The research literature still contains little information on effective PhD recruitment strategies (Jones, 2013). So far the research suggests that the most frequent form of recruitment is internal recruitment, i.e. that supervisors often know students from previous teaching and supervision or shorter employment and internship at the department, section or within the research group (Frame & Allen, 2002; Neumann, 2003). Recruitment typically takes place by the supervisors "spotting" particularly talented students and subsequently encouraging them to apply. The advantage of this form of recruitment is that it increases the likelihood of establishing fruitful collaboration, which again increases the probability of the PhD students' satisfaction with the research supervision (Ives & Rowley, 2005). Studies show that PhD students choose the supervisors who have shown enthusiasm for research work and who take an interest in the students as individuals (Neumann, 2003; Zhao, Golde, & McCormick, 2007).

ACADEMIC EMPLOYMENT PRIOR TO ENROLMENT

The PhD students were asked whether they had been employed at Aarhus University prior to enrolment as a PhD student at Aarhus University. They were asked about both teaching posts, research-related posts and other employment.

As can be seen from *Table 3.1*, more than half of the PhD students have had some form of formal employment at Aarhus University (including Aarhus University Hospital) prior to their enrolment. Seventeen percent have taught while they still were students and 21 percent have been employed as research assistants. Working at Aarhus University thus appears to be an important recruitment channel for many of the PhD students.

The figures increase slightly when we isolate PhD students with Danish nationality. An analyses - which is not reproduced in the table - shows that more than 60 percent of the Danish PhD students have been employed at the university prior to enrolment as a PhD student. Twenty-two percent of the Danish PhD students have been student teachers and 22 percent have been research assistants.

Table 3.1. The PhD students' employment at the university prior to the enrolment in the PhD programme.

	AU	AR	BSS	HE	ST
Student teacher	17%	26%	24%	13%	15%
Assistant lecturer (after Master's degree)	5%	8%	7%	7%	2%
Student assistant (with research-related tasks)	13%	16%	29%	7%	11%
Research assistant (after Master's degree)	21%	14%	20%	35%	12%
Research year student (only at Health)	6%	0%	0%	19%	0%
Other type of work (e.g. student guidance or administrative work)	11%	16%	9%	10%	11%
No, none of the above	48%	50%	40%	36%	59%

Question: "Have you been employed at Aarhus University prior to your enrolment as a PhD student (including Aarhus University Hospital)? (You may tick off more than one answer.)"
Note: The figures show the proportion of PhD students who have checked both of the above-named categories. Please note that the PhD students were able to check more than one box, but it was not possible for students to check more than one box in the cases where they answered "No, none of the above."

Looking more closely at *Table 3.1*, we can observe a pattern across the graduate schools. Among the PhD students at AR, 26 percent have been student teachers, 16 percent have been student assistants with research-related work, and 14 percent have had employment as research assistants. A similar pattern is seen at BSS where 24 percent of the PhD students have been student teachers prior to enrolment, while no less than 29 and 20 percent have been student assistants and/or research assistants respectively.

It is less common for the PhD students to have taught prior to their enrolment at HE. On the other hand 19 percent have been research year students, while no less than 35 percent have had employment as research assistants following their final examination for the Master's degree. Among the natural science PhD students, 15 percent have taught as students and 12 percent have been research assistants prior to enrolment.

PRIOR CONTACT WITH SUPERVISORS

64 percent of the PhD students indicate that they were encouraged to become a PhD student by one or more of their current supervisors. Among the PhD students from health sciences the proportion is 73 percent, while the equivalent figure for the other graduate schools is around 60 percent.

Taking Aarhus University as a whole, 78 percent of the PhD students indicate that they have contacted one or more of their current supervisors for help or inspiration with the PhD application.

Table 3.2. The contact between the PhD students and the supervisor prior to the enrolment in the PhD programme.

	AU	AR	BSS	HE	ST
Did one or more of your current supervisors encourage you to become a PhD student?	64%	58%	58%	73%	61%
Did you go to one or more of your current supervisors to get help or inspiration for your PhD application?	78%	81%	76%	86%	70%
Did you as a BA or MA student get supervision from one or more of your present supervisors?	44%	50%	45%	35%	49%
Had you worked for one or more of your present supervisors before you applied for your Ph.D. scholarship?	44%	28%	35%	63%	38%

Note: The figures show the proportion who replied 'Yes'. The remainder replied 'No'. 'Don't know/not relevant' replies are not included in the calculation.

As is also shown in *Table 3.2*, 44 percent of the students have received supervision from their current supervisor during either their Bachelor or Master's degree studies. 44 percent have tried working for one or more of their supervisors prior to enrolment. The following tendencies can here be observed across the graduate schools: At HE the most common practice is that the PhD student has worked for the supervisor prior to the enrolment. At AR, BSS, and ST it is, however, more common that contact between the PhD student and the supervisor is established during supervision of a Bachelor's or Master's degree project.

MOTIVES FOR STARTING THE PHD PROCESS

The figures in *Table 3.3* indicate the students' original motivation for starting their PhD degree programmes. The first three motives - desire to conduct research, wanting to teach, and interest in the topic - can be characterised as intrinsic motivation. By contrast motives such as increasing one's value in the job market, securing an income or pursuing prestige, may be regarded as more external motivational factors. Final, the last question describes a more coincidental element. Multiple and differing motives can thus form the basis for the PhD students' decision to start their PhD degree programme.

Table 3.3. The PhD students' motivation to begin the PhD process

	AU	AR	BSS	HE	ST
I was passionate about doing research	91%	96%	89%	92%	89%
I wanted to teach	45%	64%	62%	34%	42%
I was very interested in my topic	91%	97%	93%	88%	90%
I assumed that the PhD title would create opportunities in the job market outside the university	63%	43%	48%	75%	65%
I considered the PhD title to be prestigious	38%	37%	49%	34%	37%
I considered it to be a regular job with a permanent income	46%	45%	53%	38%	49%
I didn't have any other plans when I was given the opportunity	21%	13%	22%	15%	27%

Question: "Please think back to the beginning of your PhD process. To which degree were the following statements important to your choice of becoming a PhD student?"
Note: The figures show the proportion who replied that the circumstance (e.g. being passionate about doing research) was important or very important. The remainder have replied with 'Less important' or 'Not important at all'. 'Don't know/not relevant' replies are not included in the calculation.

With regard to inner motives, the vast majority of the PhD students indicate that the most important motivating factors are an interest in doing research and interest in the field of study. The desire to teach is also important, although not nearly as much as the other two factors.

Compared to the inner motives, the external motives are less prominent, although they are still important. More than six out of ten students state that the prospect of a PhD degree opening doors in the job market outside the university has been an important or very important motivation for starting the PhD process. This motivating factor is strongest for the PhD students from the health sciences. 38 percent indicate that prestige is an important motivating factor and 46 percent indicate that the possibility of a permanent income was an important factor in choosing to enter the PhD process.

The final motive, that of the PhD student not having any other plans when the opportunity arose - is the least important when compared to the other motives. Nevertheless, on average one in five PhD students indicate that this was an important or very important reason for starting the PhD degree programme. As many as 27 percent of the natural science PhD students mention this as an important motive for choosing to enrol.

MAIN CONCLUSIONS

- About half of the PhD students have had formal employment at Aarhus University prior to their enrolment in a PhD degree programme (*Table 3.1*).
- Internal recruitment is a widespread practice at Aarhus University. The PhD students and the supervisor often know each other from previous collaboration (study or work-related). Similarly, approximately two-thirds of the PhD students indicate that they have been directly encouraged by their supervisor(s) to apply for a PhD position (*Table 3.2*).
- The students often refer to inner motives for starting the PhD degree programme, including the desire to do research and interest in the topic. External motives such as career, income and prestige also have an influence on the decision to become a PhD student, although these factors are less common than the inner motives (*Table 3.3*).

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CHAPTER 4. THE ENCOUNTER WITH THE GRADUATE SCHOOL

According to the Ministerial Order on PhD programmes at the universities (Uddannelsesministeriet [Ministry of Science, Innovation and Higher Education], 2013), in addition to completing a research project that results in a PhD dissertation, the PhD degree programme also includes the completion of PhD courses, participation in other research environments (preferably foreign) and experience with teaching or another type of knowledge dissemination.

In the majority of graduate schools at Aarhus University the requirements regarding knowledge dissemination contained in the PhD Order are linked with the administration of the so-called salaried work in the collective agreement for PhD scholarships. There is however a great deal of variation between the graduate schools with regard to the amount of teaching that is offered to/required of the individual PhD student[3]. The requirements of the PhD Order for the PhD students to be offered courses in teaching are similarly dealt with in different ways by the individual graduate schools. Experience shows that there are large differences between the graduate schools at Aarhus University with regard to the courses offered, including e.g. award of ECTS credits, the duration of courses and the extent of the compulsory courses and their content, i.e. how generic or specific the competencies being taught are.

It would be excessive to enquire into the students' assessment of all these parameters. The questionnaire therefore explores on a more general level the extent to which PhD students experience the courses and knowledge dissemination offered at Aarhus University as relevant, educational and making a real contribution to the quality of the PhD degree programme as a whole, while at the same time reducing as little as possible the time allocated to the other elements in the PhD degree programme (including in particular the research project).

From the international research literature we know that the majority of PhD students find it important that they learn to teach as part of their PhD degree programme (Trigwell & Dunbar-Goddet, 2005). A recent study showed that experience

[3] http://www.au.dk/forskudd/phdhandlingsplan/kurser/

with teaching can directly strengthen the PhD students' research methodology skills (Feldon et al., 2011). Conversely, many of the PhD students report that they do not feel sufficiently prepared for their teaching duties and many of the PhD students feel that they are not offered sufficient opportunities to develop their teaching competencies with a view to being able to undertake a future job as a lecturer at the university (Austin, 2002a; National Association of Graduate-Professional Students, 2001; Trigwell & Dunbar-Goddet, 2005).

The research literature is very limited when it comes to knowledge about the students' benefits and satisfaction with the period abroad and courses (Jones, 2013). There is also alarmingly little knowledge about effective and valuable formative evaluation procedures in PhD degree programmes (Denicolo, 2004; Mewburn, Tokareva, Cuthbert, Sinclair & Barnacle, 2013).

According to the PhD Order, the individual institutions are obliged to regularly assess whether the PhD students are following the approved PhD plan. At Aarhus University's four graduate schools the rules are complied with through interim evaluations. In some areas these are supplemented with additional assessment formats such so-called annual assessments in supervisor colleges (BSS) or W*ork in Progress* seminars (AR). Common to all four graduate schools is also the implementation during the course of 2012 of the first version of the so-called *PhD Planner* as a joint PhD administration system. At the present time the system includes electronic working procedure support for the processes relating to recruitment, the creation of a PhD plan and the interim evaluations. In addition the long term plan includes processes in connection with the PhD defence etc. The vision is that the new joint PhD system should ensure uniform processes and in this way support systematic quality assurance for all graduate schools[4]. It is therefore important to ask the PhD students about their current experience of the PhD planner as a tool for creating an overview of the progress in their project.

PLANNING AND EVALUATION TOOLS

The first two questions that the PhD students were asked to consider regarding the graduate schools' different sets of rules and frameworks dealt with the use of the interim evaluations and the PhD planner respectively. As can be seen in the table below, 51 percent of the PhD students answer that they use the interim evaluations to some or to a high degree to take stock of the PhD process along with the principal supervisor. In *Figure 4.1* we can see that 22 percent of the students indicate that this is not the case at all, while 28 percent indicate that they use the interim evaluations to take stock together with the principal supervisor.

[4] http://medarbejdere.au.dk/administration/forskning_talent/talentadministration/phdplanner/

With regard to the PhD planner, a minority of the PhD students - 25 percent - answer that they to some or a limited extent use the planner to gain an overview of the progress in their project. Forty-six percent of the students indicate that they do not use the PhD planner at all to gain an overview of the progress in their project, while 29 percent indicate that they only use the planner to a limited degree to do this.

SELECTION OF PHD COURSES

The following two questions concern the selection of PhD courses and the extent to which they are assessed as strengthening the students' general research qualifications competencies and, more specifically, research competencies related to the PhD students' project.

Table 4.1. The PhD students' experience of the content of the PhD degree programme.

	AU	AR	BSS	HE	ST
Do you and your main supervisor use the interim evaluations to take stock of your PhD process?	51%	60%	54%	53%	44%
Do you use the PhD planner to survey the progress in your project?	25%	25%	30%	17%	29%
Does the selection of PhD courses give you the possibility of strengthening your general research qualifications?	75%	63%	77%	88%	68%
Does the selection of PhD courses give you the possibility of strengthening your research qualifications within the framework of your project?	52%	35%	48%	67%	47%
Did your period abroad strengthen your research project? [a]	84%	88%	82%	84%	83%
Was your period abroad worth the effort compared to your professional benefits (e.g. networks, general skills as a researcher)?[a]	85%	91%	81%	86%	84%
Has the work you do beyond your own project (e.g. various department work including teaching) been useful?[b]	85%	86%	93%	84%	83%
Is the work you do beyond your own project (e.g. various department work including teaching) of such a magnitude that it affects your project?[b]	56%	61%	64%	41%	63%
Are you satisfied with the extent of your teaching assignments?[c]	77%	81%	81%	83%	70%
Are you satisfied with the content of your teaching assignments?[c]	86%	89%	91%	86%	83%

Question: "We will now ask you a number of questions about the PhD subject elements. Not all elements are necessarily relevant for your particular PhD programme. If one or more elements are not included in your PhD programme, please choose "not relevant". The same applies if, for example, you have not had a period abroad so far or if you have not yet performed teaching."
Note: The figures show the percentage who have used response categories to a high degree or to some degree.

The remainder have replied with the categories to a limited degree or not at all. The calculation does not include those who replied 'Don't know/not relevant'.
a) Looking at the raw data, 60 percent answered using don't know/not relevant.
b) Looking at the raw data, 13 and 14 percent respectively answered using don't know/not relevant.
c) Looking at the raw data, 18 and 19 percent respectively answered using don't know/not relevant.

For Aarhus University as a whole, 75 percent state that the selection of PhD courses to some or to a high degree give the opportunity to strengthen general research competencies. Across the graduate schools we see that the percentage of PhD students who answer affirmatively is highest at HE with 88 percent, while it is 63 percent among PhD students at AR.

With regard to research competencies which strengthen the PhD student's own project, 52 percent indicate that the selection of PhD courses to some or a high degree strengthen such competencies. Once again differences may be seen across the graduate schools, which correspond to those previously described. Among the PhD students at HE, 67 percent assess that the selection of PhD courses has strengthened the PhD student's own project. The same percentage among PhD students at AR is 35 percent.

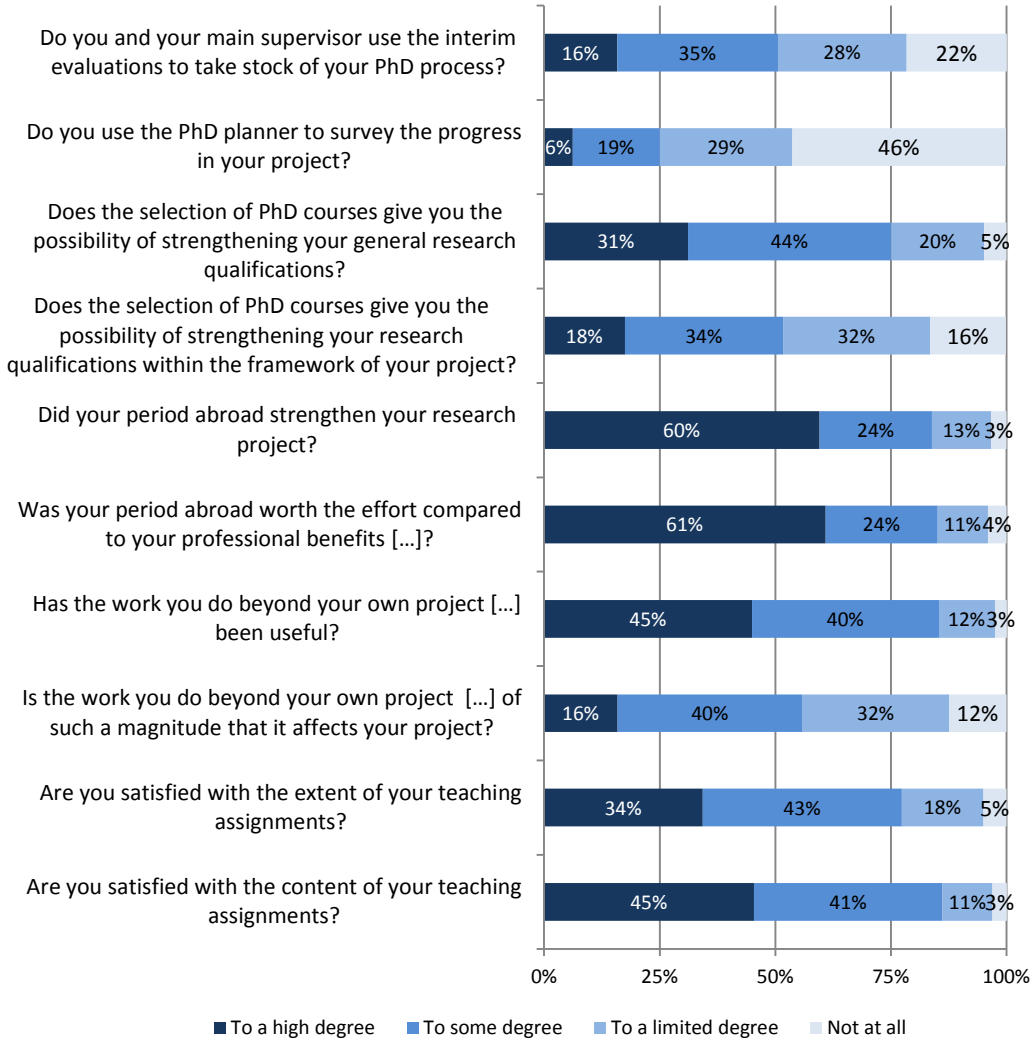
PERIOD ABROAD

Research stays at another, often foreign university (change of academic environment) is a key part of the PhD students' study programme. The questionnaire contained a question about whether the period abroad strengthened the PhD students' research project. It also asked whether the period abroad has worth the effort compared to the PhD students' assessment of the professional benefits such as e.g. networking and acquisition of general skills as a researcher.

In the introductory text to the battery of questions the PhD students were informed that some of the questions, including the question about periods abroad, might not be relevant for them. In the light of the fact that many PhD students first go on exchange to an academic environment to another university later in the process, it is not surprising that 60 percent of the PhD students replied don't know/not relevant. These 60 percent are of course not included in the analysis for the questions on the period abroad.

Table 4.1 shows that as many as 84 percent find that the period abroad has strengthened the PhD students' research project to some or to a high degree, and that 85 percent of the students indicate that the period abroad has been worth the effort in relation to the professional benefits. As can also be seen in *Figure 4.1*, only a small minority consider that this was not the case at all. The table also shows that the positive assessment of the change of academic environment is common to all of the graduate schools and is most pronounced among the PhD students at AR.

Figure 4.1. The PhD students' experience of the content of the PhD degree programme.



Note: Some statements have been abbreviated. Additionally see the note for *Table 4.1.*

DEPARTMENTAL WORK AND TEACHING ASSIGNMENTS

As part of their degree programme the majority of PhD students are obliged to perform various forms of work not directly related to the project, such as teaching. The PhD students were asked about the extent and relevance of this work. Similarly, they were asked specifically about the teaching assignments. As with the questions about the period of study abroad, it is very natural for PhD students who have not yet undertaken such tasks to answer 'Don't know/not relevant'. The percentage of these answers lies between 13 and 19 percent (see note to *Table 4.1*). These are therefore not included in the analysis.

An 85 percent majority of the PhD students indicate that the work they do beyond their own project (here referred to as department work) has been educational. We find the most positive assessment of the department work among the PhD students at BSS.

56 percent of the PhD students assess that the department work has been so extensive so that it to some or to a high degree has affected their own project. In *Figure 4.1* we can see that approximately one out of six (16 percent) indicate that the work has such en extent that it affects their project to a high degree.

With regard to carrying out teaching, 77 percent are satisfied to some or a high degree with the actual extent of the teaching assignments, and 86 percent are satisfied with the content of their teaching assignments. Across the graduate schools we find the lowest satisfaction with the extent of the teaching assignments among the natural science PhD students.

THE PHD STUDENTS' COMMENTS ON THE INTERIM EVALUATIONS AND THE PHD PLANNER

Some of the topics that are most often commented upon (see *Table 18.1*) by the PhD students in the questionnaire's open comments field refer to the graduate schools as administrative institutions, including the schools' evaluation procedures and their administration of requirements for course participation, departmental work and periods abroad.

From these comments it appears that PhD students first and foremost feel attached to the PhD degree programme that they are enrolled in. By contrast, some of the PhD students perceive the graduate schools as remote institutions with a limited impact on their PhD projects and the PhD process. A PhD student from the 'soft' subject area puts it thus:

> *The central graduate school (at faculty level) seems like a remote institution that you never see. This means that you simply do not have a clue about what the central part of the school contributes in relation to my education, apart from determining regulations and procedures.*

The same respondent clarifies his/her comments on how the perception of the graduate school as a remote administration negatively impacts the interim evaluations later on:

> *…and I cannot see the sense in my PhD plan having to be approved centrally by anyone other than my supervisor and the graduate school at the department. It seems absurd that the faculty's head of graduate school has to approve – especially when taking into account the fact that this is a purely formal form of inspection.*

In the quotation the student describes the interim evaluations as an instrument of inspection for the graduate school management. The quotation thereby illustrates a theme that appears again in a number of the comments about interim evaluations and which supports the figures in *Table 5.1* above. The table shows that approximately half of the PhD students do not use the interim evaluations to a high degree to take stock of the PhD process. Similarly, the comments contain examples of how interim evaluations are at times redefined as a bureaucratic formality which simply needs to be got out of the way, rather than being an occasion to evaluate the quality and progress in the project. The quotation below has been chosen because it shows that this devaluation of the interim evaluation to a mere formality is not always seen as an advantage by the students:

> *In my opinion, the interim evaluations do not function at all as intended. The intention is for the supervisor to complete the form regarding the project status and that this should then be discussed with the PhD student. In practice what happens in many places is that the student has to complete the form, which the supervisor then signs. (…) This also applies in my situation. Moreover my supervisor says that we should simply write that the project is proceeding according to plan so as not to attract attention from the graduate school and give them grounds to think that this is not the case. In this situation there is a risk that the project's real process is not evaluated, as there will be no external assessment of the process. (PhD student from a hard subject area.)*

In the same way that the comments about administrative procedures in the PhD process can substantiate and explain the figures for interim evaluations, so can they also clarify the figures for the students' experience of the PhD planner. As described above, only 25 percent of the PhD students use the PhD planner as a tool to gain an overview of the progress of their project and the tool receives many critical comments. The comments are primarily about the tool being perceived as 1) inflexible, 2) not technically advanced, and 3) as an administrative measure rather than a real help. The three points of criticism are illustrated in the three following quotations.

> *If it [the Planner] is supposed to be a tool for planning the PhD process for the PhD student then it needs to be more flexible. Right now it is often locked while you await approval by either a supervisor or the graduate school. If we are to benefit from it as a planning tool, it ought to be available to us all the time, also when it is "forwarded" for approval (PhD student from a hard subject area).*

> *An Excel worksheet and a notebook work better! (PhD student from a hard subject area.)*

> *The PhD planner (…) in no way promotes a creative process, which the research is also, after all. … You ought to think about why you are using it. It is just for the sake of the registration? (PhD student from a hard subject area.)*

THE PHD STUDENTS' COMMENTS ABOUT THE SELECTION OF COURSES AND PERIODS ABROAD

As previously described in this chapter the figures show that most PhD students find that the selection of courses contributes to strengthening their general research competencies, while only half find that the selection of courses strengthen their research competencies in relation to their own project. The open comments support and to some degree explain the pattern in the figures.

A point of view common to all of the faculties is that there are too many courses on general research methodology and too few PhD courses that more specifically address the theory, empirical methods and methods of analysis concerning the topics that the PhD students research in their own projects. There is furthermore a call for specific courses designed to bring the PhD student closer to other active researchers in the local environment. The argument is most clearly made in the following quotation from a PhD student in a hard subject area:

> *Traveling is nice, and that we have the budget for PhD courses elsewhere is nice, too. But I would have liked to have more PhD courses in Aarhus, in other departments, so as to be able to network also within Aarhus University -- and I am not talking about yet another of those fancy, but shallow transferable skill courses. I'm talking about real, deep scientific courses where you get to know the many good researchers that we actually have here.*

Despite requesting more specific, project relevant courses, the PhD students are mainly positive about the selection of courses. Correspondingly, the vast majority of the PhD students refer to their period abroad as being rewarding. This can clearly be seen in *Table 5.1* and the pattern is also found in the qualitative material, with statements such as:

> *Great benefit from the period abroad. This is the best thing to happen professionally and personally during my process. Enhances the quality of my project very much (PhD student from a hard subject area).*

The comments also express a wish for more clarity in the rules for periods abroad from individual PhD students. The wish for clarity arises from the fact that there can be a built-in conflict of interest in the question of whether or not to take a period abroad. In some cases the supervisor may have a greater interest in his/her PhD student carrying out research work in domestic laboratories, rather than travelling abroad. In this situation some PhD students wish for regulations on the period abroad to be completely unambiguous, so that the regulations can be used as a formal argument towards their supervisors for taking a period abroad.

THE PHD STUDENTS' COMMENTS ON THEIR TEACHING ASSIGNMENTS

Figure 4.1 shows that most of the PhD students were on the one hand very satisfied with the scope and content of their teaching assignments during the PhD degree

programme, but on the other hand, they found that the work they contribute as a whole to the department, to a certain extent is detrimental for their own project.

The same pattern is found in the comments. That the PhD students find the teaching assignments to be by and large fruitful is not the same as saying that the teaching assignments are not also a significant challenge for them. In many cases the teaching assignments during the PhD degree programme are the PhD student's début as a teacher at the university and not all of them feel well-enough equipped to do the job. Lack of familiarity and experience with the teaching assignments is illustrated by the comments of a PhD student from a hard subject area.

> *I did not have experience of teaching before I began as a PhD student and I think that made my situation completely different to some of my colleagues, who had teaching experience before starting the PhD process. I have at times worked so hard on teaching that it seriously affected my private life and it has completely stopped the progress in my PhD project. Ultimately this means that there will probably come a time where things will seriously affect my private life again if I am to finish my project in time.*

In the quotation the student tells that the teaching is not only perceived as a time-consuming task, but also as a task that requires so much attention mentally and emotionally that it has cost both progress and well-being in his PhD project. The same story is found in a number of the other comments, where the students wish for more help and support from the institution. That the experience of teaching is a difficult task, which the PhD students are expected to cope with without significant training, is clear from the following quotation from a PhD student from one of the hard subject areas:

> *In relation to teaching/ knowledge dissemination, I think that we PhD students are not well-equipped. My thinking is that it could be compulsory, in line with statistics (…) to participate in a course on pedagogics and teaching methods. I think it is a bit frightening that we as relatively unskilled teachers should be responsible for teaching at a high academic level. Sometimes in areas we only have knowledge of from the first year of our degree programme.*

In line with the quotation above, other PhD students express a desire for more support and training in the form of courses. A few take a more radical position - as above - and suggest that to the extent teaching is compulsory, it should also be compulsory to participate in courses in pedagogics.

MAIN CONCLUSIONS

- Half of the students do not use the interim evaluations as an opportunity to take stock of the project. Some PhD students suggest in their comments that the interim evaluations are filled-out as a ritual without this leading to a discussion of the project by the supervisor and the PhD student.

- The PhD planner in its current form is only used by a minority as a tool to gain an overview of the project. The PhD planner receives many - mainly critical - comments along the way.
- The selection of courses are assessed by the majority to cover the requirement for courses in general research methodology. Some PhD students express a need for PhD courses that specifically strengthen the research competencies required in relation to the PhD students' own project.
- The majority the PhD students assess the change of environment to another (often foreign) university as being positive and fruitful.
- By far the majority of the PhD students assess that the work they contribute in addition to their own project has been educative. At the same time half of the students answer that the work has such an extent that it affects the PhD students' own project.
- The majority of the PhD students are satisfied with the content and scope of their teaching assignments, but many use the open comments to call for better preparation for the teaching assignment through (compulsory) pedagogic courses.

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CHAPTER 5. INTEGRATION IN THE RESEARCH ENVIRONMENT

One of the most reliable findings in educational research on PhD degree programmes is that the research environment plays a decisive role in determining whether the PhD student completes the programme, and does so on time (Lovitts, 2001; Wao, 2011; West, 2011). Similarly, it is reliably found that research environments are organised very differently across disciplines and subjects (Wright & Cochrane, 2000). The sense of social and/or intellectual isolation is a problem for many PhD students (Ali & Kohun, 2007), and a problem that often explains drop-out rates and lack of motivation in the humanities and social science disciplines (Bair & Haworth, 2005; Universitets- og Bygningsstyrelsen [The Danish Building & Property Agency], 2007; Johnson, Lee & Green, 2000). Studies show that the PhD students who experience being part of supportive and cooperative research environments also to a greater extent feel integrated, i.e. they have a feeling of 'belonging' (Gardner, 2009, 2010; Golde, 2000, 2005). Such collaborative research environments are characterised by the PhD students being treated as junior colleagues and participating in both professional and social events (Heath, 2002; Pearson, 2005), that there is an emphasis on frequent (weekly) research meetings with oral presentations (Gardner, 2007; Vekkaila et al., 2012), and that the general tone is friendly, informal and non-competitive (Chiang, 2003; de Valero, 2001; Provtinak, 2009). Collaborative research environments are similarly characterised by the fact that PhD students naturally enter into writing and project groups with other students and thus regularly give and receive peer feedback (Fenge, 2012; Fisher, 2006; Wisker et al., 2003). Finally, they are environments where positive results are not regarded as dissertation requirements (de Valero, 2001).

According to the literature, the daily research environment at the institute, at the department, in the research programme or within the research group is thus a central arena in which academic processes and relations play out. It is therefore important to uncover the degree of community, support, collegiate spirit and integration experienced by the students in their daily research environments, and which differences that can be identified across the faculties.

OPPORTUNITIES FOR COLLABORATION AND DISCUSSION

The first two questions (*Table 5.1.)* relate to the opportunity for feedback. 82 percent of the PhD students state that they meet other PhD students in their research environments who they can use for sparring. Slightly more, 89 percent, indicate that they feel welcome to contact the other researchers if there is a need to discuss academic problems. The percentage is highest in the hard subject areas and slightly lower in the soft subject areas.

A similar trend can be seen with the next question, where the students are asked about what could be termed the presentation culture, where you regularly present your work for a circle of research colleagues. For Aarhus University as a whole 70 percent of the PhD students answer that they regularly present and discuss each other's research in their research environment. Slightly more than half of the PhD students at AR and BSS participate in a research environment where they regularly present research for one another. At ST and HE the figures are 72 and 81 percent respectively. These percentage distributions accurately reflect the distribution for the question asking whether the PhD students experience a research environment in which there is a positive attitude towards collaborating on research tasks.

Table 5.1. The PhD students' experience of their opportunities of receiving sparring and feedback.

	AU	AR	BSS	HE	ST
Here I meet other PhD students with whom I can exchange ideas	82%	77%	79%	85%	83%
If you have any problems related to the PhD programme, you are always welcome to ask one of the other researchers	89%	78%	83%	93%	92%
Here we present and discuss each other's research on a regular basis	70%	56%	53%	81%	72%
There is a sense around here that working together on research is fun	71%	56%	49%	82%	74%

Question: ”In the following we will be asking you about your perception of the research environment at your department. Department has different connotations and can mean different things like a centre, research programme, research group or even the whole department. We would like you to think of your daily research environment, that is, the researchers you meet on a regular basis.”
Note: The figures show the percentage who have indicated that they agree or somewhat agree with the statement. The remainder have replied Neutral, Somewhat disagree, or Disagree. The calculation does not include those who replied ‘Don't know/not relevant’.

The figures suggest that the natural science and especially the health science PhD students to a greater extent experience a research environment where it is possible to get help and feedback in connection with professional challenges, than the students in the soft subject areas. This help is both informal (contacting other researchers) and more formal (through planned presentation meetings).

A closer inspection of the figures shows that there is not only variation *between* the graduate schools. There is also significant variation *within* the graduate schools, which is to say variation between the individual PhD degree programmes. The reader is encouraged to consult the appendix of this survey.

COLLEGIALITY AND GENERAL TONE IN THE RESEARCH ENVIRONMENT

Table 5.2 shows the questions that deal with the PhD students' experience of friendliness, collegiality and the general tone in the research environment.

As can be seen in the first question, the majority of the PhD students experience a research environment in which the permanent academic staff show interest, and a research environment where the PhD students' research is acknowledged, even though it may not be ground-breaking. 86 percent of the students indicate that they experience a research environment where good arguments are welcome irrespective of their position in the research hierarchy.

Even though this applies to the majority of the PhD students at Aarhus University as a whole, a closer inspection of *Table 5.2* shows clear differences between the graduate schools. The trend is for the PhD students at ST and in particular HE to have a more positive experience of the collegiality of their research environment than the PhD students in the soft subject areas.

Table 5.2. The PhD students' experience of collegiate spirit and social conventions in the research environment

	AU	AR	BSS	HE	ST
The scientific staff members are generally interested in hearing about my project	76%	66%	61%	85%	76%
In this research environment, research conducted by PhD students is acknowledged although it may not be ground-breaking	77%	68%	57%	87%	79%
Here both PhD students and professors are welcome to share their opinion	86%	80%	70%	88%	92%
It is possible to talk openly with colleagues about successful as well as unsuccessful experiences	76%	63%	58%	84%	80%
I feel that the researchers here are harsh and negative rather than constructive when giving feedback on each other's work	10%	18%	18%	8%	7%
People seem to be very competitive	28%	40%	36%	24%	25%

Question: "In the following we will be asking you about your perception of the research environment at your department. Department has different connotations and can mean different things like a centre, research programme, research group or even the whole department. We would like you to think of your daily research environment, that is, the researchers you meet on a regular basis."
Note: The figures show the percentage who have indicated that they agree or somewhat agree with the statement. The remainder have replied 'Neutral', 'Somewhat disagree', or 'Disagree'. The calculation does not include those who replied 'Don't know/not relevant'.

The final two questions in the table are about what may be termed the *tone* of the research environment. In general only a minority of the PhD students meet a hard and negative tone in their research environment. 10 percent indicate that they experience an environment where the researchers' feedback on one another's work is hard and negative. 18 percent of the PhD students at AR and BSS respectively experience that the researchers are hard and negative rather than constructive. These figures are significantly smaller among the PhD students at HE and ST.

Approximately a quarter of the PhD students at Aarhus University experience a research environment where the researchers are highly competitive towards one another. The PhD students in the hard subject areas experience this atmosphere of internal competition to a lesser degree than the PhD students in the soft subject areas.

Once again there is significant variation between the PhD degree programmes within the individual graduate schools and the reader is encouraged to see the figures in the survey appendix.

FEELING OF INTEGRATION

The final question deals with the PhD students' feeling of being integrated in the research environment. The results of the analysis in *Table 5.3* indicate that by far the majority of the PhD students feel they are part of the research community in their research environment. 82 percent answer that they feel respected as a co-researcher in their unit, and 74 percent answer that they feel part of the research community there.

Table 5.3. The PhD students' sense of being part of the research environment

	AU	AR	BSS	HE	ST
Here I feel respected as a co-researcher	82%	75%	68%	90%	83%
I feel like I'm part of the research community here	74%	64%	58%	82%	76%
In physical terms, I spend most of my research time outside of the research environment (e.g. at home or in a company)	15%	34%	20%	14%	8%

Question: "In the following we will be asking you about your perception of the research environment at your department. Department has different connotations and can mean different things like a centre, research programme, research group or even the whole department. We would like you to think of your daily research environment, that is, the researchers you meet on a regular basis."
Note: The figures show the percentage who have indicated that they agree or somewhat agree with the statement. The remainder have replied 'Neutral', 'Somewhat disagree', or 'Disagree'. The calculation does not include those who replied 'Don't know/not relevant'.

As is the case with the other results in this chapter, the feeling of integration is strongest among the PhD students at health sciences, though it is also strong among the PhD students at ST. The figures are lower among the PhD students at AR and BSS.

The final question is asked to identify the circumstance that many PhD students spend much of their time outside of the research environment that they are attached to organisationally. At AR, 24 percent indicate that in physical terms they spend most of their research time outside of the research environment. At BSS the figure is 20 percent. At HE and ST 14 and 8 percent spend most of their research time outside the research environment respectively.

THE IMPORTANCE OF THE RESEARCH ENVIRONMENT FOR THE PHD PROCESS

As described in the introduction to the chapter, according to the research literature the research environment has great importance for the students' PhD process. A range of statistical analyses with the research environment as explanatory variable were conducted to discover whether this also applied in the sample of the PhD students at Aarhus University. A number of scales were included in the analyses, which were constructed on the basis of the students' responses to the individual questions. These were related to the experience of a *collegial research environment* (e.g. "Here we present and discuss each other's research on a regular basis"), *insecurity* in relation to the project (for example, "Sometimes I wonder if I'm good enough to be a PhD student"), *exhaustion* (e.g. "Does your work as a PhD student give you severe stress symptoms"), *independence* (e.g. "It is important to me that I make all the critical choices in my project") and *research self-efficacy*(for example,"[To what extent do you feel confident managing the following tasks …] successfully conduct a research project by yourself"). A more detailed description of these scales and the exploratory factor analyses leading to their construction can be found in the report *The Dimensionality of the Aarhus University Quality in the PhD Process Survey*[5]. The analysis of the importance of the research environment was primarily examined by means of ANCOVA, which allowed us to control for the variation between graduate schools (AR, BSS, HE and ST), just as the ANCOVA enabled us to test whether the importance of the research environment for the PhD students' experience of the environment was moderated by the graduate school.

The first analysis aimed to clarify whether there was a difference in the four faculties with regard to the PhD students' experience of being integrated in a collegial research environment. An analysis of variance (ANOVA) showed that there were statistically significant differences between the faculties, with regard to the PhD students' integration in a collegial research environment, $F(3, 1669)=64.07$, $p<.001$, $\eta_p^2=.103$. A post-hoc analysis with Bonferroni-adjusted confidence intervals showed that the PhD students at ST to a greater extent than the PhD students at HE

[5] http://www.au.dk/fileadmin/www.au.dk/kvalitetiphd/factoranalysis.pdf

(*p*=.002), AR (*p*<.000) and BSS (*p*<.000) feel themselves to be integrated in a collegial research environment. The PhD students at HE also feel themselves to be more fully integrated in a collegial research environment, compared to the PhD students at AR (*p*<.000) and BSS (*p*<.000).

The next step in the analysis was to identify the importance of integration in a collegial research environment controlled for differences between the faculties. A range of ANCOVA analyses showed statistically significant effects of the PhD students' experience of being integrated in a collegial research environment on the experience of *exhaustion* $F(1, 1666)=193.2$, $p<.001$, $\eta_p^2=.104$, *insecurity* $F(1, 1668)=191.8$, $p<.001$, $\eta_p^2=.103$, and *independence* with regard to the project $F(1, 1668)=87.8$, $p<.001$, $\eta_p^2=.050$. A similar analysis showed that the experience of a collegial research environment was negatively correlated with the PhD students' perception of social loneliness $F(1, 1655)=444.7$, $p<.001$, $\eta_p^2=.212$ and academic loneliness $F(1, 1645)=315.6$, $p<.001$, $\eta_p^2=.161$. In this survey academic loneliness was operationalised by the question "Do you feel that you act alone in your project and lack the necessary feedback to make progress?". Finally, an analysis showed that the experience of a collegial research environment was positively correlated with the students' satisfaction with the progress in their project $F(1, 1576)=156.6$, $p<.001$, $\eta_p^2=.090$ together with the PhD students' research self-efficacy $F(1, 1667)=96.5$, $p<.001$, $\eta_p^2=.055$.

This part of the analysis thus points to PhD students who experience being part of a collegial research environment feeling greater independence, being less exhausted, less uncertain of their project, and more satisfied with its progress when compared to PhD students who do not feel integrated in a collegial research community. The analysis also points to PhD students who do not feel they are part of a collegial research environment being more vulnerable to loneliness, both socially and academically.

THE PHD STUDENTS' COMMENTS ON THE RESEARCH ENVIRONMENT

When compared to how the literature emphasises the importance of the PhD students' experience of the research environment for their well-being and progress, it is surprising how rarely the research environment is commented upon in the comments. But some of the PhD students use the comments to convey that the comments reflect the fact that a lack of integration with the research environment outside the PhD group has, in their view, consequences for their training as researchers. The consequences are both a sense of a lack of respect and a sense of isolation. The quotation below has been chosen because it most precisely illustrates the feeling of lack of respect of the PhD students as competent fellow researchers, who contribute to the institution's production. The quotation is from a PhD student in a soft subject area:

> *The end-all and be-all is that the PhD students also feel they are respected by the institution as researchers, or as a minimum for their research efforts. Maturing into researchers happens primarily in the process of being involved and taking part in research environments. (…) Even though being a be PhD student is a learning process, the institution ought to regard us as staff employed to perform research. Rather than only seeing us as students who should be offered courses, we ought to be encouraged to play an important role in the research environment by organising conferences etc. The quality of the PhD degree programme should not be ensured via more PhD courses, but rather through encouragement to take part in active research environments.*

The following quotation is also taken from a student in a soft subject area and also deals with the need to feel acknowledged as an academic resource. But the quotation illustrates at the same time the feeling of being isolated and left alone with the project.

> *We are not thought of as a resource; we are apparently not regarded as someone that the older researchers feel they have responsibility for (unless they are supervisors), nor as bringers of exciting new life to the research environment or as sparring partners. We do not present our results to more experienced colleagues and receive no broad response. Currently I am only able to present my project for the PhD students under the auspices of the graduate school -- and that is not good. My tenured colleagues have no idea what I do.*

Both quotations underline the importance of the PhD students being included in an environment by actively contributing with presentations and feedback and organising conferences etc. All of these are activities in which the students are given access to authentic research activities in collegial relations and cooperation with senior researchers.

MAIN CONCLUSIONS

- The PhD students who feel themselves to be part of a collegial research environment are less lonely, less alone with their project, less exhausted, feel a greater degree of independence and they are more satisfied with the progress of the project.
- In general the majority of the PhD students at Aarhus University feel that they are part of a research community out in the research environments (*Table 5.3*).
- The majority also experience that their research environment provides an opportunity for sparring on academic challenges, both formal (through planned presentation meetings) and more informal (by contacting other researchers) (*Table 5.1*).
- The general tone in the research environments receives a mainly positive assessment from the university's PhD students. The majority indicate that the permanent academic staff show an interest in the PhD students' pro-

jects and acknowledge their research, even though it may not be groundbreaking (*Table 5.2*).

- The PhD students at HE and ST experience to a greater extent that they are in a collegial research environment compared with the PhD students at BSS and AR. The PhD students in the soft subject areas have more experience of a harsh tone than the PhD students in the hard subject areas (*Table 5.2*). The difference between faculties in some places covers very large differences between the PhD research programmes. In a few places the research environment has to be characterised as hard and disloyal, as less than half of the PhD students within these PhD degree programmes feel themselves to be part of the research community (see appendix).

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CHAPTER 6. THE SCOPE OF THE SUPERVISION

Even though the scope of the supervision alone is a quantitative description of how often students meet with their supervisor(s), the research on PhD study programmes shows that it is an important part of the overall picture of supervision (Engebretson et al., 2008; James & Baldwin, 1999). Several studies show that regular and frequent (preferably weekly) supervision meetings are positively connected with the PhD students' successful completion (Holbrook, Bourke & Cantwell 2006; Seagram, Gould & Pyke, 1998; Woodward, 1993) and satisfaction with the supervision (Heath, 2002; Holbrook et al., 2006; Manathunga, 2005). It is shown that the supervisory contact will typically be more frequent at the beginning of the PhD process than at the end of the PhD process (Cullen, Pearson, Saha & Spear, 1994; Engebretson et al., 2008).

From the point of view of the students, the length of the meetings is less important. It is more crucial that the supervisor is available for on-going questions and feedback (Burns, Lamm & Lewis, 1999; Lamm, 2004; Pole, Sprokkereef, Burgess & Lakin, 1997), and that there are clear agreements about when and how the supervisor may be contacted (Manathunga, 2005; van Rensburg, Danaher, Malan, Erwee & Anteliz, 2012). The differences between the disciplines is shown by the fact that the supervisory contact is generally most frequent (daily-weekly) in the health scientific and natural scientific research disciplines based on laboratory work, where there is often an "open door" policy and close forms of collaboration (Heath, 2002; Holbrook et al., 2006; Jones, 2009; Wright, 2003).

THE NUMBER OF SUPERVISORS AND AFFILIATION TO THE PRINCIPAL SUPERVISOR

The next table shows the PhD students' indication of the number of supervisors linked to the project, both principal supervisors as well as co-supervisors. Most commonly the PhD students have two supervisors linked to the project. 46 percent indicate that they are supervised by a total of two supervisors. 17 percent have one supervisor linked to the project, while 37 percent of the PhD students have three or more supervisors linked to their project.

These figures cover very different practices across the graduate schools. Among the PhD students at BSS, by far the most common practice is to have two supervisors linked to the project. The main rule at AR is also that there are two supervisors linked to the project, even though it is not unusual to have both one and three su-

pervisors. Among the PhD students at ST the practice is less uniform. One in three of the PhD students indicate that they have one supervisor linked to the project, 44 percent have two supervisors, while 17 percent have three supervisors. For the PhD students at HE the most widespread practice is to have three supervisors, while a significant percentage have four or more supervisors.

Table 6.1. The total number of supervisors (main supervisors and co-supervisors) per PhD student.

	AU	AR	BSS	HE	ST
1 supervisor	17%	14%	6%	0%	33%
2 supervisors	46%	65%	85%	23%	44%
3 supervisors	25%	21%	8%	43%	17%
4 supervisors	10%	0%	1%	27%	4%
5 supervisors	2%	0%	0%	6%	1%
6 supervisors	0%	0%	1%	1%	0%
Average number supervisor/PhD student	2.4	2.1	2.1	3.2	2.0

Question: ”How many supervisors are linked to your project?(Please include both main supervisors and co-supervisors.)”

As *Table 6.2* shows, there is also variation between the graduate schools with regard to the principal supervisor’s de facto role in relation to the project. The PhD students were asked which supervisor they used most and which was the most well-informed about their project. For Aarhus University the analysis shows that in one out of five cases the co-supervisor is the supervisor that the PhD students use most.

Table 6.2. The PhD students’ specification of which supervisor they use the most

	AU	AR	BSS	HE	ST
My main supervisor	79%	90%	82%	68%	82%
One of my co-supervisors	22%	10%	18%	32%	18%

Question: “Which supervisor is in contact with you most often and is the most well-informed about what you are doing?”
Note: Due to rounding-off the sum of the total for AU is 1.01.

Among the PhD students at HE, almost every third states that the co-supervisor in practice is the supervisor who knows the PhD student's project best and who is used most.

CONTACT BETWEEN THE PHD STUDENTS AND SUPERVISOR

The PhD students were asked about both the *form* and *frequency* of contact with the supervisor. Both contact with the principal supervisor and contact with the co-supervisors. In connection with this, the PhD students were asked to distinguish between a) the informal meeting where the PhD students just run into the supervisor, b) informal meetings where the supervisor and PhD students briefly discuss the project, and finally c) actual supervisory meetings, i.e. planned meetings where the PhD project is the explicit reason for meeting. The figures are calculated based on the supervisor that the PhD students use most. The results are shown as a table (*Table 6.3*) and a figure (*Figure 6.1*).

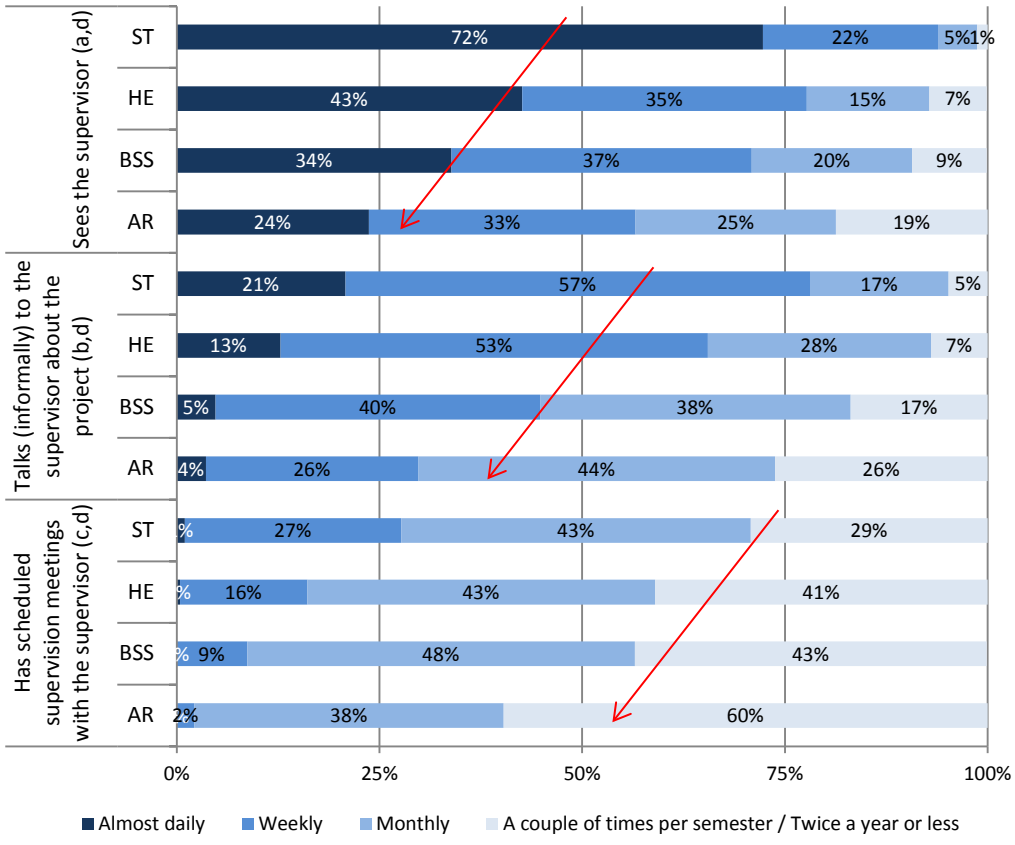
Table 6.3. Frequency of contact between the PhD student and the primary supervisor (defined as the supervisor the PhD student most often has contact with).

	Graduate schools	Almost daily	Weekly	Monthly	A couple of times per semester	Twice a year or less
Sees the supervisor[a, d]	AR	24%	33%	25%	13%	6%
	BSS	34%	37%	20%	7%	3%
	HE	43%	35%	15%	5%	2%
	ST	72%	22%	5%	1%	1%
Talks (informally) to the supervisor [b, d]	AR	4%	26%	44%	18%	8%
	BSS	5%	40%	38%	13%	4%
	HE	13%	53%	28%	6%	2%
	ST	21%	57%	17%	4%	0%
Has scheduled supervision meetings [c, d]	AR	0%	2%	38%	50%	10%
	BSS	0%	9%	48%	32%	12%
	HE	0%	16%	43%	32%	10%
	ST	1%	27%	43%	20%	9%

a) ”How often do you **see** your main supervisor? (This concerns the entirely informal communication, e.g. that you meet in the hallway or in the lunch room)”
b) ”How often do you **talk** to your main supervisor about your project? (This concerns the somewhat informal conversations and very short ad hoc meetings)”
c) ”How often do you have **scheduled** supervision meetings with your main supervisor? (This concerns long meetings where your project is the primary agenda)”
d) The calculation of these figures is based what the PhD students have responded earlier to the questions concerning which supervisor they use the most. E.g. if the PhD student stated that he or she most often has contact with a co-supervisor, the question of availability is based on the availability of the co-supervisor.
Note: 'Don't know/not relevant' replies are not included in the calculation.

As can be seen - most clearly in the figure, where the trend is highlighted by means of red arrows - there are significant differences between the graduate schools with regard to the regularity of contact between the PhD students and supervisor. The recurring pattern is that the PhD students at ST meet their supervisor most often. Next comes HE, BSS, and AR in that order. For example, 72 percent of the PhD students at ST see their supervisor almost daily in corridors, canteens and the like. At HE, BSS, and AR the figures are 43, 34 and 24 percent respectively. At ST 78 percent of the PhD students speak to their supervisor informally about their project on a weekly basis or more often. At HE, BSS, and AR the figures are 66, 45 and 30 percent respectively. At ST 71 percent of the PhD students meet with their supervisor at least once a month. At HE, BSS, and AR the figures are 59, 57 and 40 percent respectively.

Figure 6.1. Frequency of contact between the PhD student and the primary supervisor (defined as the supervisor the PhD student most often has contact with).



a) "How often do you **see** your main supervisor? (This concerns the entirely informal communication, e.g. that you meet in the hallway or in the lunch room)"
b) "How often do you **talk** to your main supervisor about your project? (This concerns the somewhat informal conversations and very short ad hoc meetings)"
c) "How often do you have **scheduled** supervision meetings with your main supervisor? (This concerns long meetings where your project is the primary agenda)"
d) In calculating these figures, the starting point is the PhD students' answer to the earlier question about which

supervisor they use most. If the PhD students have e.g. indicated that he or she uses a co-supervisor the most, then the question of availability is based on the availability of the co-supervisor.
Note: 'Don't know/not relevant' replies are not included in the calculation.
Note: The categories ”A couple of times per semester” and ”Twice a year or less” are pooled to create a better overview.

It is actually noteworthy that this pattern - the greater frequency of meetings in the hard subject areas compared to the soft - applies to all three types of contact between the PhD students and supervisors. Both for meetings in passing, informal ad hoc meetings including discussion of the project and planned supervision meetings. There is therefore no sign of the lower degree of everyday ad hoc contact being counterbalanced by the more frequently occurring formal contact.

THE SUPERVISOR'S AVAILABILITY

Despite the variations in the frequency of meetings, the variation is very small when you ask the PhD students whether they find that their supervisor is available when needed. For Aarhus University as a whole, 91 percent of the PhD students agree with the statement that their supervisor is available.

Table 6.4. The PhD students' experience of the supervisor's availability

	AU	AR	BSS	HE	ST
My main supervisor (either main supervisor or co-supervisor) is available when needed	91%	89%	89%	93%	91%

Note: The figures show the proportion who agree or somewhat agree with the statement. The rest answered neutral, somewhat disagree or disagree. The calculation does not include those who answered don't know/ not relevant.
Note: The calculation of these numbers is based what the PhD students have responded earlier to the questions concerning which supervisor they use the most. E.g. if the PhD student stated that he or she most often has contact with a co-supervisor, the question of availability is based on the availability of the co-supervisor.

There might be additional explanations for there on the one hand being a significant difference in the frequency of the supervision that the PhD students receive at the different faculties, and on the other hand, almost no difference in their experience of the supervisor's accessibility. A possible explanation is that among the PhD students at the various faculties, relatively different expectations of the quantity and frequency of supervision associated with the PhD process has been established. It is also possible that the figures for availability are overestimated, as they are calculated on the basis of the supervisor that the PhD students have previously indicated they make most use of.

MAIN CONCLUSIONS

- The number of supervisors linked to the individual PhD project varies considerably - and there are significant differences between the four faculties.
- Two supervisors per project is the most common model at AR, BSS and ST, while at HE it is most common to have three supervisors, though four or more supervisors are quite widespread.
- The principal supervisor's de facto role in relation to the students' projects varies quite a lot. Across the graduate schools the analysis shows that in one out of five cases, the co-supervisor is the supervisor that the PhD students use most. Among the PhD students at HE, almost every third states that the co-supervisor in practice is the supervisor who knows the PhD student's project best and who is used most.
- There are significant differences between the graduate schools with regard to the frequency of contact between supervisors and the PhD students.
- The frequency of meetings is unambiguously greatest in the hard subject areas and this applies to all three types of contact between the PhD students and supervisor. Both for meetings in passing, informal ad hoc meetings including discussion of the project and planned supervision meetings. A lower degree of everyday ad hoc contact is apparently not counterbalanced by more frequently occurring formal contact.
- It is applicable for all forms of contact that the PhD students at ST have the most frequent meetings with their supervisor. Then follow HE, BSS and AR.

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CHAPTER 7. CONTENT OF THE SUPERVISION

The content of the supervision deals with the topics that are (most) often taken up during the supervision. In the research literature, discussion centres on the content of the PhD supervision being both (i) directly research-related, such as e.g. supervision of literature reviews, methods, analysis and academic writing, (ii) indirectly research-related such as e.g. project management, networking and teaching assignments, and (iii) personally-related such as e.g. support for socialisation in the workplace, discussion of the emotional aspects of work as a researcher and the relationship between work and private life (Haksever & Manisali, 2000; Handal & Lauvås, 2006; Murphy, Bain & Conrad, 2007; Taylor & Beasley, 2005).

The regulations of the PhD Order permit a broad interpretation of the concept of supervision, which entails that supervisors as a minimum touch on items (i) and (ii). The research on the PhD process confirms that students also wish to receive most supervision within these areas and that they especially need advice and instruction on how to carry out a literature review, how to 'tailor the project' so it fits in with (and expands) the existing research on the subject, and how to write good scientific texts (Engebretson et al., 2008; Heath, 2002; James & Baldwin, 1999; Severinsson, 2012; Zhao et al., 2007)

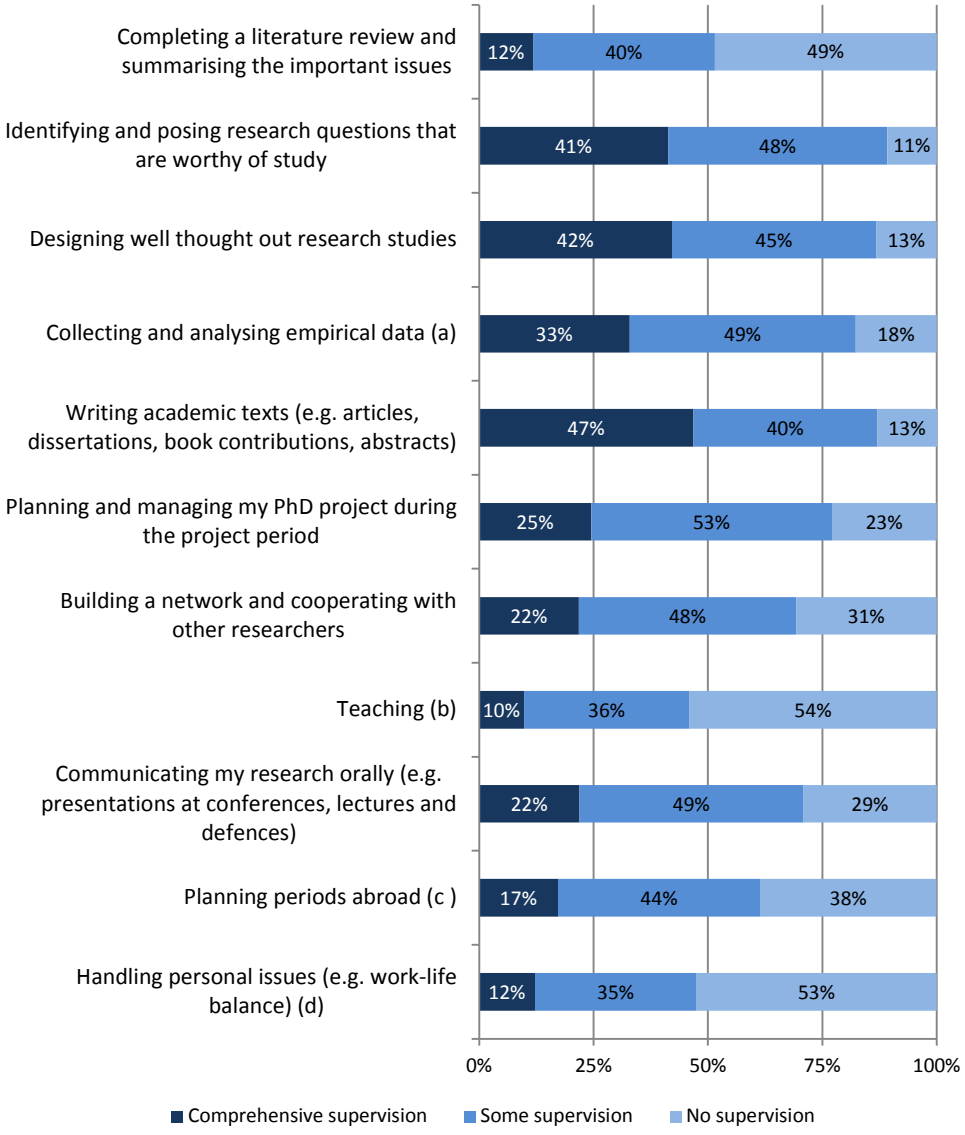
From the students' point of view this is not synonymous with the fact that personal topics are - or ought to be - absent from supervision (Fraser & Matthews, 1999; Haksever & Manisali, 2000). It is very important for the PhD students' well-being that their supervisors show an interest in them as individuals and that they discuss non-academic topics if the students have a need for this (James & Baldwin, 1999; Lamm, 2004; Sayed, Kruss & Badat, 1998). Many of the students report that they often look elsewhere for this type of supervision, e.g. from fellow students, older colleagues or co-supervisors (Cullen et al., 1994; Mullen, Fish, & Hutinger, 2010; Paglis, Green & Bauer, 2006; Wisker, 2007).

CONTENT ELEMENTS

The PhD students were asked to indicate the scope of the supervision for five points that relate to the direct research supervision, five points relating to the indirect research supervision, and a final item on supervision relating to personal issues.

The results for the university as a whole are shown in the graphic in *Figure 7.1*, and the results are reproduced in *Table 7.1,* but now distributed after the graduate schools. The proportion of the PhD students who have responded 'Don't know/not relevant' is higher than 10 percent for some of the content elements. A note indicates where this is the case. The high number of 'Don't know/not relevant' answers is also predictable. For example, it can be expected that a large number of the PhD students are unable to provide answers about the scope of the supervision regarding studying abroad, as they are not far enough into their degree programme for this to be relevant.

Figure 7.1. Extent of supervision on eleven content elements.



Question: "Please describe to what degree you have received supervision in the following areas. The supervision given can be from one or more supervisors."

a) The proportion who have replied with 'Don't know/ not relevant' is 10 percent. These are not taken into account in the calculation.
b) The proportion who have replied with 'Don't know/ not relevant' is 13 percent. These are not taken into account in the calculation.
c) The proportion who have replied with 'Don't know/ not relevant' is 10 percent. These are not taken into account in the calculation.
d) The proportion who have replied with 'Don't know/ not relevant' is 10 percent. These are not taken into account in the calculation.

As expected, in accordance with the research literature the direct research-related supervision dominates the supervision. A large majority of the PhD students state that they have received some or comprehensive supervision on posing research questions, designing well thought out research studies, collecting and analysing empirical data, and writing academic texts. On the other hand, it is not expected that half of the PhD students indicate that they have not received any supervision in completing a literature review and summarising the important issues.

It is also in line with the research literature when a slightly smaller proportion state that they have received some or comprehensive supervision in relation to indirect research-related areas, such as project management, networking and the like. In relation to project management, 25 percent indicate that they have received comprehensive supervision, 53 percent indicate that they have received some supervision, while 23 percent of the students indicate that they have received no supervision on managing the PhD project during the project period.

Table 7.1. Extent of supervision on eleven content elements

	AU	AR	BSS	HE	ST
Completing a literature review	51%	43%	51%	50%	56%
Posing research questions	89%	91%	86%	92%	87%
Designing research studies	87%	79%	83%	93%	85%
Collecting and analysing empirical data [a]	82%	73%	72%	85%	86%
Writing academic texts	87%	77%	81%	93%	87%
Planning and managing my PhD project	77%	79%	73%	75%	79%
Building a network and with other researchers	69%	70%	63%	74%	67%
Teaching [b]	46%	52%	57%	44%	41%
Communicating my research orally	71%	57%	53%	75%	78%
Planning periods abroad [c]	62%	60%	69%	49%	68%
Handling personal issues [d]	48%	51%	40%	47%	49%

Question: "Please describe to what degree you have received supervision in the following areas. The supervision given can be from one or more supervisors."
Note: The question is abbreviated for space reasons - see *Figure 7.1* for the full wording.
Note: The figures show the proportion that replied they had received some or comprehensive supervision. The remainder have replied that they received no supervision. 'Don't know/not relevant' replies are not included in the calculation. Due to rounding-off there may be differences of one percentage point between *Figure 7.1* and

Table 7.1
a) The proportion who have replied with 'Don't know/ not relevant' is 10 percent. These are not taken into account in the calculation.
b) The proportion who have replied with 'Don't know/ not relevant' is 13 percent. These are not taken into account in the calculation.
c) The proportion who have replied with 'Don't know/ not relevant' is 10 percent. These are not taken into account in the calculation.
d) The proportion who have replied with 'Don't know/ not relevant' is 10 percent. These are not taken into account in the calculation.

If we remain within the indirect research-related supervision, carrying out teaching is the area where there is least supervision of all, judging by the figures. More than half of the PhD students indicate that they have received no supervision in carrying out teaching.

With regard to supervision relating to handling personal issues, including the balance between family and working life, 12 percent indicate that they have received comprehensive guidance and 35 percent indicate that have received some guidance.

THE PHD STUDENTS' COMMENTS ON THE CONTENTS OF THE SUPERVISION

Among the comments from the PhD students, we find a number of descriptions of supervisors who are similar to the profile that emerges from the content of supervision in *Figure 7.1*. Comments about the content of the supervision deal mainly with the students' experience of having supervisors who are active with regard to the academic aspects of research, but who are cautious with regard to other aspects of the PhD process. The following example is an extract taken from a comment written by a student from a soft subject area.

> *My supervisor is extremely competent, very diligent as a supervisor and provides some cracking comments in the supervision, but can be difficult to talk to. The supervision does not really deal with anything other than the strictly academic. It is difficult to get supervision on things like future planning and expectations. I should however emphasise that my supervisor is generally friendly and polite (…) I am satisfied overall because the academic level is so high and I can find the "personal" supervision and feedback by talking to other PhD students.*

The quotation supports the general picture drawn by both figures and comments, which shows an overall satisfaction with the supervision and a positive assessment of the extensive subject-based academic supervision received. On the other hand, limited supervision of e.g. project management and teaching assignments are perceived as problematic, while lack of supervision on more personal issues can better be counterbalanced by feedback from fellow students and other colleagues.

MAIN CONCLUSIONS

- Directly research-related topics such as e.g. posing research questions, analysis and academic writing constitute the main content of the PhD supervision across all four graduate schools at Aarhus University (*Table 7.1*).
- Indirect research-related topics such as e.g. project management, networking and teaching represent a smaller part of the supervision compared with the directly research-related topics (*Figure 7.1*).
- Supervision for personal issues - including the balance between work and family life - are also touched upon to a lesser degree (*Figure 7.1*).
- Supervision in completing a literature review is touched upon least of all in the directly research-related supervision (*Figure 7.1*) and the least of all at AR (*Table 7.1*).
- Supervision in conducting teaching is touched upon least of all in the indirect research-related supervision (*Figure 7.1*) and the least of all at ST (*Table 7.1*).

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CHAPTER 8. SUPERVISOR RELATIONSHIPS

In the research literature it is well-established that successful PhD supervision is to a great extent a question of the PhD students and supervisors establishing positive and constructive working relationships. The students' perception of positive relationships are closely associated with their well-being, satisfaction and successful completion (de Valero, 2001; Gurr, 2001; Hockey, 1997; Ives & Rowley, 2005; McCormack, 2005; Scevak, Cantwell, & Monfries, 2001; Seagram et al., 1998; Wisker, 2005; Wright, 2003). Studies show that according to the students, positive relations are characterised by respect, recognition and openness (Cullen et al., 1994; Phillips & Pugh, 2000; Zhao et al., 2007). It has furthermore been demonstrated that the PhD students across disciplines attach special emphasis to these interpersonal aspects of the relationship (Tahir, Ghani, Atek, & Manaf, 2012).

Significant differences between disciplines can, however, to be seen when we examine the aspects of the supervisor relationship dealing with how much the supervisor acts to control the project, and how independently the students are expected to work. The expressions "hands-on" and "hands-off" are central concepts in the literature, describing respectively a controlling, interventionist supervision strategy and a more reticent supervision strategy (Sinclair, 2004). Hands-on supervisors meet frequently - often daily - with their students, they provide advice and make many of the academic choices in the project on behalf of the students, and they are often involved in decisions about structure and deadlines during the PhD process. They train the students in the presentation of their projects at conferences, at research meetings in the research group or the like, and they expect early and ongoing text production. Correspondingly, the supervisors react quickly to warning signals such as absence of text or postponement of deadlines. They are also often co-authors of the students' publications. The project is moreover closely related to the principal supervisor's field of research and often financed by external funds, which the principal supervisor has secured. The supervision typically takes place in cooperation with other supervisors (preferably in groups with several co-supervisors), just as much of the supervision takes place in the form of peer-to-peer training carried out by e.g. other PhD students, postdocs or laboratory technicians. Hands-on guidance is primarily seen in the health science and natural science disciplines and has proved to be a strong explanatory factor for the high rate of successful completion within these subject areas (Heath, 2002; Morton & Thornley, 2001; Pole et al., 1997; Sinclair, 2004; Wright & Cochrane, 2000).

Hands-off supervision is more well-known in the humanities and social science disciplines, where high requirements are made of the students' independence already early in the project. The students are often expected to be able to conduct individual projects, to take responsibility for the management and progress of the project, and to be able to assess the need for supervision themselves. The supervisory contact will vary and there can be longer periods without supervision, where the student could be e.g. engaged in field work or writing his or her dissertation. There is not necessarily an expectation of close academic overlap between the project and the supervisor's expertise. As a consequence the supervisor rarely has personal interest in the project or finds legitimate reasons to be able to control or guide the project. The student's project is expected to be an independent, original contribution. It is common for the student's primary (and sometimes only) supervisor relationship to be with the principal supervisor.

According to a major national survey conducted among more than 4,000 PhD students in the USA, a number of correlations can be traced between disciplines and supervisor relationships. The study shows that PhD students from the health science and natural science areas feel to a greater extent that they are being used as a source of labour by their supervisor compared to the students from the social sciences and the humanities (Zhao et al., 2007). In accordance with other studies (Egan, 2009), the study also shows that the PhD students within the humanistic disciplines are generally more satisfied with the supervision than their colleagues from the natural sciences (Egan, 2009; Zhao et al., 2007).

Finally, the research indicates that unambiguous models for 'good' supervisor relationships are not found, and nor are 'recipes' for how much control or support supervisors should give the students (Deuchar, 2008; Engebretson et al., 2008; Kam, 1997). The majority of the studies that investigate supervisor relationships conclude that supervisor relationships and forms of supervision must also be balanced in relation to a wide range of factors, such as e.g. the student's academic level, nature of the project and the juncture of the PhD process. An early and on-going reconciliation of expectations is therefore an important factor in creating successful supervisor relationships (Baltzersen, 2013; Hetrick & Trafford, 1995; Hoskins & Goldberg, 2005; Neumann, 2003; Phillips & Pugh, 2000; Woolhouse, 2002).

Based on the above literature, the questionnaire contains a comprehensive range of questions on the supervisor relationship, which together examine the students' experience of the interpersonal relationship, the degree of hands-on and hands-off supervision, the feeling of workload coming from the supervisor and the degree of reconciliation of expectations.

THE PERSONAL RELATIONSHIP WITH THE SUPERVISOR

The table below shows the distribution for the questions that relate to the personal relationship between the PhD students and supervisor. The reader should note an

important condition in that the PhD students were asked to describe the relationship with the supervisor they use most and who is closest to their project. There is thus in this chapter talk of an analysis of the PhD students' relationship to the supervisor who may be assumed to be most important for the PhD students' PhD process.

Table 8.1. The PhD students' experience of their personal relationship with the supervisor they use the most.

	AU	AR	BSS	HE	ST
My supervisor is friendly and accommodating	95%	97%	96%	95%	95%
The relationship between my supervisor and me is characterised by mutual respect	92%	94%	96%	92%	90%
My supervisor recognises my work	89%	94%	87%	89%	89%
I can openly discuss all problems with my supervisor	86%	87%	87%	87%	86%
My supervisor listens to how I want things to be	90%	93%	92%	89%	88%
My supervisor asks me about my needs and expectations regarding supervision	47%	61%	48%	46%	43%
My supervisor often seems unprepared for our meetings	15%	12%	15%	17%	15%

Question: "Please have in mind the supervisor that you use the most. Please indicate to what degree the following statements reflect your experience of the relationship between you and your supervisor."
Note: The figures show the percentage who have indicated that they agree or somewhat agree with the statement. The remainder have replied 'Neutral', 'Somewhat disagree', or 'Disagree'. The calculation does not include those who replied 'Don't know/not relevant'.

The picture of the relationship between the PhD students and the supervisor is first and foremost positive. By far the majority of the PhD students experience their supervisor as friendly and attentive and appreciative. Similarly, the majority of the PhD students experience a supervisor relationship that is characterised by mutual respect.

An actual conversation about expectations for the supervisor relationship is however less widespread. The proportion of the PhD students who experience that the supervisor asks about their needs and expectations towards the supervision is 47 percent. Finally, 15 percent find that the supervisor often seems unprepared for their meetings.

HANDS-ON SUPERVISION

While the previous questions on the supervision have dealt with the personal relationship between the PhD students and the supervisor, the questions in this section touch on the *type* of supervision - more precisely the degree of control exerted by

the supervisor. In the research literature, a high degree of control is described as hands-on supervision, while a low degree of control is described as hands-off supervision. The results are presented in *Table 8.2*.

Table 8.2. The PhD students' experienced degree of control (hands-on) from the supervisor that they use most.

	AU	AR	BSS	HE	ST
My supervisor often sets the agenda for the supervision	20%	11%	13%	18%	26%
My supervisor sets benchmarks and tells me what I need to do	31%	29%	27%	31%	33%
My supervisor follows up on whether or not I have time to do the things I need to do	48%	47%	45%	54%	45%
My supervisor has clear preferences for the direction my project needs to take	49%	29%	33%	57%	56%
My supervisor makes many important choices in my project	32%	10%	19%	39%	38%
My supervisor has a clear expectation that I will follow the advice I get	55%	41%	40%	62%	59%
My supervisor sometimes takes over the writing if I come to a standstill[a]	16%	1%	7%	20%	23%
My supervisor rarely gives specific advice about the best thing to do	23%	25%	31%	22%	22%

Question: "Please have in mind the supervisor that you use the most. Please indicate to what degree the following statements reflect your experience of the relationship between you and your supervisor."
Note: The figures show the percentage who have indicated that they agree or somewhat agree with the statement. The remainder have replied 'Neutral', 'Somewhat disagree', or 'Disagree'. The calculation does not include those who replied 'Don't know/not relevant'.
a) The proportion who have replied with 'Don't know/not relevant' is 10 percent.

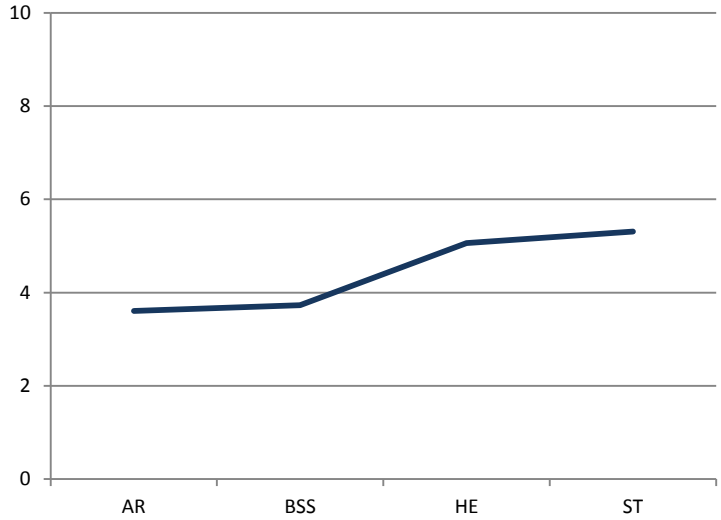
As expected based on the literature, the overarching pattern is that hands-on-supervision is more characteristic of the supervision practice in the hard subject areas than in the soft subject areas. For example, upwards of four out of ten PhD students from the health science and natural science areas reply that their supervisor makes many important choices regarding their project. At BSS and AR, the equivalent proportion is only 19 and 10 percent respectively. Another example is that the PhD students in the hard subject areas find to a greater degree than those in the soft subject areas that the supervisor has clear preferences for the direction the project needs to take.

Similarly, the most absolute form of hands-on supervision, where the supervisor sometimes takes over the writing in cases where the PhD students have come to a standstill, is not abnormal in the hard subject areas, while it is on the whole non-existent at AR.

HANDS-ON SUPERVISION ACROSS THE GRADUATE SCHOOLS

A scale was formed on the basis of an explorative factor analysis, which allowed us to describe the degree of hands-on supervision. The scale consisted of five individual questions regarding supervision: "My supervisor often sets the agenda for the supervision", "My supervisor makes many important choices in my project", "My supervisor has clear preferences for the direction my project needs to take", "My supervisor has a clear expectation that I will follow the advice I get" and "My supervisor sets benchmarks and tells me what I need to do"[6].

Figure 8.1. The degree of hands-on supervision across PhD schools (N=1.689).



Note: The degree of hands-on supervision is calculated on the basis of five questions: "My supervisor often sets the agenda for the supervision", "My supervisor makes many important choices in my project"," My supervisor has clear preferences for the direction my project needs to take", "My supervisor sets benchmarks and tells me what I need to do" and "My supervisor has a clear expectation that I will follow the advice I get". The scale runs from 0 to 10. A high value represents a high degree of control by the supervisor.

A one-way analysis of variance showed that the degree of hands-on supervision varied across the faculties $F(3, 1686)=56.3$, $p<.001$, $\eta_p^2=.091$, and a post-hoc analysis based on Bonferroni corrected confidence intervals showed a statistically significant difference in the degree of hands-on supervision between the hard and soft subject areas, but not between AR and BSS or between HE and ST. The result is illustrated in *Figure 8.1*.

[6] For a more detailed description of the scale's dimensionality and internal reliability, see *The Dimensionality of the Aarhus University Quality in the PhD Process Survey* at http://www.au.dk/fileadmin/www.au.dk/kvalitetiphd/factoranalysis.pdf .

SUPERVISION AND WORKLOAD

The final two questions relate to the cases where the PhD students experience a requirement for workload that exceeds what seems reasonable from the PhD students' perspective. The results are shown in *Table 8.3* below.

For the university as a whole, one in ten of the PhD students answer that their supervisor expects them to work so many hours that it is difficult to have a life outside the university. Eight percent answer that they sometimes feel they are seen primarily as a source of labour to advance the supervisor's own research. In general, the figures are slightly lower in the soft subject areas and slightly higher in the hard subject areas.

Table 8.3. Other issues in the PhD supervision.

	AU	AR	BSS	HE	ST
My supervisor expects me to work so many hours that it's difficult to have a life outside of university[a]	10%	6%	5%	11%	11%
Sometimes I have a feeling that my supervisor sees me primarily as a source of labour to advance his/her research	8%	2%	4%	9%	11%

Question: "Please have in mind the supervisor that you use the most. Please indicate to what degree the following statements reflect your experience of the relationship between you and your supervisor."
Note: The figures show the percentage who have indicated that they agree or somewhat agree with the statement. The remainder have replied 'Neutral', 'Somewhat disagree', or 'Disagree'. The calculation does not include those who replied 'Don't know/not relevant'.
a) Looking at the raw data, 10 percent replied 'Don't know/not relevant'. A closer analysis showed that the PhD students in the first third of the project found it especially difficult to answer this question.

By far the majority of the PhD students do not find themselves to be primarily seen as a source of labour, but some do. At HE and ST one out of 10 indicate that they sometimes feel that their supervisor seems to see them as a source of labour to advance their own research.

THE RELATIONSHIP BETWEEN THE PHD STUDENTS' AND THE SUPERVISOR'S PROJECTS

In the literature a question that is often discussed is whether you can as a supervisor, morally defend having double relations to the person you supervise and how, if this is possible, the dilemma can be handled.

The question occurs specifically e.g. in connection with PhD supervision where the supervisor has secured the funding that is financing the PhD student's project. In this way the supervisor becomes both the supervisor and employer, which may result in conflicts of interest. The employer is interested in meeting the project objectives within the required deadline and that the project is, as a result, productive, including the production of an appropriate number of articles. The supervisor has

more of an interest - in addition to the production of articles - in the PhD process as an educational process for the PhD students.

Expectations from the literature are thus that the way in which a PhD project is financed affects the supervisor relationship, and that an 'employer-supervisor' tends to be production oriented in his/her supervision, and downplays the process supervision.

Table 8.4 shows that a total of 45 percent of the PhD students at AU are in a process where their principal supervisor has secured external funding for a project which finances the PhD students' salary. Furthermore, it is shown that this is far more prevalent at HE and ST than it is at AR and BSS.

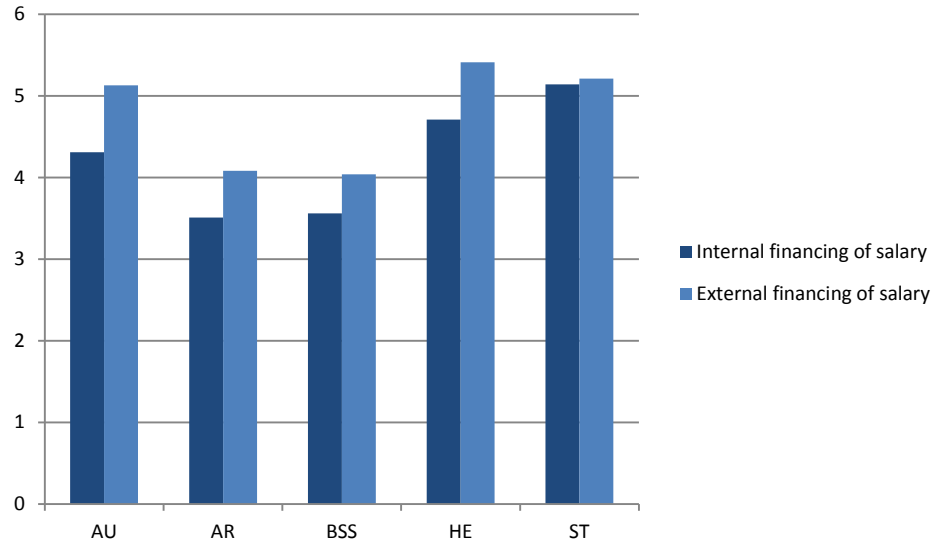
Table 8.4. Financing of the project and the relation to the research field of the main supervisor.

	AU	AR	BSS	HE	ST
Has your main supervisor applied for external funding for a project financing your salary?	45%	20%	20%	44%	66%
Is your project closely related to the research field of your main supervisor?	76%	60%	58%	78%	87%

Note: In the survey, external funding is defined in the following way: "External funding means funding from e.g. research funds, research councils and private or public-sector companies."
Note: The figures show the proportion who replied 'Yes'. The remainder replied 'No'. 'Don't know/not relevant' replies are not included in the calculation. None of the questions have a proportion of PhD students who have replied 'Don't know/not relevant' higher than 10 percent.

To investigate whether the degree of control in the supervision (hands-on supervision) was related to project financing, we compared two groups of PhD students: PhD students whose salary was financed by external funding secured by the principal supervisor, and PhD students whose salary was not financed by funds secured by the principal supervisor. The differences are illustrated in the graphic in *Figure 8.2*.

Figure 8.2. The degree of the supervisor's control (hands-on supervision) as a function of financing.



Question concerning financing: "Has your main supervisor applied for external funding for a project financing your salary?".
Note: The degree of hands-on supervision is calculated on the basis of five questions: "My supervisor often sets the agenda for the supervision", "My supervisor makes many important choices in my project"," My supervisor has clear preferences for the direction my project needs to take", "My supervisor sets benchmarks and tells me what I need to do" and "My supervisor has a clear expectation that I will follow the advice I get". The scale runs from 0 to 10. A high value represents a high degree of control by the supervisor.

For Aarhus University as a whole the analysis showed that the PhD students whose salary was financed by external funding secured by the principal supervisor, experienced a greater degree of hands-on supervision (*M*=5.1, *SD*=2.1) than the PhD students whose salary was not externally financed (*M*=4.3, *SD*=2.3), *t*(1504)=-7.226, *p*<.001. A further analysis showed that the correlation between the type of financing and supervisor control was statistically significant at HE *t*(507)=-3.,589, *p*<.001. On the other hand, there were no statistically significant differences between these two groups of PhD students at either AR t(217)=-1.710, *p*=.089, BSS *t*(218)=-1.324, *p*=.187, or ST *t*(341)=-0.365, *p*=.716.

In addition to these analyses we carried out a number of ANCOVA analyses with graduate school as control variable, where the effect of hands-on supervision was evaluated in relation to the PhD students' experience of the project and his/her process. It turned out that a high score on the scale hands-on supervision was weakly negatively correlated with the PhD students' experience of *independence*, *F*(1, 1685)=50.6, *p*<.001, η_p^2=.029, and very weakly correlated with the PhD students' *research self-efficacy, F*(1, 1684)=13.3, *p*<.001, η_p^2=.008. Correlations between hands-on supervision and respectively *exhaustion*, *F*(1, 1683)=2.6, *p*=.104,

η_p^2=.002, and *insecurity*, *F*(1, 1685)=0.4, *p*=.554, η_p^2=.000 were statistically and substantially insignificant.

THE IMPORTANCE OF SATISFACTION WITH THE RESEARCH SUPERVISION

A range of ANCOVA analyses with graduate school as control variable showed statistically significant correlations between the scale s*atisfaction with the supervision* and the following scales: *Independence* with regard to the project, *F*(1, 1684)=186.9, *p*<.001, η_p^2=,100, *research self-efficacy*, *F*(1, 1683)=164.0, *p*<.001, η_p^2=.089, *exhaustion, F*(1, 1682)=268.1, *p*<.001, η_p^2=.137, *insecurity* about the quality of the project, *F*(1, 1684)=413.3, *p*<.001, η_p^2=.197. Finally, we found a statistically significant correlation between *satisfaction with the supervision* and the question of the PhD students' satisfaction with the progress of the project, *F*(1, 1592)=429.7, *p*<.001, η_p^2=.213.

These analyses therefore suggest that the PhD students who are satisfied with their supervision are less uncertain as to whether their project lives up to the standards. They feel more independence in relation to their project and have a greater self-efficacy as a researcher. They feel less worn out and are more satisfied with the progress of the project.

In a follow-up analysis we found a very strong correlation between *satisfaction with the supervision* and the *interpersonal relationship* between supervisor and the PhD students *F*(1, 1684)=1394.8, *p*<.001, η_p^2=.453. We found a positive correlation between s*atisfaction with supervision* and the degree of h*ands-on supervision F*(1, 1684)=102.2, *p*<.001, η_p^2=.057, and a negative - but very weak correlation - between s*atisfaction with supervision* and the degree of *hands-of supervision F*(1, 1683)=5.7, *p*=.017, η_p^2=.003. Finally, it turned out that the more frequent the contact between the PhD students and supervisor, the greater the satisfaction. This applied to all three types of contact as described in *Chapter 7*: The meeting in passing *F*(1, 1648)=23.6 , *p*<.000, η_p^2=.054, the quick informal meeting at which the project is discussed *F*(1, 1657)=81.6, *p*<.000, η_p^2=.164, or the planned supervision meeting *F*(1, 1629)=38.9 , *p*=<.000, η_p^2=.087.

To sum up, the analyses point to the fact that the overall satisfaction with the research supervision is very closely linked to an open, respectful and collegial relationship between the PhD students and supervisor, just as satisfaction with the research supervision is also related to a certain level of control and follow-up on the part of the supervisor. Finally, the analyses suggest that a frequent informal contact between the PhD students and supervisor, where a brief discussion of the project may take place, is a strong predictor of satisfaction with the supervision.

THE PHD STUDENTS' COMMENTS ON THE SUPERVISOR RELATIONSHIP

In the PhD students' comments we again find many of the same conclusions that are found in the figures for hands-on and hands-off supervision respectively. This applies partly to differences between the faculties and partly to the disadvantages associated with too much and too little supervisory control.

The following quotation has been selected as an example of the many comments in which the PhD students from the hard subject areas describe hands-on supervision as a widespread practice and, at the same time, adopt a critical approach to this type of supervision.

> *In general there is too much control of the PhD students by the supervisors here at the faculty. I do not believe it is sustainable to assign a project to a student, where they act as a laboratory technician throughout their PhD. We should be entrusted with more responsibility for our projects and it should be made clear to the supervisors that there are parts of the project they do not have influence on. There is a greater risk of such a project failing, but that is precisely what there is room for in a PhD process.*

The quotation describes the perception of a controlling, intervening supervision in line with hands-on supervision. In the case here the supervision is perceived as a bit too controlling and a greater degree of freedom is called for.

By contrast the quotation below exemplifies how the PhD students in the soft subject areas generally describe hands-off supervision as a widespread practice and as a practice that also has its drawbacks.

> *In general I think it is fine that my supervisor thinks I should be independent, but I think it will begin to be a problem if the result is that the supervisor does not respond to emails, provide constructive criticism of texts and structure or reply directly to questions, because I have to find out of everything myself. If I in one way or the other comment on this and come with expectations to the supervision (which I have done), I feel that I am classified as not being independent, and that is just about the worst thing a PhD student can be in the group I am in. I sometimes feel that the feedback and communication is so sparse that I could just as well do without my supervisor (…) It seems like there is neither the time nor the desire to supervise me.*

The quotation describes the perception of a supervision with very little intervention, with emphasis on independence in line with hands-off supervision. In this case the supervision is experienced as being too loose, bordering on being absent and uninterested, and there is therefore a call for more control, guidance and contact.

Finally, the comments also reflect the issues relating to double relations, as previously shown in the analysis of the figures (*Figure 8.2*). Here the analysis showed a clear trend towards the degree of supervisor control following the type of financing.

That this can be perceived as being problematic is clear from the following quotation by a PhD student from a soft subject area:

> *For me, it has been problematic that my principal supervisor was at the same time project manager for the externally funded research project, which my PhD was a part of. This has meant that the supervision was often characterised by the fact that I was encouraged or pressured to do some things in my PhD process, which the people involved in the project wanted done and which led to me having a disproportionately heavy workload. I have long periods working 60-70 hours a week, and I have not had a summer holiday for several years. As a PhD student it can be difficult to say no. At the same time my principal supervisor was decided in advance, even though he did not actually have knowledge of the methodological approach that I use. I have therefore not had anything out of the supervision and have felt completely on my own.*

In the quotation the student reports on significant negative consequences of the supervisor having a double role as both supervisor and the person responsible for the funding from an external source of financing. In this case the consequences for the student were both reduced learning outcomes, increased workload and a feeling of loneliness.

GETTING STUCK IN THE MIDDLE AS A PHD STUDENT

Finally, the comments bring up a theme that is not encapsulated by the questionnaire's closed questions and analysis of figures. The theme concerns some PhD students' negative experiences of asymmetric power structures in the supervisor relationship. The comments bear witness to the fact that as a PhD student, you can get seriously 'stuck in the middle' in the relationship with your supervisor, if you are experiencing controversies and feel that you lack legitimacy or power to maintain your own wishes and points of view. There are examples in the comments that deal with the supervisor's efforts to suppress 'negative' research results, the supervisor's aversion to the students taking a study period abroad, the supervisor's aversion to the chosen research environment for the period abroad, competition and envy and questions of co-authoring.

Out of regard for anonymity we will not publish these comments, which both contain several critical opinions and also describe very personal, emotive situations. Instead we include the quotation below, which exemplifies that some of students use their comments to advocate a kind of 'ombudsman' for the PhD students, as a possible solution to the situations in which the supervisor relationship has reached a deadlock.

> *After completing my PhD degree programme I have spoken to many PhD students and it appears that very many have problems with their supervisors in one way or another. Perhaps it would be an idea to have some kind of impartial person who the PhD students could go to. Someone who does not only supervise educationally, but who is trained to take up issues between the stu-*

dents and supervisors. And if the person finds the need, they could get hold of both parties.

Other PhD students have similarly suggested that the graduate schools 'preempt' fruitless supervisor relationships by e.g. supervision training courses, instead of 'treating' them using ombudsmen etc. One characteristic of the comments is that students mainly ascribe the problem to either a lack of or poor pedagogical competencies on the part of the supervisors. This is also reflected in the following quotation from a PhD student in a hard subject area:

My relation with my supervisor is not the best. Sometimes this costs me so much stress that I simply can't focus on my work - thinking intensively about what he told me. I am pretty sure that in general he wants the best for me, but he simply doesn't have pedagogical skills or any kind of training in this direction. I think PhD supervisors should undergo a mandatory training in teaching/supervision and be aware of what exactly is expected from them when they supervise.

As in several of the other quotations, it expresses a wish from the PhD students for the supervisors to be offered (or directly required to take) pedagogical competency development and professionalisation of their supervisory function.

MAIN CONCLUSIONS

- The PhD students who are satisfied with the supervisor and the research supervision are less exhausted, less uncertain about the quality of the project, have more research self-efficacy and are more satisfied with the progress of the project.
- By far the majority of the PhD students at Aarhus University experience that the relationship with the supervisor they use most is characterised by mutual respect (*Table 8.1*). By far the majority of the PhD students also find that the supervisor they use most is friendly, attentive and appreciative *(Table 8.1)*.
- Direct dialogue about expectations to the supervision is less widespread. Only a little under half of the PhD students experience that the supervisor has asked about their expectations and requirements concerning the supervision (*Table 8.1*).
- Hands-on supervision is a more widespread supervision practice in the hard subject areas than the soft (*Figure 8.1*). Hands-on supervision is characterised by being product-oriented and by the supervisor exercising a high degree of control; both process control (e.g. setting benchmarks, goals and agendas for meetings), and academic control (e.g. making important decisions in the project, providing advice and expecting it to be followed).
- A radical form of hands-on supervision is shown when the supervisor takes over the writing in the event that the students have come to a standstill. It

is not abnormal practice in the hard subject areas, but it is a very limited practice in the soft subject areas and practically does not exist at AR (*Table 8.2*).

- The manner in which the PhD students' project is financed affects the supervisor relationship. In cases where supervisors have secured external funding for financing of the PhD students' salary, there is a tendency for the supervisors to practice a greater degree of hands-on supervision regardless of the faculty (*Figure 8.2*). It is most often the case in the hard subject areas that the supervisor has secured external financing of the student's salary (*Table 8.4*).
- One in ten of the PhD students experience that the supervisor they use most expects them to work so many hours that it is difficult for the PhD students to have a life outside of the university (*Table 8.3*).

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CHAPTER 9. INDEPENDENCE AND CONTROL

The PhD students were asked to relate to their own project by answering questions about two parameters: The feeling of independence and the feeling of control. Independence is not only a keyword in the literature on the PhD process. It is also an important focal point in the PhD Order (Uddannelsesministeriet [Ministry of Higher Education], 2013). Section 7(2) states that the PhD degree programme includes "carrying out *independent* research work under supervision" (italics added). According to the PhD Order, the students are thus expected to develop independence in their work as a researcher - if not from the outset then during the course of their PhD degree programme.

According to the research literature, both the PhD students and supervisors place great emphasis on independence, which is generally talked of as a necessary and positive condition for developing skills and confidence in their own capabilities as a future researcher (Overall, Deane & Peterson, 2011). Sense of ownership, autonomy to pursue their own research interests as well as control and responsibility for the project has proved to be linked to the PhD students' general satisfaction with the PhD process (de Valero, 2001; Mason, Goulden & Frasch, 2009; Mason, 2012). The transition from being a student at pregraduate level to having to act as an independent researcher at postgraduate is not, however, as simple as sometimes assumed (Lovitts, 2005; Manathunga & Goozée, 2007). Many PhD students feel unprepared for the transition and many report that they feel uncertain about what actually is expected of them and unsure about whether they can live up to the requirements (Austin, 2002; Golde & Dore, 2001).

INDEPENDENCE AND CONTROL

On a general level the figures suggest that by far the majority of the university's PhD students feel able to act independently during their project. The majority of the PhD students find the project exciting and when directly questioned, 84 percent state that they feel ownership of their project. It is important for the majority of the PhD students that they make the decisive choices in the project and only a few have a feeling of just being assistants on another project.

Comparing the figures across the graduate schools, the overarching trend is that the PhD students in the soft subject areas (especially at AR) compared to the PhD students in the hard subject areas (especially at ST) have a relatively stronger feel-

ing of independence in the form of a sense of ownership, interest in the project, and a desire to make critical choices in the project. For example, 82 percent of the PhD students at AR answer that it is important to them that they themselves make all critical choices in the project. The equivalent percentage at ST is 55 percent.

Table 9.1. The PhD students' sense of independence in the project

	AU	AR	BSS	HE	ST
I feel a sense of ownership of my project	84%	93%	89%	89%	76%
It is important to me that I make all the critical choices in my project	62%	82%	67%	61%	55%
I think that my project is very exciting	88%	96%	89%	90%	83%
Sometimes I feel that I'm nothing but an assistant to someone else's project	6%	1%	3%	5%	9%

Note: The figures show the percentage who have indicated that they agree or somewhat agree with the statement. The remainder have replied 'Neutral', 'Somewhat disagree', or 'Disagree'. The calculation does not include those who replied 'Don't know/not relevant'.

The PhD students were also asked about their sense of control of the project and the PhD process in general. The results are presented in *Table 9.2*. The most conspicuous aspect of the figures is that the PhD students apparently feel they are in control and uncertain at the same time. While 74 percent indicate that they have good control of the project, more than half answer at the same time that they often feel uncertain about whether what they are doing is good enough. Similarly, more than half state that they sometimes wonder whether they are good enough to be a PhD student.

Table 9.2. The PhD students' sense of control of the PhD process.

	AU	AR	BSS	HE	ST
I feel that I'm in control of the project	74%	73%	76%	80%	70%
I often feel insecure that what I do is good enough	59%	65%	73%	48%	61%
Sometimes I wonder if I'm good enough to be a PhD student	53%	59%	58%	47%	54%

Note: The figures show the percentage who have indicated that they agree or somewhat agree with the statement. The remainder have replied 'Neutral', 'Somewhat disagree', or 'Disagree'. The calculation does not include those who replied 'Don't know/not relevant'.

Again we see variations across the graduate schools. 73 percent of the PhD students at BSS often feel uncertain about whether the work they are doing is good enough, whereas the corresponding proportion of PhD students at HE is 48.

MAIN CONCLUSIONS

- A large majority of the PhD students at Aarhus University find their project exciting and feel ownership of the project (*Table 9.1*).
- Most of the PhD students (especially at AR) have a strong desire to act independently and to make all of the decisive choices in the project (*Table 9.1*).
- The majority of the PhD students feel that they are well in control of the research project, but at the same time they feel uncertain about whether they live up to the standards for being a competent PhD student (*Table 9.2*).

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CHAPTER 10. WORKLOAD AND WELL-BEING

A PhD process spans several years and is a period where the students are challenged both intellectually and emotionally. They have to handle the dual role of being a student and an employee (Haynes et al., 2012), and they have to succeed in being socialised into new roles as junior colleagues (Turner & McAlpine, 2011). They are expected to develop and maintain new relationships and create their professional identity (Martinez, Ordu, Sala & McFarlane, 2013; Weidman & Stein, 2003). For many PhD students this is also a phase of life with family obligations and accordingly the challenge to balance their working lives and private lives (Brus, 2006; Mason, Goulden & Frasch, 2009). All of these are roles and responsibilities that require the students' time and attention.

It is also a widespread experience that research can be an enriching but also demanding process, and it has been documented that the time spent in research training is stimulating for many people, but for some it is an exhausting experience associated with stress, uncertainty and a lack of commitment (Hyun, Quinn, Madon & Lustig, 2006; Kurtz-Costes, Helmke & Ûlkü-Steiner, 2006). The latest survey of the psychological work environment at Aarhus University in 2012 showed that a significant proportion of the PhD students who were consulted experienced severe stress symptoms (Aarhus University, 2012). The international educational research in PhD studies shows that negative emotions such as stress and burnout are well-known among the PhD students in the other Nordic countries (Jacobsson & Gillström, 2006; Stubb, Pyhältö & Lonka, 2011) and non-Nordic countries such as the UK (Juniper, Walsh, Richardson & Morley, 2011) and USA (Jairam, 2012; Lovitts, 2001). Research results from these indicate that the students who find themselves to be integrated in the daily research environment and to be acknowledged and respected as colleagues, experience less stress and burnout ((Pyhältö, Stubb & Lonka, 2009; Stubb et al., 2011; Vekkaila, Pyhältö & Lonka, 2013). The feeling of loneliness and isolation is apparently particularly critical for the PhD students as a group compared with other the academic groups of staff (Ali & Kohun, 2007; Jairam, 2012; McAlpine & Amundsen, 2009).

EXPERIENCE OF WORKLOAD

The PhD students were asked about their experience of the workload, including experiences of stress. The results are presented in *Table 10.1*.

Among the PhD students, 31 percent state that they often or almost always feel worn out, while 27 percent state that they often or almost always feel that their work as a PhD student affects their private life. Finally, 13 percent often or almost always experience severe stress symptoms. Severe stress symptoms are explicitly defined in the questionnaire as isolation, palpitations, stomach ache, depression, restlessness and memory loss.

Table 10.1. The PhD students' perception of the workload.

	AU	AR	BSS	HE	ST
Do you sometimes feel worn out?	31%	34%	34%	29%	30%
Do you feel that your work as a PhD student takes up so much time and energy that it affects your private life?	27%	32%	29%	25%	26%
Does your work as a PhD student give you severe stress symptoms[a]	13%	17%	17%	11%	12%

Note: the figures show the proportion who answered 'Almost always' or 'Often'. The remainder have answered 'Sometimes', 'Rarely' or 'Almost never'. 'Don't know/not relevant' replies are not included in the calculation.
a) In the questionnaire strong stress symptoms are defined as: "(e.g. isolation, palpitations, stomach ache, depression, restlessness, memory loss)"

The feeling of workload is a little more widespread in the soft subject areas than in the hard areas. 17 percent of the PhD students at AR and BSS state that they often or almost always have severe stress symptoms due to the work. The equivalent figures for HE and ST are 11 and 12 percent respectively.

At AR and BSS in particular, the figures cover significant differences between the individual PhD degree programmes (cf. Appendix).

LONELINESS

Another aspect of well-being is an absence of isolation in the daily life at work. In the focus group interviews with the PhD students prior to the data collection, it became clear that the PhD students distinguished between *social* and *academic* loneliness. As a result of this a question was included to operationalise the perception of academic loneliness. This asked whether the PhD students felt that they act alone in their project and lack the necessary academic feedback. The results are presented in *Table 10.2*.

If we look at the social loneliness first, 13 percent state that they often or almost always feel lonely in the day-to-day work at the workplace. It also appears that loneliness is more widespread in the soft subject areas than it is in the hard areas. Almost every fifth PhD student at AR and BSS feel lonely in everyday life at the workplace.

Table 10.2. The PhD students' perception of loneliness.

	AU	AR	BSS	HE	ST
Do you feel lonely during your day at your workplace?	13%	18%	18%	9%	11%
Do you feel that you act alone in your project and lack the necessary feedback to make progress?	16%	18%	22%	12%	16%

Note: The figures show the proportion who have answered 'Almost always' or 'Often'. The remainder have answered 'Sometimes', 'Rarely' or 'Almost never'. 'Don't know/not relevant' replies are not included in the calculation.

With regard to the so-called academic loneliness, 16 percent of the PhD students answered that they often or almost always feel alone with their project and lack the necessary feedback to make progress. This type of feeling of loneliness is apparently most widespread at BSS.

You could argue that the entire supervising institution in the graduate schools has been set-up precisely so that the PhD students should not feel that they "act alone in their project and lack the necessary feedback to make progress." That every sixth PhD student at AU - and at BSS more than every fifth - experience this is a clear indicator that there is room, and a need, for improvements in the supervision efforts of the graduate school, together with a stronger integration of the PhD students into the research environment in general.

At AR and BSS in particular, the figures once again cover significant differences between the individual PhD degree programmes (cf. Appendix).

THE CONSEQUENCES OF LONELINESS

The statistical analyses in *Chapter 10* showed that the PhD students who were integrated in a collegial research environment were significantly less exposed to loneliness than the PhD students who were not integrated in a collegial research environment. To uncover the possible consequences that loneliness has on the students' experience of the PhD process, we carried out a number of analyses with loneliness as explanatory variable. As dependent variables we chose the scales *exhaustion*, *insecurity*, and *research self-efficacy*[7]. The results are summarised in *Table 10.3*.

[7] See http://www.au.dk/fileadmin/www.au.dk/kvalitetiphd/factoranalysis.pdf for a more detailed description of the scale.

Table 10.3. The relationship between loneliness (social and academically) and being worn-out, insecurity and research self-efficacy.

	Not lonely	Socially lonely		Not lonely	Academically lonely	
Being worn out (0-10)	4.1	6.2	*	4.0	6.0	*
Insecurity (0-10)	3.9	5.7	*	3.7	6.1	*
Research self-efficacy (0-10)	7.4	6.7	*	7.4	6.4	*

Note: Being worn out, insecurity, and research self-efficacy are additive scales from 0-10.
Note: The PhD students who had answered 'Often' or 'Almost always' to the question "Do you feel lonely during your day at your workplace?" were categorised as socially lonely. The PhD students who had answered 'Often' or 'Almost always' to the question "Do you feel that you act alone in your project and lack the necessary feedback to make progress?" were categorised as academically lonely.
*p<.05.

As can be seen in the table, the socially lonely PhD students are markedly more exhausted, which includes that they experience a greater degree of severe stress symptoms. They are also more uncertain about themselves and their project, and they have lower research self-efficacy. The same applies to the PhD students who are academically lonely, i.e. the PhD students who feel alone with their project without the opportunity for feedback from anyone.

COMMENTS FROM THE PHD STUDENTS

The topics of workload and well-being give rise to plenty of comments from the PhD students and testify to the fact that life as a PhD student can be perceived as psychologically demanding. The comments reflect to a great degree the conclusions that are supported in the statistical analysis. As described above, the analysis showed that one-third of the PhD students feel themselves to be exhausted. Just as many feel that their work affects their private life. Severe stress symptoms and social loneliness are experienced by every eighth PhD student. The comments are primarily about the difficulties of handling unlimited work, where the tasks can easily spread far into leisure time, about family obligations, about being new to the job, and about job insecurity.

The essence of the comments are captured in the following description from a PhD student in a soft subject area:

> *The limitless working life presses far too many emails and work tasks in around the clock and at weekends. The older generation appears to be able to more or less manage this lifestyle - perhaps due to the security that permanent tenure gives, perhaps due to experience, but perhaps also because family life is less stressful for them in their 50s and 60s. For a PhD student who is new to the job, without any prospect of permanent tenure and with a newly established family, small children and plenty of financial uncertainties, life is simply*

hard. There is a need for much more simple and honest career guidance that understands the new conditions that PhD students live under today (…) I For a long time I believed I was a good and harmonious student who would avoid all that business of reporting sick and psychological problems. I was not. Something must be done.

The quotation describes how hard it is to combine unlimited work, fixed-term employment, the role of new and junior colleague and the family obligations that follow with a newly established family and small children. The quotation also supports the figures, which showed that these working conditions can have serious consequences in the form of stress and exhaustion. Finally, the quotation illustrates a specific desire for career guidance, which is also expressed in several of the other comments. In general these comments mark a strong awareness of the fact that a PhD process entails socialisation into academic traditions and work-culture norms, which again increase the students' need for support and supervision in personal problems such as e.g. handling the balance between working life and private life.

MAIN CONCLUSIONS

- One-third of the PhD students feel that they are often or always exhausted. A quarter feel that the work takes up so much of their time and energy that it negatively affects their private life (*Table 10.1*).
- Every eighth PhD student experiences severe stress symptoms in everyday life (*Table 10.1*).
- Every eighth PhD student feels lonely socially at the workplace and every sixth feels lonely with regard to his/her project (*Table 10.2*).
- Social and academic loneliness has clear negative consequences for the PhD students' sense of exhaustion, insecurity, and research self-efficacy (*Table 10.3*).

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CHAPTER 11. THE PROGRESS OF THE PROJECT

The project's progress is included in the questionnaire as an approximated objective measure for completion time. Completion on time is a not insignificant goal when viewed with regard to financial efficiency. Similarly, both students and supervisors are expected to have an interest in completion viewed with regard to learning and career.

Not surprisingly, completion of PhD degree programmes is also a widely examined phenomenon in the research literature. Here a large number of comprehensive studies show that the best explanatory factors for timely completion are: 1) integration in the research environment (Golde, 2000), and 2) frequent and supportive supervision (Bair & Haworth, 1999; Holbrook et al., 2006; Sinclair, 2004; Wao, 2011). The studies also show that both factors dominate the PhD process in the natural science and health science disciplines (CGS, 2008; Earl-Novell, 2006; Jiranek, 2010; Wright & Cochrane, 2000). Other, but less powerful explanatory factors on completion have been shown in some small-scale studies, including gender (men) (Jiranek, 2010; Moses, 1994; Siegel, 2005), financing (full scholarship) (Jiranek, 2010), as well as enrolment arrangements (full-time) (Bourke, Holbrook, Lovat & Farley, 2004; Martin, Maclachlan & Karmel, 2001; Vassil 2012).

The overall conclusion in the research literature is thus that the students' background characteristics do not determine their possibilities for, or decisions to complete - nor do their grade levels from previous degree programmes, even though they are most often used as selection criteria (Lovitts, 2001). The crucial factor is what happens to the students after they enter the PhD degree programme. Completion is a function of structures and processes in the PhD process, the organisational cultures in the graduate schools, and the possibility of integration in the research environment (Lovitts, 2001).

PROGRESS AND CAUSES OF LACK OF PROGRESS

The PhD students were asked two questions about the progress of their project. Firstly, whether they had completed or reckoned that they realistically would be able to complete the PhD degree programme within the stipulated time. In the questionnaire emphasis was placed on the fact that so-called legitimate leave extends the PhD period. Secondly, the PhD students were asked whether they were -

all things considered - satisfied with the progress of the project. The results are shown in the table below.

Table 11.1. The PhD students' assessment of the progress in their project.

	AU	AR	BSS	HE	ST
Did you finish or do you realistically expect to finish your PhD degree programme within the stipulated time?[a]	88%	80%	94%	87%	90%
Did you or do you realistically expect to finish your PhD degree programme within the stipulated time? [PhD students in the last third of their process][b]	81%	67%	89%	81%	85%
Are you – all things considered – happy about the progress in your PhD project?	79%	80%	82%	83%	75%

Note: The figures show the proportion who replied 'Yes'. The remainder replied 'No'. 'Don't know/not relevant' replies are not included in the calculation.
a) The following was written as a note to the question: "By stipulated time we mean the deadline on which you have to hand in your dissertation. This date can have been extended due to maternity leave or other officially approved leave."
b) N=776

As can be seen in the table, the majority of the PhD students expect to complete the project within the stipulated time. The proportion is greatest among the PhD students at BSS. The proportion is smaller among the PhD students at AR, where one in five do not expect to submit or have not submitted the project within the prescribed deadline. Not surprisingly, when you isolate the answers from the PhD students who are in the final third of their PhD degree programme, the proportion who expect to submit their dissertation on time falls.

The PhD students who stated that they were not satisfied with the progress and/or did not realistically expect to be able to complete the project within the stipulated time were directed to questions about possible causes for the lack of progress. *Table 11.4* below is only based on the 190 PhD students who have stated that they will not be able to complete within the prescribed time.

Table 11.2. Factors that the PhD students consider to have contributed to the delay of the project (N=190).

	AU	AR	BSS	HE	ST
Lack of motivation and interest	16%	7%	38%	10%	24%
The project has become immense and difficult to manage	42%	40%	69%	37%	42%
Fear of not being good enough	33%	36%	69%	18%	39%
Problems with the financing	9%	17%	15%	7%	4%
Practical or experimental conditions (e.g. access to equipment or data	47%	19%	8%	74%	45%
Inadequate supervision	23%	17%	38%	24%	24%
Low quality supervision	17%	12%	46%	10%	22%
Family or personal conditions (e.g. illness)	37%	45%	54%	28%	37%
Other	26%	45%	8%	22%	22%
N	190	42	13	68	67

Question: "Which factors do you consider to have significantly contributed to the delay or the lack of progress? (You can choose more than one answer.)"
Note: The analysis only includes the 190 PhD students who answered no to the question about whether they completed or realistically expected to complete their project within the stipulated time.

For Aarhus University as a whole, the majority of PhD students provided the following reasons for being delayed: practical or experimental conditions, that the project had become immense and difficult to manage, family or personal conditions (including illness), as well as fear of not being good enough. However, these figures cover considerable variation across the graduate schools. Three-quarters of the group of PhD students at HE who answer that they expect to be delayed state that this is due to practical or experimental conditions.

MAIN CONCLUSIONS

- Four out of five of the PhD students who are in the final third of their PhD degree programme expect to submit on time, though only two-thirds at AR (*Table 11.1*).
- The most often stated reason for delay is that the project has become immense and difficult to manage. At ST and in particular HE practical or experimental conditions are stated as the cause of delay (*Table 11.2*).
- Statistical analyses in *Chapter* 5 showed that integration in the research environment is positively correlated with the students' satisfaction with the progress of the project.

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CHAPTER 12. DISSERTATION AND PUBLISHING

Production of written work is a core activity and an often used parameter for success in the world of research. Similarly a PhD dissertation is the most visible result of a PhD process, just as the dissertation is the product that is weighted most in the final evaluation. For this reason the PhD students in the survey were asked about their experience of publication and knowledge dissemination during their process. The PhD students was also asked about their choice of format for the dissertation and its language, as well as their publication profile, i.e. how many abstracts, papers and/or books they had had accepted.

It is however not possible to use the number of publications during the PhD process as an unambiguous success parameter. Firstly, because the requirements made of the dissertation in the PhD Order are not interpreted uniformly across Aarhus University's various graduate schools and degree programmes. Secondly, because it is well-established in the international literature on PhD processes that quality parameters such as originality and cogency in research work are often interpreted in very different ways across disciplines and even within narrow academic circles (Badley, 2009). Thirdly, because the international literature documents that very different traditions for publication across disciplines leads to unequal conditions for comparison, if you attempt to measure productivity by the number of publications alone (Sabharwal, 2013). The format for articles is well-established in most health sciences, technical and scientific disciplines, where the tradition of co-authorship contributes to increasing publication rates (Lei & Chuang, 2009) and helps explain the higher production compared with the humanities and social science disciplines (Hesli & Lee, 2011). The format for articles is however gaining ground in the humanities and social science disciplines (Sabharwal, 2013).

There is thus considerable uncertainty associated with using selected publication formats and numbers as a single measure of productivity across the university's graduate schools and programmes. It is still interesting, however, to get a descriptive picture of the PhD students' choice and experience of publication. We know from the international research that conference presentations and articles are the formats in which the PhD students most frequently gain experience during their degree programme (Dinham & Scott, 2001). It has also been shown that the faster the PhD students complete, the more they publish later in their research career – irrespective of publication format (Hesli & Lee, 2011). The same applies to the PhD

students who publish during their PhD degree programme: They will also in all probability publish later in their research career. Not surprisingly it has been shown that the PhD students' rate of publication increases concurrently with progression in the PhD degree programme (Kahn & Scott, 1997; Paglis et al., 2006).

Several studies point to clear correlations between the PhD supervision and the PhD students' productivity measured by number of publications (Jones, 2013). Direct help, guidance and support in writing by the supervisor, including detailed feedback on text, increases the students' productivity (Dinham & Scott, 2001; Robins & Kanowski, 2008). It appears that the productivity increases in particular when supervisors adopt a collaborative approach to writing, e.g. by organising peer feedback and writing groups (Lee & Boud, 2003; McGrail, Rickard & Jones, 2006), or by writing together with the PhD students (Florence & Yore, 2004; Kamler, 2008; Alison Lee & Kamler, 2008). In a comprehensive review of interventions targeting increased publication, the authors conclude that academic text production does not come of its own accord but requires considerable institutional support in the form of writing courses, writing groups, guidance, and peer feedback (McGrail et al., 2006).

THE FORM OF THE DISSERTATION

The form of the PhD student's dissertation can be divided into two categories: the article model, where the dissertation consists of a number of articles bound together by an overall summary, and the monograph model, where the dissertation consists of a coherent work, typically in the form of a book.

As can be seen from *Table 12.1*, the article model is the most common model, especially among the health science PhD students. At AR on the other hand, it is most common to submit the dissertation in the form of a monograph.

Table 12.1. The form of the dissertation

	AU	AR	BSS	HE	ST
As a number of manuscripts/articles plus a summary	72%	26%	77%	95%	68%
As a monograph / book	27%	73%	23%	5%	30%
Other	1%	1%	0%	1%	2%

Question: "How do you plan to submit your dissertation?"
Note: Due to rounding-off the sum of the total for HE is 1.01.

The PhD students were also asked which language they were writing or planning to write their dissertation in. As can be seen in the table, 92 percent of the PhD students write their dissertation in English. Eight percent are planning to submit the

dissertation in Danish. At AR the proportion of the PhD students writing in Danish is however 40 percent.

Table 12.2. The language of the dissertation

	AU	AR	BSS	HE	ST
Danish	8%	40%	12%	2%	0%
English	92%	57%	88%	98%	100%
Other language	1%	3%	0%	0%	0%

Question: "In which language are you writing (or planning to write) your dissertation?"
Note: Due to rounding-off the sum of the total for AU is 1.01.

PUBLICATION PROFILE

In order to obtain a picture of the nature and scope of the PhD students' publications, the PhD students were asked about the types of research products they had currently had accepted. The results are reported in *Table 12.3* and *Table 12.4*. The reader is asked to note that the analysis is limited to the PhD students who were in the final third of their PhD degree programme. This analytical choice was taken as these PhD students reasonably may be assumed to have written publications, which are ready to be published, or at least ready to be submitted for review.

Table 12.3. Research products accepted from PhD students in the final third of their process (PhD students who writes articles).

	No	No, but under review	Yes, nationally	Yes, internationally	Yes, both nat. and intern.
an abstract aimed at a research conference (n=560)	6%	0%	4%	33%	57%
a paper as first (principal) author in a peer-reviewed journal (n=562)	15%	10%	1%	56%	18%
a paper as co-author in a peer-reviewed journal (n=556)	30%	6%	1%	50%	14%
a paper in a journal or magazine (not peer reviewed) (n=517)	65%	1%	18%	9%	7%

Question: "In the following you will find a list of research products. Please indicate one or more research products that you have already completed or will complete in the very near future. Have you obtained approval of…"
Note: Only the PhD students who have indicated that they would submit the dissertation as a number of articles (article mode) and who are at the same time in the final third of, or have completed, the PhD degree programme are included in the analysis. The valid number of responses (n) is stated for each question. 'Don't know/not relevant' replies are not included in the calculation.

As can be seen in the table, the vast majority of the PhD students in this final third of their degree programme have had an abstract accepted as a poster or oral presentation at a research conference, while 90 percent have presented their research at international conferences.

The majority of the PhD students in the final third of their degree programme have similarly had an article accepted by a peer review journal. 75 percent have had an article accepted as principle author and 65 percent have had an article accepted in which they are co-author.

Table 12.4 presents the figures for the PhD students who are in the final third of their PhD degree programme and who, at the same time, state that they plan to submit the dissertation as a monograph. If we look at this group in isolation, the vast majority have had an abstract accepted for a poster or oral presentation at a research conference. 34 percent at international conferences and 51 percent at both national and international conferences. Not surprisingly, far fewer of the PhD students who are writing monographs have at this time had their research published.

Table 12.4. Research products accepted from PhD students in the final third of their process (PhD students who writes monograph).

	No	No, but under review	Yes, nationally	Yes, internationally	Yes, both nat. and intern.
an abstract aimed at a research conference (n=216)	10%	0%	6%	34%	51%
a book (n=202)	89%	1%	7%	2%	1%
chapters in a book (n=204)	73%	3%	9%	12%	3%

Question: ”In the following you will find a list of research products. Please indicate one or more research products that you have already completed or will complete in the very near future. Have you obtained approval of…”
Note: Only the PhD students who have indicated that they would submit the dissertation as a book or monograph and who are at the same time in the final third of, or have completed, the PhD degree programme are included in the analysis. The valid number of responses (n) is stated for each question. 'Don't know/not relevant' replies are not included in the calculation.

The PhD students who stated that they had had articles accepted were asked to indicate a) the number of articles accepted with them as principal author, b) the number of articles accepted as co-author, and (c) how many of these articles were written with one or more supervisor. Based on these figures it was possible to calculate the number of articles the PhD students write in collaboration with one or more of their supervisors. The results are presented in *Table 12.5*.

Table 12.5. Proportion of articles written by PhD students and supervisor jointly.

	AU	AR	BSS	HE	ST
Proportion of articles written with supervisor(s)	75%	[a]	42%	77%	82%
N	388	[a]	33	196	151

Question: "How many articles in peer-reviewed journals have you had accepted (given consent) by now?"
Note: Only the PhD students who have indicated that they write articles and who are at the same time in the final third of, or have completed, the PhD degree programme are included in the analysis. The valid number of responses (n) is stated in the table.
a) As the valid n for AR<10, the result is not shown.

MOST IMPORTANT POINTS

- More than 9 out of 10 of the PhD students at Aarhus University write their dissertation in English. Though 40 percent write in Danish at AR.
- At BSS, HE and ST more than two-thirds of the PhD students write articles, while three out of four of the PhD students at AR are planning to write a monograph.
- The majority of the PhD students in the final third of their degree programme have had oral or written contributions accepted at international research conferences.
- The majority of the PhD students in the final third of their degree programme have had articles accepted by peer-reviewed journals.
- A significant proportion of the PhD students' research articles - almost half at BSS and more than three out of four in the hard subject areas - are written in collaboration with the supervisor.

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CHAPTER 13. RESEARCH SELF-EFFICACY

Confidence in own abilities as a researcher (*research self-efficacy*) refers to the PhD student's confidence that he or she can master the tasks tied to driving successful research, e.g. to complete a literature review, analyse data and publish academically (Overall et al., 2011). According to Bandura's theory of self-efficacy, confidence in one's own abilities is important because people who expect to be able to master a task have greater courage in tackling challenges and demonstrate greater persistence when they encounter problems (Bandura, 1997). Bandura also argues that confidence in one's own abilities is a good predictor for increased learning among students and better academic performance (Bandura, 1989).

A large number of studies on the PhD process confirm the importance of the PhD students' developing *research self-efficacy* (Gelso & Lent, 2000). The PhD students who successfully develop confidence in their own abilities to solve research tasks have more motivation for conducting research and are more interested in pursuing a research career (Bishop & Bieschke, 1998; Hollingsworth & Fassinger, 2002; Kahn & Scott, 1997). They are also more productive with regard to publishing articles and presenting at conferences (Bieschke, 2006; Brown, Lent, Ryan & McPartland, 1996; Hollingsworth & Fassinger, 2002; Phillips & Russell, 1994).

Studies have pointed to a number of factors that predict the PhD students' research self-efficacy. Research points to an inclusive research environment as increasing the students' research self-efficacy (Brown et al., 1996). A similar relation is demonstrated for the PhD students who report positive experiences with supportive, personal supervision that promotes independence (Overall et al., 2011; Paglis et al., 2006). Finally, it is demonstrated that the PhD students' research self-efficacy increases concurrently with the PhD process (Bieschke, Bishop & Garcia, 1996).

RESEARCH SELF-EFFICACY

The PhD students were asked the following questions: "To what extent do you feel confident managing the following tasks? (Place yourself on a continuum from 1 to 5)." The students were subsequently asked to assess their confidence in own abilities in relation to eight research competencies. The table below shows the percentage of PhD students who state that they have developed research self-efficacy, operationalised with the proportion of the PhD students who have selected 4 or 5

on the scale. The figures are reported for the PhD students who stated that they were in the final third of their degree programme.

Table 13.1. PhD students' research self-efficacy (PhD students in the final third of their project)

	AU	AR	BSS	HE	ST
… completing a literature review and summarising the important issues	85%	84%	82%	92%	81%
… identifying and posing research questions that are worthy of study	78%	93%	82%	84%	66%
… designing well thought out research studies	72%	84%	77%	79%	60%
… collecting and analysing empirical data	85%	83%	84%	93%	80%
… submitting an abstract to a conference that will be accepted	85%	90%	85%	94%	76%
… submit a manuscript to a journal/publisher that will be accepted	62%	59%	52%	80%	51%
… successfully conduct a research project by yourself	66%	76%	68%	75%	54%
… be an effective and successful scientist	55%	58%	57%	65%	46%

Question: " To what extent do you feel confident managing the following tasks? (Place yourself on a continuum from 1 to 5.) 1 indicated "Not at all confident" while 5 indicated "Very confident".
Note: The figures indicate the proportion who have answered 5 ("Very confident") or 4.
Note: The analysis is limited to the PhD students who state that they are in the final third of their degree programme AU (841), AR (112), BSS (109), HE (279), ST (341).

As can be seen from *Table 13.1*, the majority of the PhD students at Aarhus University who are in the final third of their degree programme answer that they are very confident in own abilities as researcher. The first six statements are about the sense of being able to perform specific tasks associated with specific stages or contexts in a research process, while the final two statements are more about a general sense of being able to master the entire process and working as a researcher. Without being able to precisely say what the high and low values on the scale are, it is worth noting that more students feel very confident in own abilities as researcher when it comes to being able to solve specific subtasks, rather than when it comes to being able to succeed on a more general level as a researcher. Of the six statements about specific research tasks, the publishing task (submit a manuscript that will be accepted) is the one where the fewest PhD students at Aarhus University state that they are very confident in their research self-efficacy (62 percent). Though the PhD students from HE stand out here with 80 percent.

It is also worth noting that there are fewest students from ST who express great confidence in own abilities to successfully conduct a research project alone (54

percent) and to be an effective and successful scientist (46 percent). Compared with the students from AR, there are also significantly fewer students from ST who indicate a predominantly positive sense of being able to master specific tasks related to the initial stages of a research process. 66 percent of the PhD students at ST indicate great confidence in identifying and posing research questions that are worthy of study, while the corresponding figure is significantly higher at AR (93 percent). Similar differences can be identified between ST and AR when the students are asked to indicate their confidence in designing well thought out research studies, as the figure is 60 percent at ST and 84 percent at AR.

A supplementary one-way analysis of variance (ANOVA) with the PhD students in the final third of their degree programme, showed that graduate school predicted the degree of research self-efficacy measured with the PhD students' average score on the scale *research self-efficacy*, $F(3, 802)=61.1$, $p<.001$, $\eta_p^2=.082$. This scale was based on the PhD students' responses to the eight questions about research self-efficacy[8]. A post-hoc analysis with Bonferroni adjusted confidence intervals showed that the PhD students at AR reported greater research self-efficacy than the PhD students at ST ($p<.000$). The analysis also showed that the PhD students at HE on average scored higher on the scale than the PhD students at BSS ($p=.030$) and ST ($p<.000$). The PhD students at BSS had a lower average score than the PhD students at HE ($p=.030$), but a higher average score than the PhD students at ST ($p=.008$).

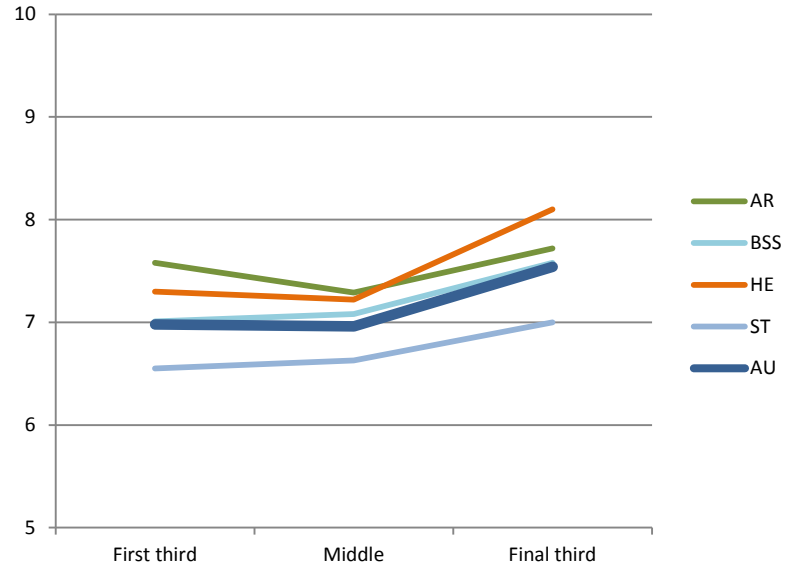
RESEARCH SELF-EFFICACY IN DIFFERENT PHASES

In *Figure 13.1* below, the PhD students' average score on the scale *research self-efficacy* is compared across the graduate schools. How far the PhD students are in their degree programme is also taken into account

The graph is not based on longitudinal data, and you should therefore be wary of interpreting it as such. Nonetheless, the graphs demonstrate the same trend, as you would expect. From the beginning of the PhD degree programme until the middle of the process there is virtual stagnation or even a small fall. On the other hand, there is a positive development in research self-efficacy towards the end of the PhD degree programme. Within each of the graduate schools, the PhD students who are in the final third of their PhD degree programme score higher on the scale than the PhD students who are in the first third of the degree programme.

[8] The scale is based on a preceding factor analysis. For a more detailed description of the scale's dimensionality and internal reliability, see *The Dimensionality of the Aarhus University Quality in the PhD Process Survey* at http://www.au.dk/fileadmin/www.au.dk/kvalitetiphd/factoranalysis.pdf.

Figure 13.1. Research self-efficacy during different stages of the PhD-process (N=1.689)



Note: The scale *Research self-efficacy* is composed of eight items. The scale is rescaled so that it goes from 0 (Not at all confident) to 10 (Very confident).

A statistical analysis partly confirmed the picture shown by the graph, i.e. that the students' progression in the process - measured by whether they find themselves in the first, second or final third of the process - predicts the degree of research self-efficacy $F(2, 1613)=22.8$, $p<.001$, $\eta_p^2=.027$. A post-hoc analysis with Bonferroni adjusted confidence intervals showed that the PhD students at the end of the PhD degree programme reported greater research self-efficacy than the PhD students at the beginning ($p<.000$) and in the middle ($p<.000$) of their degree programmes.

MAIN CONCLUSIONS

- Compared with the PhD students at the beginning of their PhD degree programme, the PhD students in the final third of their degree programme score higher on the scale *research self-efficacy*. This suggests that the PhD students' research self-efficacy increases during the PhD process at Aarhus University.
- Among the PhD students at the end of the PhD degree programme, confidence in being able to conduct a research project by themselves is highest among the PhD students from AR (76 percent) and HE (75 percent), and lowest among those at ST (54 percent).
- A summarising of the questions about research self-efficacy in a combined scale shows that the PhD students at HE and AR have the highest average scores, while the average score for the PhD students at ST is lower.

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CHAPTER 14. SATISFACTION

Even though satisfaction may be criticised for being a modest success parameter, the international research in PhD processes suggests that the PhD students' satisfaction with the learning outcomes of their degree programme is important, because the level of satisfaction is found to affect their completion (Hesli, Fink, & Duffy, 2003). Studies have shown that the PhD students who report low levels of satisfaction with learning outcomes have a higher probability of abandoning or considering abandoning their degree programme (Lovitts, 2001).

Similar criticism may be made against using satisfaction with supervision as an isolated and direct indicator of the quality of supervision. But if satisfaction with supervision is compared to other parameters it may be seen as a valuable measure of the quality of the supervision (Holbrook et al., 2006). Firstly, the research shows a positive correlation between the PhD students' satisfaction with the supervision and their general satisfaction with the PhD process (Mason, 2012). Secondly, the research suggests that the PhD students are more satisfied with the supervision when they experience a positive and constructive collaborative relationship with the supervisor that is characterised by collegiality, including recognition, respect, personal interest and solicitude (Zhao et al., 2007). Thirdly, the research suggests that the PhD students' experience of constructive supervisor relationships has a positive influence on the PhD students' productivity (Lan & Williams, 2005), research self-efficacy (Paglis et al., 2006), progress in the writing process, (Faghihi, Rakow & Ethington, 1999), and completion times (Gardner, 2009; Wao, 2011).

Finally, it is worth noting that the satisfaction with the learning outcome of the overall PhD process is generally high among the PhD students if you take a good look around the international landscape of studies on the topic (Golde & Dore, 2001; Heath, 2002; Trigwell & Dunbar-Goddet, 2005). Similarly, large quantitative studies show that the majority of the PhD students surveyed are satisfied with the supervision they receive during their PhD degree programmes (Cullen et al., 1994; Heath, 2002; Holbrook et al., 2006).

SATISFACTION WITH LEARNING OUTCOMES AND RESEARCH WORK

The PhD students were asked to consider how satisfied they were with their PhD process in the form of three items: Their learning outcome, the quality of their re-

search work, and the quality of their research supervision. Finally, as a measure of satisfaction the PhD students were asked to state whether they were willing to warmly recommend their principal supervisor. The results are reported in *Table 14.1* as well as figures *14.1* to *14.3*. Due to rounding-off the individual figures may vary with a single percentage point, depending on whether the table or the figures are read off.

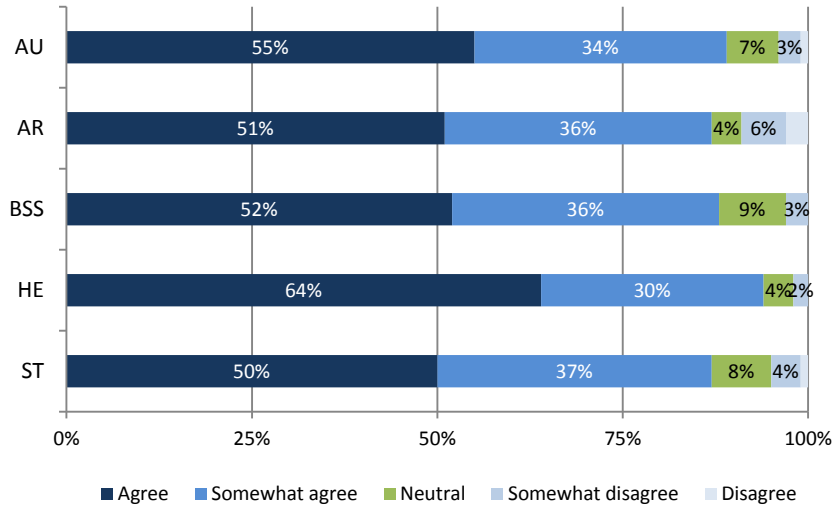
Table 14.1. Satisfaction with the PhD process.

	AU	AR	BSS	HE	ST
Overall, I'm satisfied with what I have learned during my PhD process	89%	87%	87%	93%	87%
Overall, I'm satisfied with the quality of my research work	82%	85%	80%	91%	75%
Overall, I'm satisfied with the quality of my research supervision	77%	79%	71%	82%	75%
I can warmly recommend my main supervisor	78%	78%	73%	78%	79%
I can warmly recommend my main supervisor[a]	82%	82%	79%	85%	80%

Note: The figures show the percentage who have indicated that they agree or somewhat agree with the statement. The remainder have replied 'Neutral', 'Somewhat disagree', or 'Disagree'. The calculation does not include those who replied 'Don't know/not relevant'.
a) Only the PhD students who have indicated that the main supervisor is the supervisor with which they have most contact and is best informed about their work. The number of responses is therefore somewhat lower than for the other questions: AU (1363), AR (208), BSS (193), HE (370), ST (592).
Note: 'Don't know/not relevant' replies are not included in the calculation

As can be seen from *Table 14.1* together with *Figure 14.1*, the vast majority of the PhD students - 89 percent - are generally satisfied with what they have learned during their PhD process. This generally high level of satisfaction with the learning outcome applies across all of the graduate schools. The majority of the PhD students - 82 percent - are also satisfied with the quality of their research work.

Figure 14.1. Satisfaction with the learning outcome.



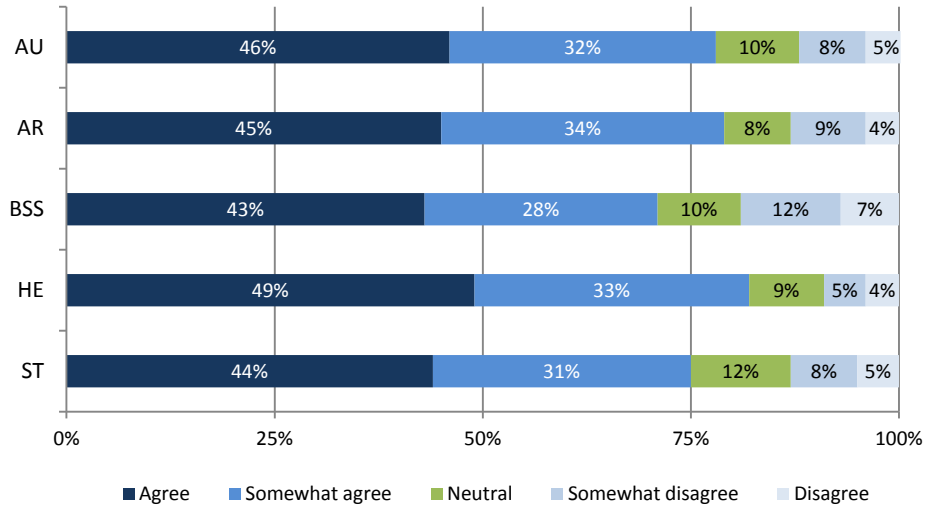
Question: "Overall, I'm satisfied with what I have learned during my PhD process"
Note: 'Don't know/not relevant' replies are not included in the calculation.

SATISFACTION WITH THE RESEARCH SUPERVISION

As can be seen from *Table 14.1* as well as *Figure 14.2*, the majority of the PhD students are generally satisfied with the quality of their research supervision. 78 percent agree or somewhat agree with the statement "Overall, I'm satisfied with the quality of my research supervision." On the other hand, 13 percent are not satisfied with the quality of their research supervision, while 10 percent are neither satisfied nor dissatisfied.

A comparison across the graduate schools shows greatest satisfaction among the health science PhD students. Satisfaction is lower among the PhD students at BSS, where 19 percent of the PhD students are not satisfied with the research supervision.

Figure 14.2. Satisfaction with the research supervision.

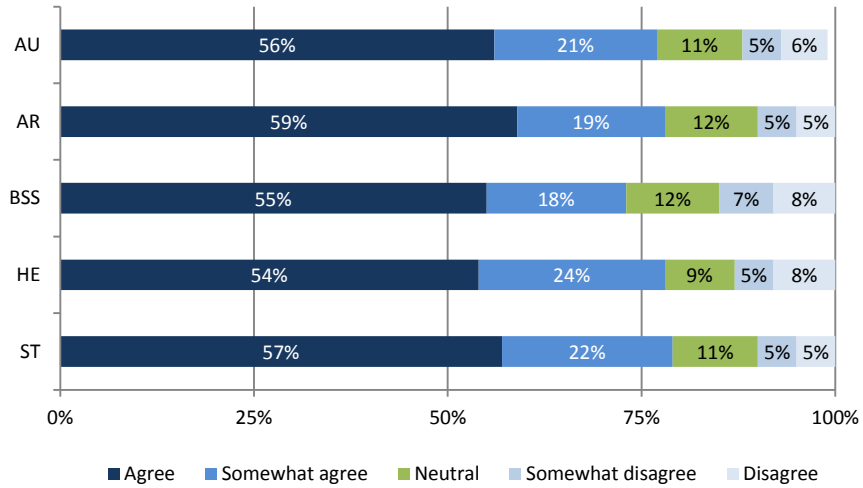


Question: ”Overall, I’m satisfied with the quality of my research supervision”
Note: 'Don't know/not relevant' replies are not included in the calculation.

78 percent of the PhD students can warmly recommend their principal supervisor (*Table 14.1*), and 13 percent cannot recommend their principal supervisor (*Figure 14.3*). As the principal supervisor is not always the one that the PhD students use most, two figures are specified in *Table 14.1*. The uppermost number (fourth row) is the total as already described. The lowermost number (fifth row) is the willingness to recommend the principal supervisor by the PhD students who have indicated that the principal supervisor is actually also the supervisor with which the PhD student has most frequent contact, and the one who knows most about the PhD student’s project. Based on this figure there are slightly more - 82 percent - who would gladly recommend their principal supervisor.

The reader should note that the satisfaction with the research supervision and the willingness to recommend the principal supervisor varies considerably across the PhD degree programmes - especially among those at BSS, where the breadth of variation between the PhD degree programmes on the question of satisfaction with the research supervision is 30 percentage points (see appendix).

Figure 14.3. Willingness to recommend the main supervisor



Question:" I can warmly recommend my main supervisor"
Note: 'Don't know/not relevant' replies are not included in the calculation.

MOST IMPORTANT POINTS

- The vast majority of the PhD students at Aarhus University are generally satisfied with what they have learned during their PhD process.
- The majority of the PhD students are generally satisfied with the quality of their research supervision.
- Satisfaction with the research supervision is relatively low on some of the PhD degree programmes. In some places 60 percent of the PhD students or less are satisfied with the research supervision.
- The majority of the PhD students who indicate that the principal supervisor is the primary supervisor on the project can recommend their principal supervisor. However, this figure includes considerable variation among the PhD degree programmes.

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CHAPTER 15. CAREER PLANS

For a of number of reasons it is important to examine the extent to which the PhD process at Aarhus University endows the students with the desire to pursue a research career. Firstly, because according to the PhD Order, the PhD programme is a research programme that primarily aims to qualify the students to undertake research, development and teaching assignments in the private and public sectors, in which a broad knowledge of research is a prerequisite. Secondly, an important, overall objective for the graduate schools at Aarhus University is, in addition to attracting and developing research talents, to *retain* the most outstanding PhD graduates in research positions at the university.

The Ministry of Higher Education's most recent calculations on the employment of newly graduated researchers in Denmark show that 92 percent were in employment 4-19 months after completion of their degree programme (Danske Universiteter [Universities Denmark], January 2013). The most recent employment survey among PhD graduates at Aarhus University (year group 2011/12) showed a correspondingly high figure (Aarhus University, May 2013). The study also showed that 45 percent of the surveyed PhD graduates in employment were employed at universities, in government research and other public research institutions. In light of the significantly increased intake of PhD students since 2006 at the Danish universities including Aarhus University, it is however not given that the high employment rate for PhD graduates will continue, or that as many as hitherto will find employment in academic posts at the universities (Neumann & Tan, 2011). Both Danish and international studies also suggest that many of the PhD students increasingly experience that there are uncertain opportunities for research careers (Johnston & Murray, 2004; Dansk Magisterforening [the Danish Association of Masters and PhDs], 2011).

Danish and American studies have shown that the majority of the PhD students enrol on a PhD programme because they find the field and research work interesting and because they dream of a research career (Anderson & Swazey, 1998; Golde & Dore, 2001, 2004; Dansk Magisterforening [the Danish Association of Masters and PhDs], 2011). The interest in continuing in a research career appears to have the same level or increase during the PhD process in the case of the PhD students who state they are satisfied with the learning outcomes of the process (National-Research Council, 1998), and who have established a positive researcher identity as

well as an interest in and enjoyment of the research work (Austin, 2002b; Leonard, Becker & Kelly, 2005). The interest in continuing in a research career appears to decline in the PhD students who report on the negative experiences of 'life as an academic', e.g. loneliness and a competitive environment, publication pressure and a difficult balance between working life and private life (Austin, 2002a; Golde & Dore, 2004; Harman, 2002; Moorhead-Rosenberg, 1997).

CAREER PLANS

In the final part of the questionnaire the PhD students were asked to indicate which career they currently would like to pursue. Each PhD student could select a maximum of two possible career paths. The results are presented in *Table 15.1.*

Table 15.1. The PhD students' further career plans.

	AU	AR	BSS	HE	ST
Researcher at a university	57%	72%	67%	48%	56%
Researcher career outside the university (e.g. in a private research organisation, an industrial company etc.)	48%	43%	44%	35%	61%
Lecturer (at a level below university level)	12%	28%	8%	8%	10%
Employee in the private sector (with no major focus on research)	21%	9%	24%	9%	33%
Employee in the public sector (with no major focus on research)	10%	11%	20%	7%	8%
Become self-employed	6%	9%	7%	2%	7%
Doctor at a hospital or a private practice (only Health)	15%	0%	0%	47%	0%
None of the careers above	7%	14%	8%	7%	5%

Question: "Which career would you currently like to pursue? (Tick off up to two of the career paths below)"
Note: The PhD students had the opportunity of selecting a maximum of two possible career paths. Only respondents who have selected at least one career path (N=1705) are included in the analysis.

Looking firstly at Aarhus University as a whole we see that it is most common for the PhD students to see themselves in a research-related career. 57 percent indicate that they would like to pursue a career in research at the university, while 48 percent would like to pursue a career in research outside the university. Looking across the graduate schools, we see that the trend is for the desire for a research career at the university to be most widespread among the PhD students in the soft subject areas and, in particular, among the PhD students at AR. On the other hand, the proportion of PhD students who would like to pursue a career in research outside the university is greatest among the PhD students at ST.

With the exception of the PhD students at AR, only a smaller proportion of the PhD students would like to pursue a career as a teacher outside the university.

21 percent of the PhD students would like to pursue a non-research-based career in the private sector, and 10 percent would like to pursue a non-research-based career in the public sector. There are again clear differences between the graduate schools. 24 percent of the PhD students at BSS and 33 percent of the PhD students at ST see themselves in a non-research-based career in the private sector. 20 percent of the PhD students at BSS can see themselves in a non-research-based career in the public sector.

Only a few of the PhD students indicate that they see themselves in a career as self-employed. As something special for the health science PhD students, 47 percent indicate that they can see themselves in a career as a medical doctor at a hospital or in a private practice.

MAIN CONCLUSIONS

- The majority of the PhD students at Aarhus University see themselves following a research career - either at the university or outside the university.
- Approximately half of the PhD students can see themselves pursuing a career without emphasis on research.
- A quarter and one third of the PhD students at BSS and ST respectively can see themselves pursuing a non-research-related career in the private sector, and one-fifth of the PhD students at BSS can see themselves in a career in the public sector without emphasis on research.
- Almost half of the PhD students at HE would like to pursue a career at a hospital or in a private practice.
- Among the PhD students in the humanities, upwards of every fourth PhD student would also like to pursue a teaching career outside the university.

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APPENDIX: MAIN RESULTS AT PHD PROGRAMME LEVEL

KEY FIGURES FOR PHD PROGRAMMES AT ARTS

Abbreviations:

AIOR:	Anthropology, International Area Studies and the Study of Religion
KLK:	Art, Literature and Cultural Studies
Didactics	Didactics
HAA:	History, Archaeology and Classical Studies
IMKJ:	ICT, Media, Communication and Journalism
SLK:	Language, Linguistics and Cognition
LP:	Learning and Education
TIF:	Theology, History of ideas and Philosophy

	AR (total)	AIOR	KLK	Didactics	HAA	IMKJ	SLK	LP	TIF
On the way to a PhD (Important + Very important)									
I was passionate about doing research	96%	100%	97%	91%	100%	81%	100%	97%	100%
I was very interested in my topic	97%	97%	97%	94%	97%	100%	100%	95%	100%
I assumed that the PhD title would create opportunities in the job market outside the university	43%	52%	42%	47%	59%	35%	25%	49%	15%
I considered it to be a regular job with a permanent income	45%	65%	49%	38%	39%	62%	31%	41%	33%
I didn't have any other plans when I was given the opportunity	13%	21%	11%	17%	10%	24%	0%	9%	8%
Has your main supervisor applied for external funding for a project financing your salary?	20%	21%	17%	23%	25%	37%[a]	13%	22%	4%
The PhD subject elements (To some degree + To a high degree)									
Do you and your main supervisor use the interim evaluations to take stock of your PhD process?	60%[a]	69%	62%	52%	72%	60%[a]	53%	56%	52%
Do you use the PhD planner to survey the progress in your project?	25%	30%	14%	30%	41%	21%	27%	17%	20%
Does the selection of PhD courses give you the possibility of strengthening your general research qualifications?	63%	61%	58%	75%	75%	60%	47%	76%	44%
Does the selection of PhD courses give you the possibility of strengthening your research qualifications within the framework of your project?	35%	27%	29%	53%	37%	42%[a]	33%	46%	11%
Has the work you do beyond your own project (e.g. various department work including teaching) been useful?	86%[a]	93%[a]	100%	68%[a]	97%	82%[a]	85%[a]	73%[a]	87%[a]

	AR (total)	AIOR	KLK	Didactics	HAA	IMKJ	SLK	LP	TIF
Is the work you do beyond your own project (e.g. various department work including teaching) of such a magnitude that it affects your project?	61%[a]	65%	62%	60%	75%[a]	56%[a]	54%[a]	67%[a]	41%[a]
Research environment (Somewhat agree + Agree)									
I feel like I'm part of the research community here	64%	63%	73%	59%[a]	79%[a]	63%	75%	59%	44%
Here I feel respected as a co-researcher	75%	66%	86%	78%[a]	86%[a]	79%[a]	81%	68%	60%
In this research environment, research conducted by PhD students is acknowledged although it may not be ground-breaking	68%[a]	66%	69%	73%[b]	62%[a]	74%[a]	85%[a]	77%[a]	43%[b]
There is a sense around here that working together on re-search is fun	56%[a]	61%	46%	58%[b]	67%[b]	63%[b]	79%[a]	50%[a]	42%[a]
It is possible to talk openly with colleagues about successful as well as unsuccessful experiences	63%[a]	60%	56%	68%[b]	57%[a]	70%	87%	63%[a]	59%[a]
Here we present and discuss each other's research on a regular basis	56%	63%	56%	46%[a]	62%[a]	60%	87%	47%	48%
I feel that the researchers here are harsh and negative rather than constructive when giving feedback on each other's work	18%[a]	21%	22%	26%[b]	12%[a]	16%[a]	13%	17%[a]	12%
People seem to be very competitive	40%[a]	47%	57%	28%[b]	36%[a]	25%	27%	34%[a]	46%
Supervision relationship (Somewhat agree + Agree)									
My supervisor is friendly and accommodating	97%	97%	97%	100%	94%	90%	100%	100%	100%
My supervisor recognises my work	94%	97%	94%	97%	90%	90%	81%	100%	92%
My supervisor asks me about my needs and expectations regarding supervision	61%	71%	56%	72%	47%	65%	31%	76%	56%
Sometimes I have a feeling that my supervisor sees me primarily as a source of labour to advance his/her research	2%	3%	0%	0%	3%	10%	0%	0%	0%
My supervisor (either co-supervisor or main supervisor) is available when needed	89%	80%	94%	85%	88%	89%	94%	94%	88%
My supervisor makes many important choices in my project	10%	19%	14%	15%	13%	5%	0%	0%	4%
My supervisor has clear preferences for the direction my project needs to take	29%	45%	30%	33%	26%	19%	33%	19%	23%
My supervisor has a clear expectation that I will follow the advice I get	41%	55%	23%[a]	30%	64%[a]	37%[a]	53%	24%[a]	50%
My supervisor sometimes takes over the writing if I come to a standstill	1%	0%	0%	3%	3%	0%	0%	0%	0%
Independence and control (Somewhat agree + Agree)									
I often feel insecure that what I do is good enough	65%	66%	61%	55%	71%	75%	56%	73%	68%
Sometimes I wonder if I'm good enough to be a PhD student	59%	68%	50%	52%	61%	52%	63%	66%	64%
I feel a sense of ownership of my project	93%	88%	94%	97%	84%	95%	81%	100%	100%
It is important to me that I make all the critical choices in my project	82%	81%	78%	70%	88%	81%	88%	94%	80%

	AR (total)	AIOR	KLK	Didactics	HAA	IMKJ	SLK	LP	TIF
Workload (Often + Almost always)									
Do you feel that your work as a PhD student takes up so much time and energy that it affects your private life?	32%	39%	31%	31%	39%	30%	31%	30%	24%
Does your work as a PhD student give you severe stress symptoms(e.g. isolation, palpitations, stomach ache, depression, restlessness, memory loss)?	17%	13%	8%	22%	9%	20%	25%	22%	24%
Do you feel lonely during your day at your workplace?	18%	19%	6%	30%	10%	29%	0%	24%	24%
Do you feel that you act alone in your project and lack the necessary feedback to make progress?	18%	19%	6%	30%	7%	37%[a]	19%	15%	20%
Satisfaction (Somewhat agree + Agree)									
Overall, I'm satisfied with what I have learned during my PhD process	87%	78%	94%	88%	94%	85%	88%	85%	84%
Overall, I'm satisfied with the quality of my research work	85%	90%	86%	82%	87%	80%	75%	88%	88%
Overall, I'm satisfied with the quality of my research supervision	79%	84%	81%	76%	78%	75%	75%	85%	75%
I can warmly recommend my main supervisor	78%	87%	69%	72%	81%	75%	56%	85%	88%

Note: The colouring of the table follows the guidelines described in Figure 1.1.
a) Between 10-20 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.
b) Between 20-30 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.
c) Between 30-40 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.

KEY FIGURES FOR PHD PROGRAMMES AT BSS

	BSS (total)	Business Adm.	Business Comm.	Economics and Business	Law	Political Sciecne	Psychology	Social Sciences and Business
On the way to a PhD (Important + Very important)								
I was passionate about doing research	89%	94%	100%	91%	87%	90%	85%	71%
I was very interested in my topic	93%	94%	100%	94%	93%	93%	92%	81%
I assumed that the PhD title would create opportunities in the job market outside the university	48%	50%	31%	70%	33%	27%	45%	43%
I considered it to be a regular job with a permanent income	53%	65%	47%	51%	52%	33%	58%	67%
I didn't have any other plans when I was given the opportunity	22%	30%	0%[a]	22%	20%	24%	18%	37%[a]
Has your main supervisor applied for external funding for a project financing your salary?	20%	26%	19%	24%	14%	7%	18%	26%[a]
The PhD subject elements (To some degree + To a high degree)								
Do you and your main supervisor use the interim evaluations to take stock of your PhD process?	54%	63%[a]	63%	52%	46%	53%	45%	70%
Do you use the PhD planner to survey the progress in your project?	30%	44%	29%	31%	27%	7%	38%	32%[a]
Does the selection of PhD courses give you the possibility of strengthening your general research qualifications?	77%	79%	80%	73%	67%	77%	93%	67%
Does the selection of PhD courses give you the possibility of strengthening your research qualifications within the framework of your project?	48%	44%	59%	54%	37%	47%	50%	43%
Has the work you do beyond your own project (e.g. various department work including teaching) been useful?	93%	94%	100%	86%	96%	100%[a]	95%	90%
Is the work you do beyond your own project (e.g. various department work including teaching) of such a magnitude that it affects your project?	64%	79%	88%	65%	41%[a]	64%[a]	69%	35%
Research environment (Somewhat agree + Agree)								
I feel like I'm part of the research community here	58%	38%	88%	62%	39%	77%	53%	57%
Here I feel respected as a co-researcher	68%	45%	82%	68%	50%	93%	63%	86%
In this research environment, research conducted by PhD students is acknowledged although it may not be groundbreaking	57%	33%	73%[a]	60%	48%[a]	80%	46%[a]	70%
There is a sense around here that working together on research is fun	49%	28%	56%	56%[a]	22%	87%	42%	53%[a]
It is possible to talk openly with colleagues about successful as well as unsuccessful experiences	58%	41%	64%[a]	67%[a]	36%[a]	67%	61%	60%

	BSS (total)	Business Adm.	Business Comm.	Economics and Business	Law	Political Scieene	Psychology	Social Sciences and Business
Here we present and discuss each other's research on a regular basis	53%	30%	59%	58%	19%	97%	49%	57%
I feel that the researchers here are harsh and negative rather than constructive when giving feedback on each other's work	18%	41%	6%	13%	15%[a]	17%	22%	10%
People seem to be very competitive	36%	41%	44%	26%	42%[a]	43%	37%	32%[a]
Supervision relationship (Somewhat agree + Agree)								
My supervisor is friendly and accommodating	96%	91%	100%	96%	100%	97%	95%	100%
My supervisor recognises my work	87%	72%	88%	91%	93%	97%	81%	86%
My supervisor asks me about my needs and expectations regarding supervision	48%	42%	53%	40%	50%	63%	51%	52%
Sometimes I have a feeling that my supervisor sees me primarily as a source of labour to advance his/her research	4%	12%	0%	3%	0%	0%	8%	5%
My supervisor (either co-supervisor or main supervisor) is available when needed	89%	88%	94%	85%	97%	93%	87%	86%
My supervisor makes many important choices in my project	19%	24%	6%	27%	10%	7%	26%	14%
My supervisor has clear preferences for the direction my project needs to take	33%	41%	19%	37%	30%	31%	29%	30%
My supervisor has a clear expectation that I will follow the advice I get	40%	36%	43%[a]	55%	30%	37%	38%[a]	25%
My supervisor sometimes takes over the writing if I come to a standstill	7%	9%	0%	9%[a]	3%	3%	11%	5%
Independence and control (Somewhat agree + Agree)								
I often feel insecure that what I do is good enough	73%	82%	88%	71%	66%	69%	72%	67%
Sometimes I wonder if I'm good enough to be a PhD student	58%	68%	63%	64%	38%	52%	56%	62%
I feel a sense of ownership of my project	89%	76%	88%	86%	97%	100%	92%	90%
It is important to me that I make all the critical choices in my project	67%	62%	100%	56%	79%	70%	63%	71%
Workload (Often + Almost always)								
Do you feel that your work as a PhD student takes up so much time and energy that it affects your private life?	29%	56%	38%	22%	3%	30%	24%	38%
Does your work as a PhD student give you severe stress symptoms (e.g. isolation, palpitations, stomach ache, depression, restlessness, memory loss)?	17%	44%	6%	9%	7%	20%	18%	14%
Do you feel lonely during your day at your workplace?	18%	24%	7%	14%	36%	7%	18%	24%
Do you feel that you act alone in your project and lack the necessary feedback to make progress?	22%	38%	21%	23%	7%	10%	26%	25%
Satisfaction (Somewhat agree + Agree)								
Overall, I'm satisfied with what I have learned during my PhD process	87%	88%	88%	87%	86%	93%	87%	81%

	BSS (total)	Business Adm.	Business Comm.	Economics and Business	Law	Political Scieone	Psychology	Social Sciences and Business
Overall, I'm satisfied with the quality of my research work	80%	71%	100%	84%	79%	73%	79%	79%[a]
Overall, I'm satisfied with the quality of my research supervision	71%	59%	87%	64%	89%	87%	66%	67%
I can warmly recommend my main supervisor	73%	64%	87%	67%	90%	87%	62%	71%

Note: The colouring of the table follows the guidelines described in Figure 1.1.
a) Between 10-20 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.
b) Between 20-30 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.
c) Between 30-40 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.

KEY FIGURES FOR THE PHD PROGRAMMES AT HE

Abbreviations:

GP01: Membrane Transporters and Receptors
GP02: Endocrinology
GP03: Public Health
GP05: Inflammation and Infection
GP06: Cardiovascular
GP07: LabMed - From Biomarker to Diagnostic Tests and clinical .
GP08: Neuroscience
GP09: Oncology
GP10: Translational Molecular Medicine
GP11: Tooth, Bone and Joint Diseases (TBJ)
GP12: Clinical Medicine

	HE (total)	GP01	GP02	GP03	GP05	GP06	GP07	GP08	GP09	GP10	GP11	GP12
On the way to a PhD (Important + Very important)												
I was passionate about doing research	92%	100%	95%	91%	100%	89%	100%	94%	78%	98%	88%	88%
I was very interested in my topic	88%	88%	72%	82%	100%	87%	82%	90%	96%	91%	91%	87%
I assumed that the PhD title would create opportunities in the job market outside the university	75%	94%	87%	69%	85%	83%	73%	64%	75%	81%	61%	75%
I considered it to be a regular job with a permanent income	38%	59%	39%	46%	38%	26%	40%	44%	31%	56%	24%	19%
I didn't have any other plans when I was given the opportunity	15%	29%	8%	25%	12%	6%	9%	21%	10%	21%	3%	6%
Has your main supervisor applied for external funding for a project financing your salary?	44%	80%[a]	62%	45%	24%	29%	45%	58%	51%	44%	32%	33%
The PhD subject elements (To some degree + To a high degree)												

	HE (total)	GP01	GP02	GP03	GP05	GP06	GP07	GP08	GP09	GP10	GP11	GP12
Do you and your main supervisor use the interim evaluations to take stock of your PhD process?	53%	47%	39%	64%	42%	52%	50%	56%	52%	53%[a]	66%	44%
Do you use the PhD planner to survey the progress in your project?	17%[a]	8%[b]	8%	22%[a]	20%	12%	0%	22%[a]	5%[a]	32%[a]	10%[a]	19%
Does the selection of PhD courses give you the possibility of strengthening your general research qualifications?	88%	88%	82%	91%	79%	91%	90%	81%	82%	89%	97%	97%
Does the selection of PhD courses give you the possibility of strengthening your research qualifications within the framework of your project?	67 %	59%	67%	68%	63%	62%	50%	59%	65%	71%	77%	76%
Has the work you do beyond your own project (e.g. various department work including teaching) been useful?	84%[a]	83%[b]	88%[a]	86%[a]	77%	83%[a]	100%[b]	85%[a]	83%	81%	81%[b]	88%[a]
Is the work you do beyond your own project (e.g. various department work including teaching) of such a magnitude that it affects your project?	41%[a]	42%[b]	50%[a]	36%[a]	49%[a]	33%[a]	13%[b]	43%[a]	31%	44%[a]	32%[a]	53%[a]
Research environment (Somewhat agree + Agree)												
I feel like I'm part of the research community here	82%	81%	86%	79%	85%	84%	100%	83%	80%	91%	71%	78%
Here I feel respected as a co-researcher	90%	82%	89%	83%	98%	95%	100%	94%	88%	93%	85%	89%
In this research environment, research conducted by PhD students is acknowledged although it may not be groundbreaking	87%	73%[a]	89%	85%	96%	89%	100%	84%	90%	89%	85%	84%
There is a sense around here that working together on research is fun	82%	76%	89%	77%	85%	86%	100%	81%	80%	85%	82%	80%
It is possible to talk openly with colleagues about successful as well as unsuccessful experiences	84%	82%	89%	76%	91%	88%	100%	88%	82%	89%	68%	83%
Here we present and discuss each other's research on a regular basis	81%	76%	89%	81%	81%	75%	90%	83%	82%	87%	58%	86%
I feel that the researchers here are harsh and negative rather than constructive when giving feedback on each other's work	8%	13%	11%	9%	2%	5%	0%	14%	10%	13%	3%	6%
People seem to be very competitive	24%	41%	19%	24%	23%	20%	9%	37%	16%	25%	9%	26%
Supervision relationship (Somewhat agree + Agree)												
My supervisor is friendly and accommodating	95%	88%	97%	94%	96%	93%	100%	99%	98%	93%	94%	91%
My supervisor recognises my work	89%	75%	88%	91%	92%	91%	100%	92%	90%	88%	94%	82%
My supervisor asks me about my needs and expectations regarding supervision	46%	18%	43%	64%	46%	41%	73%	43%	52%	38%	35%	38%
Sometimes I have a feeling that my supervisor sees me primarily as a source of labour to advance his/her research	9%	18%	11%	4%	8%	9%	9%	12%	6%	23%	6%	6%
My supervisor (either co-supervisor or main supervisor) is available when	93%	100%	97%	89%	96%	95%	100%	96%	92%	93%	88%	93%

	HE (total)	GP01	GP02	GP03	GP05	GP06	GP07	GP08	GP09	GP10	GP11	GP12
needed												
My supervisor makes many important choices in my project	39%	65%	50%	28%	33%	38%	64%	37%	39%	54%	42%	34%
My supervisor has clear preferences for the direction my project needs to take	57%	71%	70%	48%	62%	67%	64%	48%	54%	56%	56%	59%
My supervisor has a clear expectation that I will follow the advice I get	62%	81%	73%	50%	67%	73%	55%	64%	58%	72%	61%	55%
My supervisor sometimes takes over the writing if I come to a standstill	20%	59%	31%[a]	12%	34%	23%	20%	16%[a]	19%	22%[a]	13%	13%
Independence and control (Somewhat agree + Agree)												
I often feel insecure that what I do is good enough	48%	53%	36%	53%	46%	47%	36%	46%	52%	53%	31%	50%
Sometimes I wonder if I'm good enough to be a PhD student	47%	41%	28%	58%	41%	51%	36%	45%	52%	51%	35%	41%
I feel a sense of ownership of my project	89%	65%	83%	90%	90%	98%	100%	85%	92%	88%	88%	88%
It is important to me that I make all the critical choices in my project	61%	41%	53%	66%	54%	73%	55%	67%	52%	56%	58%	63%
Workload (Often + Almost always)												
Do you feel that your work as a PhD student takes up so much time and energy that it affects your private life?	25%	12%	14%	30%	25%	29%	18%	20%	24%	39%	13%	22%
Does your work as a PhD student give you severe stress symptoms(e.g. isolation, palpitations, stomach ache, depression, restlessness, memory loss) ?	11%	6%	6%	13%	12%	13%	0%	8%	18%	14%	6%	10%
Do you feel lonely during your day at your workplace?	9%	0%	6%	16%	4%	13%	0%	13%	10%	5%	6%	9%
Do you feel that you act alone in your project and lack the necessary feedback to make progress?	12%	6%	8%	12%	14%	9%	0%	11%	10%	23%	9%	12%
Satisfaction (Somewhat agree + Agree)												
Overall, I'm satisfied with what I have learned during my PhD process	93%	88%	94%	92%	94%	93%	100%	94%	96%	93%	94%	94%
Overall, I'm satisfied with the quality of my research work	91%	88%	86%	92%	96%	96%	100%	94%	84%	89%	91%	88%
Overall, I'm satisfied with the quality of my research supervision	82%	76%	92%	79%	88%	80%	100%	83%	88%	72%	88%	79%
I can warmly recommend my main supervisor	78%	82%	86%	72%	86%	84%	100%	75%	80%	70%	79%	74%

Note: The colouring of the table follows the guidelines described in Figure 1.1.

a) Between 10-20 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.

b) Between 20-30 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.

c) Between 30-40 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.

KEY FIGURES FOR THE PHD PROGRAMMES AT ST

	ST (total)	Agroecology	Animal Science	Bioscience	Chemistry	Computer Science	Engineering	Env. Science	Food Science	Geoscience	Mathematics	Mol. Biology and Genetics	Nanoscience	Physics and Astr.
On the way to a PhD (Important + Very important)														
I was passionate about doing research	89%	83%	81%	85%	88%	90%	87%	80%	90%	86%	93%	88%	92%	95%
I was very interested in my topic	90%	86%	90%	93%	96%	98%	83%	90%	83%	95%	93%	87%	89%	91%
I assumed that the PhD title would create opportunities in the job market outside the university	65%	61%	68%	54%	67%	51%	71%	44%[a]	69%	64%	39%	81%	82%	42%
I considered it to be a regular job with a permanent income	49%	51%	55%	44%	41%	30%	55%	50%	59%	55%	25%	58%	63%	28%
I didn't have any other plans when I was given the opportunity	27%	25%	34%	20%	22%	22%	32%	30%	34%	32%	14%	32%	31%	20%
Has your main supervisor applied for external funding for a project financing your salary?	66%[a]	49%	71%[a]	59%[a]	68%[b]	56%[c]	52%	56%[a]	80%[c]	75%	38%	68%[b]	83%[b]	69%[b]
The PhD subject elements (To some degree + To a high degree)														
Do you and your main supervisor use the interim evaluations to take stock of your PhD process?	44%[a]	75%[a]	73%[a]	29%[a]	22%[a]	43%[a]	60%[b]	60%	84%[a]	50%[a]	24%[a]	46%[a]	37%[a]	20%[a]
Do you use the PhD planner to survey the progress in your project?	29%	62%	32%	29%	6%	29%	36%[a]	40%	59%	29%	11%	28%	23%	14%

	ST (total)	Agroecology	Animal Science	Bioscience	Chemistry	Computer Science	Engineering	Env. Science	Food Science	Geoscience	Mathematics	Mol. Biology and Genetics	Nanoscience	Physics and Astr.
Does the selection of PhD courses give you the possibility of strengthening your general research qualifications?	68%	87%	90%	78%	73%	54%	60%[a]	80%	86%	78%[a]	52%[b]	64%	64%	40%[a]
Does the selection of PhD courses give you the possibility of strengthening your research qualifications within the frame-work of your project?	47%	68%	73%	58%	37%	44%	41%[a]	60%	83%	33%[a]	38%[a]	48%	33%	19%[a]
Has the work you do beyond your own project (e.g. various department work including teaching) been useful?	83%[b]	83%[c]	74%[c]	87%[b]	94%	84%	88%[a]	100%[c]	79%[a]	86%	92%	80%[b]	79%[a]	79%[a]
Is the work you do beyond your own project (e.g. various department work including teaching) of such a magnitude that it affects your project?	63%[b]	53%[b]	40%[b]	73%[b]	78%	74%	76%[a]	50%[c]	22%[a]	48%	38%	72%[b]	65%[a]	59%[a]
Research environment (Somewhat agree + Agree)														
I feel like I'm part of the research community here	76%	64%	87%	79%	88%	79%	72%	60%	75%	68%	67%	69%	78%	85%
Here I feel respected as a co-researcher	83%	66%	92%	80%	88%	82%	98%[a]	80%	93%	67%	79%	79%	88%	86%
In this research environment, research conducted by PhD students is acknowledged although it may not be ground-breaking	79%[a]	68%	89%[a]	84%	83%[a]	78%	85%[a]	67%[a]	84%[a]	65%[a]	86%[a]	73%	79%	89%[a]
There is a sense around here that working together on re-search is fun	74%	63%	76%	67%	87%	77%	66%[a]	56%[a]	75%	64%	55%[a]	67%	82%	87%
It is possible to talk openly with colleagues about successful as well as unsuccessful experiences	80%	71%	89%[a]	78%	86%	80%	81%[a]	60%	79%	61%[a]	86%[a]	77%	85%	83%
Here we present and discuss each other's research on a regular basis	72%	63%	76%[a]	69%	81%	75%	42%[a]	50%	79%	42%[a]	60%	73%	87%	75%
I feel that the researchers here are harsh and negative rather than constructive when giving feedback on each other's work	7%	5%	0%	4%	6%	16%	7%	0%	10%	6%[a]	10%[a]	11%	7%	3%

	ST (total)	Agroecology	Animal Science	Bioscience	Chemistry	Computer Sci-ence	Engineering	Env. Science	Food Science	Geoscience	Mathematics	Mol. Biology and Genetics	Nanoscience	Physics and Astr.
People seem to be very competitive	25%	28%	15%	23%	44%	28%	16%	0%[a]	21%	19%	4%	28%	32%	11%
Supervision relationship (Somewhat agree + Agree)														
My supervisor is friendly and accommodating	95%	92%	98%	96%	98%	98%	96%	100%	90%	95%	96%	91%	94%	97%
My supervisor recognises my work	89%	94%	90%	90%	83%	90%	98%	100%	86%	90%	92%	83%	84%	92%
My supervisor asks me about my needs and expectations regarding supervision	43%	62%	61%	41%	34%[a]	42%	50%	78%[a]	59%	37%[a]	30%[a]	46%	32%	33%
Sometimes I have a feeling that my supervisor sees me primarily as a source of labour to advance his/her research	11%	7%	7%	11%	8%	9%	17%	10%	13%	5%	4%	17%	15%	8%
My supervisor (either co-supervisor or main supervisor) is available when needed	91%	94%	90%	89%	94%	89%	94%	100%	96%	86%	91%	92%	85%	92%
My supervisor makes many important choices in my project	38%	35%	39%	45%	32%	33%	26%	30%	35%[a]	35%	35%[a]	48%	38%	42%
My supervisor has clear preferences for the direction my project needs to take	56%	54%	59%	58%	63%	53%	46%	50%	64%	53%[a]	56%	60%	59%	48%
My supervisor has a clear expectation that I will follow the advice I get	59%	54%[a]	55%	61%	63%	60%	62%	50%	76%[a]	44%[a]	71%[a]	52%	65%	56%[a]
My supervisor sometimes takes over the writing if I come to a standstill	23%[a]	14%	11%[a]	16%[a]	16%[a]	41%	18%[a]	20%	17%[a]	39%[a]	22%[a]	23%[a]	28%	27%[a]
Independence and control (Somewhat agree + Agree)														
I often feel insecure that what I do is good enough	61%	57%	60%	58%	59%	67%	57%	80%	43%	67%	70%	70%	57%	58%

	ST (total)	Agroecology	Animal Science	Bioscience	Chemistry	Computer Science	Engineering	Env. Science	Food Science	Geoscience	Mathematics	Mol. Biology and Genetics	Nanoscience	Physics and Astr.
Sometimes I wonder if I'm good enough to be a PhD student	54%	45%	54%	51%	55%	69%	49%	90%	43%	57%	63%	62%	49%	52%
I feel a sense of ownership of my project	76%	75%	79%	77%	82%	78%	83%	70%	79%	70%	79%	68%	74%	75%
It is important to me that I make all the critical choices in my project	55%	72%	63%	59%	46%	50%	55%	80%	57%	52%	23%[a]	56%	53%	44%
Workload (Often + Almost always)														
Do you feel that your work as a PhD student takes up so much time and energy that it affects your private life?	26%	29%	10%	27%	27%	13%	23%	20%	37%	29%	8%	37%	29%	18%
Does your work as a PhD student give you severe stress symptoms (e.g. isolation, palpitations, stomach ache, depression, restlessness, memory loss)?	12%	20%	15%	8%	13%	11%	9%	0%	21%	19%	8%	19%	11%	3%
Do you feel lonely during your day at your workplace?	11%	22%	8%	12%	6%	4%	11%	20%	14%	24%	8%	18%	7%	5%
Do you feel that you act alone in your project and lack the necessary feedback to make progress?	16%	19%	13%	16%	16%	20%	19%	40%	17%	20%	12%	18%	16%	6%
Satisfaction (Somewhat agree + Agree)														
Overall, I'm satisfied with what I have learned during my PhD process	87%	85%	90%	88%	93%	87%	93%	80%	83%	75%	84%	79%	89%	90%
Overall, I'm satisfied with the quality of my research work	75%	85%	84%	76%	81%	81%	63%[a]	60%	77%	80%	58%	71%	75%	71%
Overall, I'm satisfied with the quality of my research supervision	75%	79%	88%	85%	83%	72%	71%	80%	73%	60%	83%	68%	66%	81%
I can warmly recommend my main supervisor	79%	84%	83%	81%	92%	77%	78%	70%	83%	57%	80%	72%	73%	88%

	ST (total)	Agroecology	Animal Science	Bioscience	Chemistry	Computer Science	Engineering	Env. Science	Food Science	Geoscience	Mathematics	Mol. Biology and Genetics	Nanoscience	Physics and Astr.

Note: The colouring of the table follows the guidelines described in Figure 1.1.

a) Between 10-20 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.

b) Between 20-30 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.

c) Between 30-40 percent have replied 'Don't know / not relevant'. These are not part of the calculation of the frequency.

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