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Higher Education Teachers' Descriptions of Their Own Learning: A Large-Scale Study of Finnish Universities of Applied Sciences

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Kentän koodi muuttunut

Abstract

In this large scale study, higher education teachers` descriptions of their own learning were examined with qualitative analysis involving application of principles of phenomenographic research. This study is unique: it is unusual to use large-scale data in qualitative studies. The data were collected through an e-mail survey sent to 5,960 teachers at universities of applied sciences in Finland. The number of respondents was 1,622. Four hierarchically structured categories of learning were found: individual learning, collegial learning, team learning and innovative partnership learning. The role of teachers in higher education demands innovative partnership learning: being active at the societal level with workplaces and international partners.

Keywords: experiences of learning, qualitative research, phenomenography, higher education teachers, university of applied sciences

Introduction

Rapid changes within society challenge higher education and its teachers to keep up with the latest developments and demands in their field. Digitalisation, along with a rapidly increasing amount of information, offers better possibilities for the acquisition of knowledge. However, the variety of information sources and the vast amount of often incoherent information may create confusion and cause difficulties in analysing and synthesising knowledge. At the same time, significant transformations take place in the world of work and in professions. Globalisation, networking and increasing economic instability are reflected in all fields of the working world. As a result of all these developments, the significance of lifelong learning has become fundamental and teachers need to find answers to the question of how to support students in acquiring the kinds of skills and knowledge needed in today's rapidly evolving society.

In many European countries, universities of applied sciences have been established and developed to serve as an alternative track of higher education parallel to traditional universities. A specific aim of these establishments is to develop partnerships with industry and commerce and to offer education involving more work experience than traditional universities do. Research and

development, especially regional development, are also main focal points of universities of applied sciences in the education system in Finland (Ministry of Education, 2013). Hence, one of the greatest challenges of teachers at universities of applied sciences is to integrate the processes of teaching, learning, researching and developing. This makes the competence development of teachers challenging. Teachers must avoid complacency and ensure the continuous renewal of knowledge, where knowledge of learning processes is of particular importance for teachers.

The importance of professional development in teachers' work is internationally widely recognized, and there are a lot of studies and policy documents focussing on teachers' learning and qualification (Darling-Hammond 2000; Darling-Hammond & Bransford, 2007; e.g. European Commission, 2009; Wei et al., 2009). Most of the studies on teaching, teachers, and their professional development have focussed on primary and secondary school teachers but in recent years the interest in higher education teachers as a specific group has also increased. For example, university teachers' descriptions of teaching (Postareff & Lindblom-Ylänne 2008), their conceptions of good teaching (e.g. Kember & Kwan 2000; Parpala 2007; van Rossum & Hammer 2010), their development as teachers (Åkerlind 2003, 2007), regulation of university teaching (Lindblom-Ylänne & Nevgi 2011) and the relationship between research and teaching (Elen & Lindblom-Ylänne 2007) have been studied. There are also studies on higher education teachers' learning conceptions (e.g. `Author, 2011` [details removed for peer review], van Eekelen, Boshuizen, &Vermunt, 2005; Marton, Dall'Alba, & Beaty 1993), but how they learn themselves is seldom asked. In addition to that, there are no previous studies concerning learning of teachers working at universities of applied sciences. Teachers' understanding and experiences of their own learning are crucial for two reasons. First, teachers' main job is to promote learning in their students, and, second, teachers themselves should continuously learn and develop in their profession to meet the challenges of the rapidly changing world of work.

The aim of this article is to bridge the aforementioned gaps in research and to examine how teachers at universities of applied sciences describe their own learning. The context of our study is the Finnish higher education system, where the universities of applied sciences have an established position and whose teachers' professional development has been given increasing attention in recent times (for details on the education system in Finland, see Ministry of Education 2015. For example, having achieved a minimum of 60 ECTS points pedagogical education is obligatory for all teachers working at universities of applied sciences. In addition to that, three years of work experience is

required. There is also pedagogical and professional continuing education for teachers at universities of applied sciences. (Haaga-Helia 2015.)

Previous studies focusing on teachers at Finnish universities of applied sciences have shown that learning new ways of teaching and working involves both individual and collaborative learning and change processes. In one study (`Author, 2012` [details removed for peer review]), there were unveiled two work cultures that are typical of the university of applied sciences in Finland. In the *work culture of conflicting interpretations,* the teachers perceived their work through their job requirements. The competence requirements at teachers' workplace focused on the ability to work collaboratively, by sharing know-how, combining competences, negotiating a work style and planning collaboratively, for example. In the *substance and teaching-centred work culture*, the teachers structured their work using a teaching-centred approach focused on the tasks to be performed within a classroom setting. These teachers felt that they required mostly mastering of the subject matter, which they viewed as the backbone of teaching. Also in the study by Suhonen (2008), this two-fold orientation to teaching and learning at universities of applied sciences became evident. The teachers reported experiences of contradictory demands between their traditional working methods, management of their work and the approach of inquiry-based teaching and learning. Most teachers described inquiry-based activities as teachers' individual work, but also cooperative activities between teachers were mentioned. These two working cultures reflect the changes in teaching and learning at higher education. (e.g. `Author, 2012`[details removed for peer review]; Suhonen 2008).

Teaching and learning of higher education teachers
In the literature concerning higher education teachers, the focus has mostly been on their teaching (Elen & Lindblom-Ylänne 2007; Hativa 2000; Kember 1997; Kember & Kwan 2000; Lindblom-Ylänne & Nevgi 2011; Norton et al. 2005; Postareff 2008). Two typical approaches to teaching have been identified in previous research: *content-oriented* (focus on knowledge transmission), and *learning-oriented/student-centred* (focus on ensuring learning) (Kember 1997; Postareff & Lindblom-Ylänne 2008). The content-oriented teachers emphasised external motivation, such as in the form of exams, in order to get their students to remain active, while learning-oriented teachers saw their responsibility in helping to motivate students to learn about the subject matter. In many studies most of the teachers have had a traditional conception of teaching and seen it mainly as a form of knowledge transmission (Kember 1997; Kember & Kwan 2000). Kember (1997) suggests that teachers' own beliefs about teaching influence their perceptions of teaching.

4

In a study by van Eekelen and colleagues (2005), it was found that teachers' learning experiences were not as self-regulated, structured and reflective as had been expected. According to the findings, teachers learn spontaneously or without planning. The researchers concluded that although teachers do not always self-regulate their learning, they mostly do govern their teaching customs. (van Eekelen et al. 2005).

Some studies on teachers' learning have focused on student teachers (e.g. `Author, 2011` [details removed for peer review]; van Rossum & Hammer 2010). For example, in one study , six different conceptions of learning among health education student teachers were identified: learning as the reproduction of acquired health knowledge, learning as the application of health knowledge, learning as developing personal meanings regarding health matters, learning as the transformation of individual thinking, learning as personal growth, and learning as collective meaning-making. (Paakkari, Tynjälä & Kannas, 2010).

Methodologically, mainstream research on learning conceptions and experiences of learning has followed the qualitative research line, usually the phenomenographic approach (e.g. 'Author, 1999´ [details removed for peer review]; `Author, 2011` [details removed for peer review]; Boulton-Lewis, Brownlee, Berthelsen, & Dunbar 2008; Marton, Dall'Alba, & Beaty 1993; Åkerlind, 2005; 2008b; Yang & Tsai, 2010). Phenomenography is a methodology which examines the different ways how people understand or experience a particular phenomenon. Outcomes of phenomenographic studies are presented in 'categories of description' which show the variation in participants' understanding or awareness concerning the phenomenon in question. Data of peoples' conceptions are usually collected with interviews. Consequently, the number of participants in studies has been small and usually the studies have been limited to a specified teacher group or a certain sector like ICT-assisted teaching (e.g. Löfström 2008; Mällinen 2007). To the best of our knowledge only the study of student teachers' learning and teaching conceptions by van Rossum and Hammer (2010) has used quite a big sample (n=124). In the present study, the material is ample and the participants represent various fields of higher education teaching.

Aim of the Study

Understanding teachers' own learning experiences and conceptions of learning is crucial for pedagogical development, but there is a lack of large-scale studies on this topic. In particular, there is lack of research concerning teachers at universities of applied sciences. Therefore, the purpose of

the present study was to examine these higher education teachers' descriptions of their own learning based on a large amount of data covering different disciplines. Specifically, the following research question was addressed: How do higher education teachers describe their own learning?

Research methods

The data of the study were collected from teachers at Finnish universities of applied sciences. The system of higher education in Finland is comprised of traditional universities and universities of applied sciences also known as polytechnics. The universities of applied sciences were established in the early 1990s in response to the needs of the labour market and to provide a more business-oriented higher education (for more details, see Ministry of Education 2013). The qualification required of teachers at a university of applied sciences is a doctoral degree for senior lecturers and a master's degree for lecturers. In addition to that, pedagogic competence (60 ECTS points) and three years of work experience in the teacher's specific field are required. There are still teachers working in universities of applied sciences who do not meet these standards.

The present study was part of a larger research project in which a structured questionnaire about teachers' work was sent to 5,960 teachers at universities of applied sciences in Finland. The individuals addressed worked as teachers or superiors of the teachers. The questionnaire included 25 questions. The first set of questions focussed on teachers` background variables, such as sex, age, education, experience, substance, and pedagogical education. The second part of the questionnaire dealt with teacher`s work, competencies and professional development. The other parts were about support given for developing teacher`s competence, and the future of teacher`s profession and teaching. The last item requested open-ended comments about succeeding as a teacher at university of applied sciences.

 The questionnaire was sent by e-mail and a total of 1,622 (27%) teachers responded. The data of the present study are based on the open-ended question which was situated in the second part of the questionnaire dealing with teachers work and competences: "How do you learn yourself?" There were no space limits for writing the answer and no definitions about learning. Thus, teachers themselves could determine how they defined learning and what they understood by learning. A total of 1,059 responses were accepted for the study, excluding 563 blanks or one-word answers. (An example of a one word answer: "lukemalla", i.e. "by reading" in English). The range of words was 2-133. Altogether, the data included 17,003 words (50 pages of text; A4, font Times New

Roman 12, line spacing 1.5), written as sentences. Both the questionnaire and the answers were written in Finnish.

Data analysis

The data were analysed qualitatively by applying principles of the phenomenographic research approach (e.g. Marton & Booth, 1997; Åkerlind, 2007; 2011). Phenomenography was chosen because it provides a systematic way to analyse qualitative data and makes it possible to reveal variation in how people experience or understand something. Phenomenography also involves search for structural relationships between the different ways of experiencing (Åkerlind, 2004; 2005). The different ways of experiencing the same thing are seen as internally related, as they represent different meanings of the same phenomenon (Åkerlind, 2003). In the present study, the aim of the analysis was to find the different ways how teachers describe their own learning.

The data, that is, written descriptions by the respondents regarding the ways in which they think they learn, were analysed in an iterative manner by reading the answers several times and discussing these among the researchers involved. In the first phase of the analysis, the answers were categorised into preliminary categories based on their similarities and differences; here the researchers read and interpreted the answers alone. After that, the researchers discussed each other's interpretations and finally agreed on four hierarchical categories after some negotiation. Thus, in reliability checking we used both intercoder check (two researchers independently coded answers and compared them) and dialogic reliability check (agreement between researchers was reached through discussion) (Khan, 2014; Åkerlind 2005). While analysing the data we were aware that our previous knowledge and theoretical backgrounds have an influence on what we saw in the data, but at the same time we intentionally aimed to bracket our own assumptions and to rely on the data (cf. Bowden, 2005; Åkerlind, 2008a; 2012).

 In the second phase of the analysis, the differences between the categories were elaborated by identifying so-called *dimensions of variation* or *themes of variation* (see, e.g., Marton & Pong, 2005; Åkerlind, 2008a). These dimensions represent the attributes that vary between categories. The categories were structured according to phenomenographic principles, with the categories forming a hierarchical system where the categories higher in a hierarchy may include the same aspects as categories lower in that hierarchy but not vice versa (Uljens, 1989; Åkerlind, 2011).

The hierarchical nature of the categories is based on the assumption of phenomenography that every phenomenon can be understood in more or less complex way. Thus, the categories have a logical relation and are related to each other in a hierarchical way in terms on complexity. The conception

lower in the hierarchy represent less complex or advanced ways of experiencing something whereas the conceptions higher in the hierarchy represent more complex or advanced ways of experiencing the same thing (Marton & Booth 1997 p.107; Åkerlind 2005, Author 2015a). Phenomenographic researchers argue for the usefulness of the hierarchical presentation of the categories on the basis of pedagogical reasons. That is, revealing the hierarchical nature of the conceptions makes it possible to focus in teaching on those aspects of conceptions which are critical as regards moving to the more complex way of understanding (Marton & Booth, 1997, 111; Åkerlind, 2005; 2011).

According to Marton and Booth (1997), the categories of description should meet three quality criteria: 1) each category should describe a distinctly different way of experiencing the phenomenon, 2) a logical relationship between each category should be hierarchically represented and 3) there should be a limited, parsimonious number of different categories that describe variation across the sample. (see also, Kettunen et. al. 2012; Paakkari 2012).

One important aspect in the outcome of the phenomenographic analysis is the fact that it can be seen as a collective description on how people in the studied group understand, describe or experience something. In other words, the categories that will be formed as a result of the analysis do not present types of individuals. This means that one individual may have expressed ideas belonging to more than one category. In some phenomenographic studies, however, the number of individuals belonging to each category has been counted. This has been done on the basis of the highest category in the hierarchy in an individual's response (e.g. Micari, Light, Calkins, & Streitwieser 2007; Paakkari et. al. 2014). As the present study is based on a large data, we also conducted quantitative analyses but the findings of these analyses will be presented elsewhere (Author 2015b).

Data analysis was conducted with the original Finnish data. Afterwards selected responses were translated into English for providing examples of each category.

Results
On the basis of the analysis, we found four categories describing universities of applied sciences teachers' experiences of their own learning: 1) individual learning, 2) collegial learning, 3) team learning, and 4) innovative partnership learning. These categories differ from each other in five dimensions of variation, which we labelled: 1) the actor 2) the way of constructing knowledge, 3) the nature of reflection, 4) the learning situation and 5) motivation. The categories and the

8

dimensions of variation are presented in Table 1, where the teachers' different experiences-of learning are shown in a hierarchical structure: the category on the left side of the table represents the most narrow experience of learning in the hierarchy, with each category to the right representing a further broadened experience. Each category is described in more detail below, and the dimensions of variation in each category are marked in bold in the description.

Table 1. Higher Education Teachers´ Experiences of their own learning: the Descriptive Categories and the Dimensions of Variation.

	Categories			
Dimensions of variation	**Individual learning**	**Collegial learning**	**Team learning**	**Innovative partnership learning**
Actor	Learner alone	Learner with other	Group	Community
The way of knowledge construction	Acquisition Doing	Interaction	Collaboration, participation	Co –creation and innovation
Nature of reflection	Individual	Interactive with another person	Interactive in group	Collective, creative
Learning situations	Written/audiovisual material	Interactive encounters	Collaborative problems	Social networks
Source of motivation	External pressure/ internal self - development	External pressure/ internal self - development	Learning together	Developing together

Description of the categories

Category 1: Individual learning
The first category, individual learning, represents the narrowest interpretation by teachers of their own learning. In this category, learning is seen as a solitary activity: the **actor** focused on learning alone, and colleagues or students were not mentioned as part of the process. The **way of constructing knowledge** represents one-directional knowledge acquisition. For example, the respondents described that they learn by reading, writing and doing, through different senses, from experience, and by trial and error. The teachers in this category search for knowledge, learn that knowledge, and then teach it to their students. They described their learning as involving thinking, doing, trying, practising and analysing knowledge on their own.

Thus, the **nature of reflection**—often the most important component of the learning process—is individual. Discussions about knowledge with other people are not mentioned; the teacher acts totally alone. **Learning situations,** in this category, are dominated by the usage of written and audio visual material. For example, books, professional journals, research reports, documentaries, and the Internet were regarded as the most important sources of information for learning. Sometimes the respondents mentioned their own workplace as a key learning environment.

As for **motivation**, both internal and external motivating forces were mentioned in this category. Some teachers referred to external pressure coming from the university's management as a factor stimulating learning activities, while for some teachers internal motivation for learning was stronger. The teachers referred to, for example, their own interest in self-development and further studying. Sometimes these interests were seen to relate to their work and sometimes to out-of-work activities or hobbies.

The following excerpts from the data illustrate the answers belonging to this category. The quotations are answers to the question: "How do you learn yourself?" Every excerpt stems from a different person's answer.

> *Learning by doing*

> *In practice, by working, and partly by reading and pondering theoretical knowledge.*

> *In many ways. I like to listen to lectures... I also learn by reading and traditionally swotting up.*

> *At the moment, my learning takes place by studying on my own. I read about the subject I'm learning about in books or scientific publications.*

Category 2: Collegial learning

In the second category, the focus moves from learning as an individual activity to learning with a partner. The main difference to the first category is that the teacher does not work alone; instead, he/she has a learning partner. Thus, the **actor** is a learner learning with another person. The teachers in this category felt that conversations and acting with a colleague were important to their own learning.

The **way of constructing knowledge** is not restricted to unidirectional knowledge acquisition anymore, but involves interaction and conversation with another person such as a colleague. Knowledge is constructed through dialogue by doing, asking advice and discussing with a colleague. Although these respondents see learning as a social activity, they still describe the way of constructing knowledge in cognitive-constructive terms rather than emphasising the social construction of knowledge. The application of learned knowledge into practice is seen as important.

The **nature of reflection** seems to be interactive; the teacher uses another person for reflecting what he/she has learned. **Learning situations**, in this category, are comprised of different encounters with other people, both face-to-face or virtually, or through quality assurance processes such as evaluations of teaching by students, benchmarking, teaching in the classroom, and working with the Internet. The guidance of students was also often mentioned as an important learning situation. **Motivation** for learning was seen similarly as in the previous category, stemming from external pressures or from the internal desire for self-development. In the following quotations, the respondents expressed experiences belonging both to the first and second category. These examples illustrate the hierarchical and nested nature of the categories: the categories higher in the hierarchy (broader learning experiences) may include ideas from categories lower in the hierarchy (narrower learning experiences).

> *[I learn by] discussing with a colleague.*

I learn by taking part in education, listening and experimenting; also, by practising independently or together with my colleague.

[I learn] by studying hard, both independently and with the help of another teacher.

Category 3: Team learning

In the third category, team working is seen as an essential process of learning. The difference between this category and the first and second one is that, as an **actor**, the teacher shares know-how and learns in a group inside his or her own department or professional context. A field-specific focus is emphasised, but representatives of workplaces are also seen as potential partners in learning. The **way of constructing knowledge** seems to be based on taking part in discussing with colleagues, action planning with others in one's unit, enquiring of others, working together in multi-professional groups, and overcoming challenges and solving problems together. The **nature of reflection** is interactive and thus reflection occurs within a group, and in this case usually within the teacher's own professional group. **Learning situations** involve the social context in which the collective problems of the group are then solved. In this category, teachers' own learning at graduate schools and in their postgraduate studies is often mentioned. Regarding **motivation** for learning, researching and experimenting are often mentioned as sources of motivation.

[I learn by] studying, researching and doing—alone and in teams.

[I learn] cooperatively (e.g., by carrying out projects), by networking (including during leisure time with the people in my field), by independently searching for knowledge, and as a postgraduate student by participating in current seminars.

Category 4: Innovative partnership learning

The broadest understanding that teachers have of their own learning is expressed in category 4, innovative partnership learning. In this category, teachers describe learning outside of their own university school context; learning seems to be associated with **acting** in workplaces. Thus, learning has a strong social dimension and the focus of collaborative learning is on acting together. Learning is described as innovative and as taking place with others in regional developments, in cooperation with workplace partners, and in collaboration with other schools. Cooperation with outside quarters is emphasised in this category of learning. The **way of constructing knowledge** can be characterised as co-creation and collaborative innovation taking place in research and development

12

work, collectively with workplaces and students, and in social networks and seminars. Knowledge is constructed in collective developments with other members of the teachers' organisation and external partners. Learning is contextual, that is, network- and workplace-oriented. The **nature of reflection** in this category is communal, collective and creative. **Learning situations** include social networks, Wikis and other social media tools, instructional situations, topical courses, continuing education, congresses, teamwork projects workplaces, RDI (research, development and innovation), visits, social media, and the surrounding society. The teachers in this category also mentioned learning from adult students. The **motivation for learning** comes from learning together during the work day with others, from outside the teacher's typical context, and from developing competence together.

> *[I learn] by reading, discussing with different persons, following industry publications and news, searching for new knowledge from many sources, and taking part in different developmental projects and professional seminars/conferences as well as exhibitions. I also give seminar presentations myself occasionally, teach at foreign partner institutions from time to time, and write regular articles on a variety of topics. Every few years, I work at companies.*

> *I learn by discussing in collaboration with colleagues, interest groups and stake holders ... and by familiarising myself with the work tasks of my collaborators and by listening to them.*

> *I learn all the time—together with students, teachers and partners, such as in projects in which external professionals are involved.*

Discussion and conclusions

The results of this study show that there is variation in how teachers describe of their own learning at universities of applied sciences. The first category reflects the traditional individualistic conception of learning, where learning is seen as a cognitive intrapersonal activity. In this category, the teachers' descriptions of their learning are reminiscent of the 'transmission of knowledge' conception of good teaching identified by Kember and Kwan (2000). The teachers expressing experiences belonging to this category described that they first learn the knowledge by themselves, and then teach it to their students. In the second category, the traditional individualistic idea of learning is broken down, and teachers describe their learning in terms of collaboration with another

13

person. The other person is usually a colleague in the same field. However, in this category learning does not yet take place in an interdisciplinary or multidisciplinary context or with workplace partners. Thus, this collegial learning is limited to the teacher's own field in higher education as the context. In the third category, teachers' learning seems to be related to a wider sharing of skills and knowledge. Interaction typical of the second category turns into active collaboration in this category. The widening from collegial to team learning raises the question of the prerequisites enabling this kind of transformation. In their study, Hadar and Brody (2012) found out that individual teachers joined other groups only when it supported their personal goals and because it provided opportunities for connecting with other faculties. In the third category, similar to the second one, teachers emphasised working and learning through teamwork with others in their own field and workplace—rather than in a multidisciplinary context. Anyway, the widening of the perspective to the community level can be seen as significant, and earlier studies suggest that it may advance teachers' projection of learning methods onto students ('Author, 2014` [details removed for peer review]; Åkerlind 2008b). Finally, the fourth category representing innovative partnership learning, reflects a new kind of learning conception in which the teacher emphasises learning in collaboration with workplace representatives plus international partners. Here, the teacher's learning is associated with tasks related to regional and societal developments.

Altogether, the hierarchy of categories identified in this study represents teachers´ experiences of their own learning from teacher-centered action (in category 1) to shared expertise in different contexts (in category four). The results also show that while some of the teachers relate their own learning mainly to learning about teaching, some others see learning in a broader context, referring to all professional areas, including not only teaching but also research and development and workplace relations. These findings are in line with some previous studies on teachers professional development (e.g. McLaughlin & Talbert, 2001; Postareff & Lindblom -Ylänne, 2008; Wei et al., 2009).

It can be seen that the four identified descriptions of teacher learning reflect the variety of today's changing and evolving learning contexts from classroom-based learning and the individualistic approach to modern networked and innovative learning interactions with a collaborative partnership approach. The outcome space, or the sum of the four categories, can also be seen to show a process of developmental change in teachers' learning experiences. The process seems to progress step by step, in that first one accepts another person or a colleague as a learning partner, then one sharesknowledge and skills in one's own team, and finally one expands by networking more widely

with other learning partners. The nature of reflection is important in this process. Widening the learning spectrum from the individual to the collegial level, seen in the second category, implies an understanding of the value of interactive reflection as part of the learning process. Further, represented by the third category, team working benefits knowledge sharing and problem solving. Reflection and learning situations widen still further in categories three and four, where the teacher acts with different partners and all of them learn from each other. The widening of one's learning horizon beyond the boundaries of one's own organisation to other workplaces, broader society and international colleagues—as in the fourth category—represents the broadest understanding of professional learning, and this view is closely related to the mission of universities of applied sciences. It can even be said that it is necessary that teachers' perspective of learning expands to innovative partnership learning because of the nature of teachers' work nowadays, particularly in universities of applied sciences ('Author, 2012` [details removed for peer review]). Teachers need to collaborate with other people, networks, workplaces and international partners so that they can act in a wider, international context, and in that way they can better meet the challenges of today's rapidly changing world. This is the only way that the fulfilment of the main tasks of universities of applied sciences—such as regional and workplace development—can be ensured.

Methodologically, this research was unique in that it utilized the principles of the phenomenographic method for analysing big questionnaire data. Usually, phenomenographic studies are based on interview data, which limits the number of participants. Our study indicates that using large-scale survey data is feasible and that the forming of hierarchically structured categories is possible also with large amounts of data—even though, admittedly, written open-ended answers may not be as rich in expression as responses expressed in live interviews. Although, the phenomenographic analysis with the big data proved feasible, we have to admit, on the basis of our findings, that the use of the big data did not bring with it any added value in terms of qualitative categories. Our final outcome is similar to many other phenomenographic studies conducted with small data, that is, small number of categories describing differences in research participants' experiences or understanding. In fact, some qualitative studies have reported that the saturation point may be as small as 11 participants (Mason 2010; Täks 2015, 48-49).

Another important methodological aspect of the present study relates to the number of researchers involved. Most phenomenographic studies are conducted by one researcher working alone on the data analysis. However, some authors argue that group research may produce a better outcome (triangulation; Denzin & Lincoln 2005; Åkerlind 2012). In the present study, five researchers took

part in the phenomenographic analysis and most of them had previously gained extensive experience in phenomenography, suggesting a high validity (Åkerlind 2012) regarding this project's research results. We believe that the discussions, negotiations of interpretations and mutual critique within the research group (cf., Åkerlind 2012) contributed to gaining the valid outcome of the analysis.

A limitation of the study was that the teachers' answers to the survey questions concerning their own learning were quite short. Despite this, the principles of phenomenographic data analysis could be applied because of the large number of answers (1,059) and the fact that most of the written answers were lucid, and variation among the responses was easily discernible. Another limitation, associated with the first one, was that it was not possible to ask any clarifying questions, which is typical in phenomenographic interview studies using surveys. However, the clarity of the participants' responses compensated this shortcoming.

According to Åkerlind (2005), research outcomes are pragmatically valid if they can be used for improving teaching. The findings of the present study provide insight into the variation of teachers own learning in universities of applied sciences, and the dimensions of variation identified clarify what are those aspects on the background of the variation. Understanding variation may help in designing professional development programs for teachers by showing the critical points where teachers need support in their learning. For organizing development programs it is also important to get quantitative information, that is, distribution of teachers in the four categories identified. Therefore, we have conducted a further study examining quantitative aspects such as prevalence of each category, differences between different teacher groups and so on. The findings of these analyses will be presented elsewhere ('Author, 2015b` [details removed for peer review]).

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