

## SUPERVISORS' CONCEPTIONS OF DOCTORAL STUDIES

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**Abstract.** Changes in the content and organization of doctoral studies have provided material for researching different aspects of doctoral studies. Much of the current literature concentrates on identifying the functions that an effective supervisor needs to carry out. Less attention has been paid to how well supervisors understand the aims of doctoral studies. The aim of this study was to describe the Estonian PhD supervisors' conceptions about doctoral studies. The study is based on semi-structured interviews with 21 PhD supervisors from educational science and exact and natural science disciplines. The data was analyzed using qualitative thematic data analysis techniques. The results show that according to supervisors' conceptions, the aim of a doctoral study is to prepare future researchers and acquire academic writing skills as quickly as possible. Doctoral studies are also seen as an intermediate process in the course of becoming a researcher.

**Keywords:** doctoral education, supervisors' conceptions, qualitative research, Estonia

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### 1. Introduction

A recent study of doctoral students (Vassil and Solvak 2012) showed alarming results regarding the doctoral education in Estonia. Sixty per cent of PhD students fail to graduate on time or drop out from doctoral programmes. The pressure to complete successful doctoral work on time is increasingly important in Estonia (Kärner 2009, Vassil and Solvak 2012) as well as in other countries (see e.g. Kehm 2004).

The successful completion of a PhD depends on several factors. McCormack (2005) pointed out four categories: the psychological features of the doctoral student, the socio-economic situation of the student, the discipline and type of research, and supervision. Although all of the above mentioned factors are important, several scholars (e.g. Halse and Malfroy 2010, Lee 2008) have claimed that the supervisor is still considered to be the main instigator of a PhD student's

learning process. The scope of the current study is PhD supervision and supervisors' conceptions. Addressing the views of supervisors is important as the awareness of conceptual approaches to supervision has been seen as the main influencer and prerequisite for successful supervision (Lee 2008). As empirical studies on the conceptions of supervisors are limited in number (the research necessity has also been expressed by Brew (2001), Kiley and Mullins (2005), and Lee (2008)), and it is not clear which views underlie supervisory practices in the Estonian context (Kärner 2009), it is relevant to tackle the matter further through empirical research.

The current study was a part of a larger study that aimed at describing and analysing the supervisory practices of PhD supervisors as well as the factors that influence these (see e.g. Lepp, Karm and Remmik 2013). This paper focused on Estonian supervisors' conceptions of doctoral studies, with accentuated focus on supervisors' conceptions of the output of doctoral studies and the learning of PhD students during doctoral studies. The term "conceptions" in this paper is used similarly to Kiley and Mullins (2005) according to which it refers to a PhD supervisor's understanding of what the aims of doctoral studies and doctoral dissertations are.

In the empirical part of the study, the focus was on the conceptions of supervisors from two domains (educational science and exact and natural sciences). The article presents an overview of the literature discussing how earlier studies have described the learning of PhD students and the aims of doctoral studies in general, outlines the findings of the study, and discusses some implications for doctoral education.

### *1.1. The aim of doctoral studies*

Gaining a PhD can be viewed as a unique and highly personal experience, during which the development of the doctoral student occurs. The relevant literature (see e.g. Doctoral studies in ... 2007, Kärner and Puura 2008, McAlpine and Norton 2006) is gradually laying more emphasis on the fact that the aim of PhD studies is not only preparing new researchers. Therefore, as stated by Mowbray and Halse (2010:662) "it shifts the lens from the instrumental production of the skilled PhD graduate to the progressive building of virtuous individuals who contribute to society through their productive actions". Doctoral studies as the frontier research in all disciplines is thus seen as a major source of innovation in a knowledge-based society and has a crucial role to play in the development of economic, political, and cultural life (Doctoral studies in ... 2007).

Mowbray and Halse (2010:657–660) described the purpose of a PhD and reflected on what it develops, distinguishing three major areas: 1) developing personal resourcefulness that "enables students to become more assertive, confident, resilient, persistent and resolute in determining how to progress their PhD while balancing their other commitments"; 2) developing cognition, where the focal point is the development of critical thinking skills; and 3) developing research and other skills – data analysis, computer skills, management skills.

Consequently, PhD studies constitute a period during which students not only acquire direct research skills but also, as stated by Mullins and Kiley (2000:4) "amongst other things a student learns the art and the science of research."

An emerging theme in doctoral discourse is the topic of PhD as a Process and PhD as a Product (Park 2005). In case of PhD as a Product, the main tangible product is the dissertation that each student must present. In case of PhD as a Process, the switch from content to competence is valued, and the PhD experience as a whole is considered important.

Furthermore, research on supervisors' conceptions reflects that the focus of the supervisor during supervision is directed either at the product or the process. For example, having researched supervisors' conceptions, Emilsson and Johnsson (2007) and Murphy et al. (2007) found that supervision focus at one extreme is on the task (task-focused beliefs) and at the other on interpersonal processes and relationships (person-focused beliefs). With focus on task, supervision is concentrated on the immediate implementation of research tasks and skill development through those tasks. In the context of interpersonal processes, and person-focused beliefs, supervisors are more broadly concerned with the candidate's development as a person in general.

Moreover, Lee (2008) in her study of PhD supervisors demonstrated that there are different approaches to supervision (which are usually combined in the supervision process).

1) *Functional*, characterized by a clear focus on the task. Therefore, the functional approach sits most closely with the professional role of the researcher and can be related to the abovementioned focus of PhD as a Product. 2) *Enculturation*, where achieving a PhD is about becoming a member of a community. 3) *Critical thinking*, where the analytical thinking of a student is valued and according to Lee (2008), conventionally, this is the heart of the PhD supervision. 4) *Emancipation*, (similar to Brew's (2001) journey conception and leaning towards PhD as a Process) where the supervisor considers the personal growth of a student to be significant, and 5) *relationship development*, which places emphasis on working in and as part of a group.

On the one hand, supervisors in their supervisory practices are influenced by their views on doctoral studies and its aims in general (see e.g. Brew 2001, Lee 2008). On the other hand, a pertinent aim of PhD studies is finalising a dissertation which needs to meet the required standards on which the student and the supervisor act.

It is clearly stated that a doctoral dissertation can be regarded as a 'product' providing new and original knowledge. As stated in the League of European Research Universities document, "doctoral theses are expected to give a substantive and original contribution, in either content or method, to the candidate's study field" (Doctoral studies in ...2007). Green and Bowden (2012) were inclined to think that a doctoral student has to find new explanations, evidence of a different way of seeing something from what has been seen before, or develop a new theory that would replace or 'oust' an existing one. By doing so, the student

would learn to see their own perspective as one among many, and similarly, the perspectives of others. In the end, students would be able to trust and prove their own perspective, even when it is in contrast to other approaches.

Due to the changes that are taking place in higher education (e.g. Bologna reform, and consequently, doctoral students' highly varied educational backgrounds; reduced resources (see Kehm 2004)), questions have been raised whether the requirements for dissertations can be met within the parameters of a PhD (Craswell 2007) – whether accomplishing the stated aims (e.g. originality) is realistic given the limited resources (e.g. time, previous knowledge of students, finances). There have also been doubts about the quality of doctoral dissertations. For instance, Park (2005:198) noted that over recent decades, the traditional notion of “a piece of research that could have a lasting impact on a discipline” has been replaced by the more pragmatic notion of a manageable piece of work, of a scope and size that a student reasonably expects to complete within the nominal study period.

Therefore, summarising theoretical considerations, it could be said that the learning of PhD students during doctoral studies takes place in different aspects whereas the supervisors' conceptions regarding PhD as a Product or PhD as a Process are of importance, determining whether the focus is on the task or on the person or which approach to supervision is ‘the dominant approach’. Moreover, the finalization of a dissertation as an end-product is directed by different regulations and requirements, which the supervisor needs to consider.

### *1.2. Research task*

Drawing on the above presented theoretical framework, the aim of this study was to describe Estonian PhD supervisors' conceptions about doctoral studies. More specifically, we formulated three research questions: 1) what conceptions of the aim of doctoral studies do PhD supervisors hold?, 2) what do supervisors presume a doctoral student should learn and how students should change during doctoral studies?, 3) what conceptions of the aim of doctoral dissertation do PhD supervisors hold?

## **2. Method**

### *2.1. Participants*

The study was based on semi-structured interviews with 21 supervisors (15 in educational sciences, including 3 in the domain of science education, and 6 in exact and natural sciences) in two research-intensive Estonian universities. All participants (11 male, 10 female) were senior academics, with the majority being professors or associate professors. Participants ranged from being inexperienced in doctoral supervision (i.e. no doctoral completions yet) to very experienced (i.e. 10 or more completions).

Selection of the sample from two different domains was motivated by the difference in the doctoral students' graduation rates and progress in their studies. The PhD students of educational sciences progress in their studies slower than the students of exact and natural sciences (see Ots, Leijen and Pedaste 2012) and merely 30 per cent of educational science PhD students graduate within the nominal period in Estonia. Furthermore, the level of on-time graduation for the curricula of Biosciences and Environment is between 70 to 83 per cent (see *Doktoriõppe üleminekuhindamine. Bio-... 2011*). Based on doctoral completion rates, it could be assumed that there are substantial differences in the organization and arrangements of doctoral studies in these domains. The differences could become evident in the conceptions of supervisors from the two domains.

### *2.2. Data collection and analysis*

The data was collected using semi-structured interviews (see Appendix). All interviews consisted of questions seeking information concerning the aim of doctoral studies and doctoral dissertation (e.g. what they thought the aim of a doctoral dissertation was), and participants were asked to share their understandings about what a doctoral student should learn and how they should change during doctoral studies (e.g. what do you think a doctoral student should learn during the studies?). Questions asked in a similar manner (e.g. what do you think research is?) have also been used by Kiley and Mullins (2005) to study the conceptions of supervisors. These initial questions were followed by additional clarifying questions (e.g. can you expand a little on this?). Throughout the process of constructing interview questions, many potential interview questions were examined, discussed with academic colleagues, and tried out in the target group.

All the interviews were fully transcribed. To protect the participants' identities, supervisors and people mentioned in the interviews were given pseudonyms.

The data was analysed using qualitative thematic data analysis techniques. The thematic analysis (Ryan and Bernard 2003) consisted of discovering themes and sub-themes, deciding which themes are important in this research area, and building hierarchies of themes. Three authors undertook parallel coding to ensure consistency in the interpretation of the transcribed text. If there was a disagreement about coding or categorization, authors went back to the original data and discussed it until a consensus was reached. A random member-check was used to increase the credibility of the findings.

It should be pointed out that the intension at this stage of research was to identify a variety of concepts of doctoral studies held by supervisors. When the concepts were clearly domain-bound in the supervisors' descriptions, the differences were shown separately in the results. The presented results follow the identified themes and sub-themes.

### 3. Results

#### 3.1. The aims of doctoral studies

Three main categories emerged in the supervisors' interviews when talking about the aims of doctoral studies: 1) doctoral studies as a way of educating future researchers and developing the domain, 2) doctoral studies as a way of creating new knowledge, 3) doctoral studies as a PhD student's learning process.

##### 3.1.1. Doctoral studies as a way of educating future researchers and developing the domain

According to supervisors' conceptions, the aim of doctoral studies was educating future researchers and thus developing the domain in general. While discussing students' professional careers, a doctoral studies graduate was predominantly seen as an independent researcher being a member or leader of a research group involved in developing the domain further.

*I would like to see it as rearing offspring, that grants would form of the candidates in the next few years, that some kind of smaller research groups would form. (Anne)*

In supervisors' conceptions, the topic of domain development was closely bound up with the dimensions of local practice development and internationality. The supervisors in the exact and natural sciences clearly emphasized contributing to science undertaken internationally. Several supervisors in educational sciences considered the international dimension to be important as well, especially when it came to the distribution and value of research results (e.g. articles must be published and dissertation presented in English in order to communicate it to international audiences). Some supervisors in the educational domain stressed the idea that science must predominantly serve national interests and solve the problems of the Estonian education sphere. The supervisors expressed their concern of students' studies not always being planned while taking the needs and issues of the Estonian educational sphere into consideration as the applicability and implementation of the results is poor.

According to the supervisors, the output of doctoral studies could be significantly broader: in addition to educating future academics, doctoral studies could also prepare people for working in leading positions in either the private sector or public institutions. Nevertheless, it was mentioned that although a broader output is necessary, since the doctoral completion rate is low, the graduates were primarily 'necessary' for the university itself.

*Not everyone having been conferred a PhD has to start working in the academic sphere. Unfortunately, we get so few graduates and the offspring is so limited that mostly they do stay.../Our society would benefit so much from having people with PhD degrees working only in the Ministry of Education and Research, not to mention other spheres. (Mary)*

Supervisors often referred to doctoral studies as an intermediate step in the process of becoming a credible researcher. The supervisors were of the view that doctoral studies were mainly a formal intermediate step after which the skills and knowledge were still being gained and built on in future research.

*Well, for me, a doctoral degree is really a formal parameter/.../it is one point on a continuous scale./.../Simply, a natural course of events brings to a point where a doctoral degree is received and then research is continued. (Arvo)*

### 3.1.2. Doctoral studies as a way of creating new knowledge

The supervisors had a common view that by the end of doctoral studies, new knowledge should have been acquired or be established in a particular domain, or a novel dimension added to the existing knowledge base as a result of the undertaken research during doctoral studies. New knowledge could be created, according to the supervisors' conceptions, by tackling an issue within a research group as well as individually (on the topic selected by the student). The supervisors from the educational domain expressed their understanding that working individually made researching time-consuming.

*You work on your research when you have the time/.../You move on as you can and we don't have any greater projects, so we basically operate on non-existent finances, only relying on our brain potential. (Sandra)*

Nevertheless, supervisors of the educational sphere valued the aspirations of PhD students to give added value to science and solve the problems rising from practice by independent research.

*To my mind, the best developers come from practice, they can see what the problem is. (Karla)*

### 3.1.3. Doctoral studies as a PhD student's learning process

In supervisors' conceptions, the development and learning of a PhD student during doctoral studies occurred in two directions: 1) doctoral studies as the acquisition of skills, and 2) doctoral studies as the development of a person.

#### 3.1.3.1. Doctoral studies as the acquisition of skills

The supervisors stated that the acquisition of a PhD student's research skills occurred both through passing compulsory subjects and doing practical research activities. Participants considered the subjects of doctoral studies necessary. Nonetheless, some supervisors were concerned that students took the subjects, but that the transfer of learned material was complicated.

*They are awfully enthusiastic about the courses they take, they proudly talk about it and when I ask how their own thesis is coming along, they can't give me any answer./.../They take the course, learn the thing, do some practical tasks and when they need to do the same in their own work, nothing! (Vambola)*

The supervisors stated that the creation of scientific text was one of the most important skills students needed to acquire during their doctoral studies. It was understood that writing articles required practice; however, supervisors understood their roles differently: the supervisor as a co-author (writing together) or as a reviewer (giving feedback). In supervisors' conceptions, the acquisition of scientific writing skills was closely tied to the pressure to complete doctoral studies within the nominal study period.

*We start writing articles from the start, we try to write these 3 articles together /.../ Even if his or her [the supervisor] role in writing the article has been bigger than that of the supervisee, he or she still puts them [students in the list of authors] first. (Riina)*

When discussing the transferable skills acquired during doctoral studies, the supervisors pointed out critical thinking and cooperation skills as well as the development of independence. According to supervisors, on the one hand, critical thinking skills stood for a doubtful attitude concerning theoretical standpoints and the opinions of the supervisor. On the other hand, critical thinking for supervisors represented the confidence of the student to express their viewpoints in a reasoned manner, both verbally and in writing, during their studies. An important resource in the formation of critical thinking skills was considered to be the literature of the field; thus, a student should be guided towards purposeful reading in the first year.

*You need to doubt constantly, you need to be critical, you need to ask questions /.../ You have to doubt previous results, but for that you need to read similar things, research, theory and then you have to ask whether it is the way they say it is. (Karoliina)*

The supervisors regarded the increase in students' independence in the course of doctoral studies to be important. Moreover, during their studies, a doctoral student should become an independent researcher capable of initiating ideas, planning, analyzing, writing, and expressing their views in their domain.

*I've told my students that I presume a doctoral student is a person who can work independently for a week without me having to stand next to them. (Heldur)*

The supervisors expressed their view that a student as a future researcher had to acquire cooperation skills and become a member of the research community. It was stated that students should have understood how conducting research cooperatively and making use of discussions (in research groups, as well as taking part in conferences and making use of other ways of communication) created opportunities for conducting research together with supportive colleagues to be able to work in research groups after their doctoral studies had been completed.

*Science is not done alone. The biggest qualitative change in a person is that they become a member of the academic community and are able to communicate there. (Anne)*

### 3.1.3.2. Doctoral studies as a PhD student's personal development

According to supervisors' conceptions, the development of a person as a whole should occur during doctoral studies. The interviewees mentioned it in relation to broadening one's horizons that happened through passing subjects of doctoral studies, attending conferences abroad as well as reading independently and having discussions with the supervisor. Several supervisors perceived their role in it as helpers with foreign trips, communication partners, and advisors.

*For me it's important that a person would not only mature as a researcher, but also as a person/.../I discuss culture and books with students, send them abroad and recommend places to visit/.../I want them to be educated people with a broad worldview. (Kristjan)*

There were several supervisors who considered the development of a person to be important, but to support it was not considered the task of a supervisor.

### 3.2. Views of doctoral dissertation

The supervisors of a particular study considered a doctoral dissertation to be research work which should thus meet all the requirements. According to their descriptions, the foundation of research was applying scientific method and scientific argumentation ("the whole working culture is scientific" (Toomas)) – obtaining trustworthy data and providing a scientifically valid answer to the problem raised.

Most supervisors participating in the study expressed their view that PhD dissertations were research work of quality and international value.

*We don't have PhD student research, we have just research/.../The student works with us and carries out research on the same level as us [other members of the research group in the lab]. (Uku)*

At the same time, there were doubts expressed in the interviews concerning the conformity of some of the defended dissertations to the content-related requirements of research work, and these non-conformities occurred, according to supervisors, at both universities to whom the supervisors belonged to in the sample.

*The quality of dissertations is very inconsistent/.../namely, there are theses that are on a very good international level and there are those that, well, practically revise some other work with a small supplementary aspect. (Eero)*

The supervisors also discussed whether and to which extent the format of a dissertation (a monograph or an article-based dissertation) enabled to reflect the aim of the dissertation. The supervisors of exact and natural sciences domain expressed an understanding that article-based dissertations were suitable for the domain. Several supervisors of educational sciences doubted whether an article-based dissertation ensured providing a wide and thorough overview of the field the way writing a monograph did.

*I haven't seen one article-based dissertation where a person has conducted one study from beginning to end/.../You get some data, write an article together with*

*your supervisor/.../there is no study process experience because you are dealing with secondary data, and personal learning experience is lost/.../We are only dealing with creating articles. I think learning as such remains partial.* (Karoliina)

According to supervisors, it was important for the dissertation to either be written on the basis of one study or be a whole solving one particular research problem. The principle of integrity was considered important by supervisors from both domains.

*Well, article-based dissertations have their own issues. In the sense that they are often articles of different areas that have been put together and sort of a summary is created/.../Yes, the person has published their four or five articles but they are co-authored, about different things and they haven't been able to squeeze it into one/.../You can do either well and poorly. And it is unfortunate if either is done poorly and it is good if either is done well./.../I personally find a dissertation should be decent, no matter the format.* (Uno)

When discussing the completion of doctoral studies, the dimension of time was expressed in supervisors' conceptions. It was mentioned that getting articles published was difficult, mainly because according to supervisors doctoral students found it challenging to compete with the publications of professors, who have more expertise and experience in writing for journals. The fact that the length of the publication process may cause a delay in the graduation date was mentioned by the supervisors. In fact, supervisors of the exact and natural sciences domain differed by saying that getting published was time-consuming; however, this was not usually a problem as writing collaboratively in research groups made publishing possible already at the beginning of doctoral studies.

The supervisors consented that there was a need both for clear agreements concerning the quality of dissertations as well as specifications of general requirements – there was a need for general standards of doctoral studies across the sector. Supervisors also expressed their wish to consider the quality of PhD dissertations within their own universities. When discussing it, supervisors emphasized that reaching such agreements was necessary for creating equal conditions for the students. At the same time, it was considered necessary from the viewpoint of supervisors' own supervisory practices.

*During the defence, supervisors gain and adjust their understandings of what a dissertation should be like.* (Karla)

#### 4. Discussion

Findings concerning educating future academics as one aim of the doctoral study were in line with earlier research and with the official documents on doctoral studies in Estonia (see e.g. Kärner and Puura 2008, Teaduskraadide põhimäärus 2012). Moreover, emphasis on a wider focus of doctoral studies was consistent with international research (Boud and Tennant 2006, McAlpine and Norton 2006).

However, supervisors' conceptions on the output of doctoral studies were somewhat controversial: although supervisors stressed the need for people with a PhD degree in other sectors; in their conceptions, they focused solely on educating future academics, valuing an academic career. This raises a question concerning the extent to which a supervisor focusing only on academic career would be able to meet multiple aims of doctoral education.

Supervisors' conceptions were also controversial regarding the scientific and practical relevance of doctoral studies. Supervisors were of the opinion that research results should add new knowledge to the domain internationally; at the same time, national interests were considered pertinent. Achieving both practical and theoretical relevance in a doctoral dissertation is complicated, and thus developing the educational sphere of Estonia as a small country, while adding new theoretical knowledge to the research of the world (and vice versa), may prove to be challenging. A potential solution to the issues discussed above would be working out and implementing the Professional doctorate model in the framework of doctoral study (see e.g. Boud and Tennant 2006, Kehm 2004), which would cater for the universities' need to educate future academics as well as deal with practice-bound domains based on research.

The results indicated that according to supervisors' conceptions, doctoral study was an intermediate step in the process of becoming a credible researcher, which was consistent with the approach of PhD as a Process (see Park 2007) and the findings of Mullins and Kiley (2002:386), according to which "A PhD is a stepping stone into a researcher's career/.../A PhD is three years of solid work, not a Nobel Prize". Consequently, on the one hand, supervisors regarded the doctoral study as an 'intermediate step' and a doctoral student was seen as a learner being supported in writing articles and getting published. On the other hand, supervisors had a conception that the dissertation finalised in the course of the doctoral study was research work which added novel knowledge and was also of international value. A significant theme in supervisors' conceptions was writing articles suitable for publication. As supervisors comprehended that in the process of getting published, the article of the student competed with the ones of experienced professors, they contributed to writing articles and publishing the results more than would strictly be necessary or sensible from the aspect of student's learning process. Therefore, the expectations supervisors and the society as a whole have of the content of dissertations should be considered. Namely, whether the end result should merely be a product with all parts meeting high academic standards, or whether a dissertation can clearly reflect on the development of the student as a researcher. A thought-provoking question would thus be: what is being assessed when the quality of a dissertation is under question – student's development and forming into an independent researcher, or the end-product that may have a vague personal contribution by the student (as it is shared with the supervisors and a research group)?

When discussing dissertations as products, earlier studies have described the tendency to specify and standardize general requirements of dissertations

(Doctoral studies in... 2007, Kehm 2004). The current study also demonstrated that supervisors considered general standards within universities as well as across sectors to be important. Consequently, a point worth considering is the extent to which the supervisors' understandings (as well as supervisors as members of the defence committee) concerning the quality of dissertations overlap. Another aspect to consider would be the consistency of requirements to dissertations with what is being assessed. Similarly to the study of Mullins and Kiley (2002), the supervisors of the current study regarded such knowledge to be essential for themselves as supervisors as well as for their PhD students. Although the supervisors expressed a view that concise and uniformly followed requirements of doctoral dissertations would be necessary, can an excessive effort to standardize the requirements lead to situations where people may operate within limited paradigms or use limited range of methodologies?

Based on the conceptions of supervisors participating in the study, both progressing fixedly towards a dissertation as an end result (focus on task and PhD as a Product) and becoming a member of the academic community in addition to developing as a person (focus on person and PhD as a Process) were considered important, similarly to the studies of Emilsson and Johnsson (2007) and Murphy *et al.* (2004). With regard to the learning of students, all characteristic features of approaches described by Lee (2008) were evident in supervisors' conceptions; thus, the conceptions of supervisors were multifaceted. Functional approach and critical thinking were mostly mentioned in connection with emphasizing a student acquiring writing skills, whereas in supervisors' conceptions they were expressed combined with the approach of emancipation and enculturation. The acquisition of skills necessary for working in a team, also emphasized by the supervisors, overlapped with Lee's (2008) relationship development approach. Therefore, based on supervisors' conceptions, it was important to support the development of a PhD student as a researcher in different aspects, which is in accordance with approaches presented in earlier studies (e.g. Brew 2001, Lee 2008). Further research would be needed to determine to which extent differences in the conceptions expressed by the supervisors and their actual supervisory practices occur.

Although the results of the current study do not provide a definite answer as to how and in which areas supervisors should be supported, it is still relevant to carry on construing how to diversify supervisors' conceptions of the output of doctoral studies and supporting the learning of the student so that this diversity in supervisors' conceptions would also be expressed in their actual supervisory practices.

The authors of the study consider it necessary to stress that the given results were initial categories of conceptions and further analysis by increasing the sample as well as standardizing the proportional distribution is necessary. Although a disproportionate and small-scale sample hindered making generalizations, some observations among the supervisors participating in the study could be made. Namely, the conceptions of supervisors in educational science domain held greater variety than those of supervisors in the exact and natural sciences domain. More-

over, supervisors of science education domain were in their conceptions more similar to the supervisors from the exact and natural sciences domain. Disciplinary differences in supervisors' conceptions are worth investigating further. A *phenomenographic* data analysis would be a helpful addition to this work.

Kiley and Mullins (2005:260) have stated that "it is argued that unless the underlying conception of research is identified and addressed, research training is building upon a shaky foundation". Despite the limitations, the chosen methodology and the results of the current study produced new ideas about the conceptions of supervisors from the domains of educational science and exact and natural sciences, and provided thereby some arguments for making decisions to develop doctoral studies further.

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APPENDIX

**Semi-structured interview plan**

- What do you think research is?
- What is the aim of doctoral study?
- What is the output of doctoral study?
- For which career is a doctoral student being prepared for during doctoral study?
- How should a doctoral student 'change' during doctoral study?
- What does a doctoral student learn and master during doctoral study?
- What should the subjects in the curriculum provide a doctoral student with?
- What is a doctoral degree?
- What is the output of a doctoral degree?
- What is the aim of a doctoral dissertation?
- What should a good-quality dissertation reflect?

<ul style="list-style-type: none"><li>* Can you expand a little on this?</li><li>* Can you give me some examples?</li></ul>
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- \* *if one thing in particular is brought out, ask about other important aspects*
- \* *when discussing the achievement of aims, ask about the narrower (the student) and the more general sense (university, society, world)*
- \* *reach the idea of a product or a process when talking about the aim of doctoral studies, ask for reasoning*

