Chapter 3
The Relevance of Research for the Improvement of Education and Professional Practice

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Introduction

The purpose of this chapter is to discuss the relevance of research for the improvement of professional education in universities of applied sciences (UASs) and professional practice in the relevant occupations. Higher education institutions outside the universities provide study programmes in a wide range of professional education areas, of which engineering, teacher training (for elementary school and preschool) and nursing generally are the most important in terms of number of staff and students. In addition, these institutions offer many other professional programmes, e.g. social work, arts and design, and different types of health education, as well as studies in economics, business and information technology. So far, the number of master's degrees in the UAS sector is low in most countries, and the number of PhD programmes, with the exception of Norway, is negligible. Accordingly, in this chapter, the discussion on the relevance of research for the improvement of teaching will be confined to bachelor programmes. The question on the relevance of research for the improvement of professional work applies, however, to professional programmes in general.

These programmes represent different historical traditions and cultures related to practice and working life. Some of the programmes were originally founded on an apprenticeship model where the education was organised within working-life institutions. Others were established within the secondary vocational education sector, and as a consequence, there is a strong traditional pedagogy for schooling. Common for these programmes is the tendency towards professionalisation through the development of a scientific knowledge base and extended use of abstract vocabularies (Brint, 2002, p. 238), and the movement from a 'vocational' to an 'academic' education (Smeby, 2007).

In this chapter, *engineering*, *teacher training* and *nursing* will be specifically examined, but the discussion is relevant for all types of professional programmes. In the countries included in this book, engineering is the only programme that

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is provided by most UAS-type institutions. Also, teacher training for elementary school is mainly provided by institutions outside the traditional university sector. This applies to Belgium, the Czech Republic, Ireland, The Netherlands, Norway and Switzerland, while in Germany this programme is offered both by universities and teacher training colleges, and in Finland by universities only. Nursing is mainly provided by UASs in countries like Finland, The Netherlands, Norway and Switzerland.

The introduction of research as a task for teaching staff in these programmes has been contested, and the extent of research varies much between countries. Still, it has become more commonly accepted that research-based teaching can be important in order to improve the quality of education and subsequently the practice of professionals. The rationale for this development has been excellently summarised by Pratt, based on his study of the development of the former British polytechnics (1997, p. 326):

> The critical argument is that those teaching future professionals cannot do so without reflecting on the implications of professional and educational practices. Moreover, they need experience and understanding of current developments in theory and practice. The graduates, too, need to have a firm understanding of investigative methods appropriate to their future careers. Most non-university institutions also have an important task of offering advisory and consultancy services to firms of all sizes. This activity is itself investigative; much research arises in this way. Staff need research skills to undertake this task and they (and students) can further develop these skills by doing it.

The call for a stronger research orientation of professional programmes comes from different groups (see the model presented in Chapter 1). Staff members who are competent and interested in undertaking research, as well as programme leaders and institutional leaders, actively work to create a research culture and to increase the resource basis for this type of scholarly activity. National authorities, professional associations and working-life institutions argue that research is important to improve the quality of professional programmes and the knowledge basis of professional work. Similarly, the OECD and the European Commission support the enhancement of research activity in these programmes.

Nevertheless, many are sceptical to this development and argue that too much emphasis on research in professional programmes might in fact be detrimental to the vocational orientation of the courses and the employability of the graduates (Skoie, 2000). Furthermore, there is not much evidence in the research literature that increased focus on research in professional programmes at a bachelor's level will increase the quality of teaching and learning and improve the preparation of students for a professional career. To the extent that this issue has been addressed in this literature, it is the relationship between teaching and research within disciplinary university programmes that have been examined.

In this chapter, we will discuss four arguments that have been used to introduce research in professional programmes:

1. Teaching will improve if the staff engage in research (research-based teaching).
2. Students will learn more if they come into contact with research (research-based learning).

3. Professional practice will improve if professional workers in their training learn how to base their work on research-based knowledge (research-based practice).
4. Professional programmes have an obligation to improve the knowledge basis of professional work through research (research-based knowledge production).

The first three arguments focus on the importance of basing professional programmes on research, while the fourth argument concerns the importance of doing research to enhance 'evidence-based' knowledge. Although these arguments are closely related, they are analytically distinct and will be examined separately.

National Policies

In the countries included in this book, national policies vary in the extent to which research in professional programmes is regarded as important for improving education and professional practice. In most countries, state authorities have expressed that teaching in professional programmes should have a basis in research as well as in practical knowledge, but the implications of rather diffuse statements are unclear. The second purpose – that research should contribute to improved professional practice in the relevant occupations – is not visible in the official mandate of the UASs in all of the countries.

Norway is the country where state authorities most clearly pronounce that research is important to improve the quality of these programmes and that research should contribute to better teaching in elementary school, to better kindergartens and to improved health care and social care. Furthermore, in order for professional programmes to obtain accreditation, research-based teaching is one of the criteria. National evaluations of nursing (2005), teacher training (2006) and engineering (2008) have recommended that the extent of research and the research competence of their staff should be enhanced. Similarly, a national commission set up to propose reforms in the higher education system (Stjernø Committee, 2008) argued that the quality of professional programmes should be improved and that a stronger research-orientation was needed to improve professional education and professional work. Based upon the recommendations by this commission, the Minister of Education and Research stated that elementary school teachers should have a research-oriented approach to their teaching practice, have access to research and be competent to apply research results in his/her teaching. Thus, during teacher training, students should come in contact with research and get experience with research (Aasland, 2008).

In The Netherlands, the act on higher education states that the UASs can undertake research to the extent that this activity is related to the education at the institutions. What this statement actually implies for the relationship between research, teaching, learning and professional practice is not quite clear, but other policy documents state that research in UASs should contribute to improving the quality of education as well as improving professional practice in society.

Because professional work is to an increasing extent supposed to be evidence-based, research and knowledge transfer should play an important role in the education of professionals and in the societal mission of the UASs.

In Finland, the Polytechnic Act says that the tasks of the UASs are to provide teaching which is based on scientific or artistic foundations aiming to produce high expertise in the related fields, to support the professional development of students and to conduct applied research and development which supports both the development of teaching, working life and regional development. The Development Plan for Education and Research for the years 2007–2012 similarly states that the primary mission of the UASs is to provide and develop professional higher education closely connected with working life and to conduct R&D which serves working life and regional development as well as teaching.

In Germany, the role of application-oriented research in the education of students in the UASs is emphasised, because research among the teaching staff establishes the relationship to work practice via cooperation with industry and supervision of the students' bachelor and master theses in firms.

In the other countries, the role of research in the education of students and in the development of evidence-based professional practices is not very visible in policy documents. This does not necessarily mean that research is regarded as unimportant for these purposes, but the awareness that research should play an important role in the enhancement of teaching, learning and professional practice is not very well developed at the state level. To some extent, this situation is probably due to fact that national authorities regard the role of research in UASs primarily as a tool in the regional innovation processes.

In the following, we will critically examine arguments for research in professional programmes in terms of a *teaching* perspective, a *learning* perspective and a *knowledge-production* perspective by briefly reviewing relevant literature and by comparing practices across the major professional programmes.

Research-Based Teaching

The notion 'research-based teaching' is ambiguous and is interpreted in different ways, of which we will analytically distinguish between two interpretations: (a) all staff should undertake research and (b) teaching should take place in a research culture.

An argument for introducing research as a task for academic staff in professional study programmes is that the teaching of students needs to be done by teachers who are themselves engaged in research. It is important that teachers keep being informed on recent research in their own field. In this respect, reading the literature is not regarded as sufficient; teachers have to undertake research themselves. Such activity may develop passion for the subject which in turn is communicated to students, and engagement in research may develop thinking abilities, knowledge and skills that can be reused in teaching (see Trowler & Wareham, 2008). A strong interpretation of this proposition is that teaching should only be provided by staff

members who have themselves done research related to their lectures. In practice, this interpretation is not sustainable (not even in research universities) because staff are required to offer lectures in areas and subjects where they themselves have not undertaken research.

Others argue that the requirement of research-based teaching will be fulfilled if the teaching takes the form of dissemination of research-based knowledge by teachers who are well-informed on established scientific knowledge in their domain. This means that all staff members do not need to undertake research themselves; it will be sufficient that they keep themselves up-to-date with the essential literature in the field. This seems to be the message in the OECD report on tertiary education (1998, p. 58), which states that 'a culture of research and scholarship implies not that all teachers are current, active researchers but that all understand and experience the ethos of critical, reflective inquiry and efforts to explore, construct and create knowledge'. Embedded in this debate is the question about what should be the minimum level of academic qualifications in order to be a teacher in a permanent position in the UASs.

The argument that teaching in professional programmes will improve if the teachers are engaged in research is however contested. It is commonplace knowledge that there are good researchers who are excellent teachers, but also that there are research-oriented teachers who use too little time for their students. It is also well-known that there are "teaching-only staff" who lack engagement for teaching or have great difficulties in communicating the curriculum to their students. How we perceive the relationship between research and teaching also depends on our notions of what research is (Brew, 2006). A broad conception of research seems to be needed for this activity to have an impact on education at a bachelor's level. Furthermore, the meaning of research-based teaching is dependent on the nature of the field of knowledge or discipline (Neumann, Parry, & Becher, 2002).

In the scholarly literature the extent to which there is a positive relationship between research and teaching has been discussed over a very long time, but for the most part, confined to university teaching. Numerous studies have been undertaken to examine and discuss the relationship between research and teaching, but the results are inconclusive (see Hattie & Marsh, 1996 for a review). Marsh and Hattie (2002, p. 635) conclude that good researchers are neither more nor less likely to be effective teachers than are poor researchers, and that good teachers are neither more nor less likely to be productive researchers than are poor teachers. Based on these results, Marsh and Hattie argue that personnel selection and promotion decisions must be based on separate measures of teaching and research.

But even though the general evidence for such a relationship is inconclusive, it seems to be a common belief among academics and societal stakeholders that teaching in higher education, including professional education at a bachelor's level, should take place in a research atmosphere (OECD, 1998; Barnett, 2005; Brew, 2006). Still, few studies support the argument that teaching in professional programmes at this level will improve if the teachers engage in research.

There is not much information from the various countries about the extent of, forms of and experiences with research-based teaching in professional programmes.

Table 3.1 Percentage of academic staff in Norwegian university colleges in 1998 who reported that their teaching was influenced by their research

	To a large extent	To some extent	Not at all/not relevant	Sum	*N*
Engineering	6	17	77	100	(376)
Nursing	15	33	52	100	(267)
Teacher training	14	29	57	100	(808)

An obvious reason is that the share of teachers who undertake some kind of research themselves is relatively low.

A survey of Norwegian university colleges undertaken in 1998 show that only a small share of the academic staff reported that their teaching was influenced by their research 'to a large extent' (Table 3.1). In nursing and teacher training programmes more than half of the staff stated that there was no relation at all between their research and their teaching, or that this issue was not relevant to them, while in engineering programmes this applied to three quarters of the staff. However, if we confine the results to those who were research active, about 30% of the teacher training staff, and about 20% of the engineering and nursing staff reported that their teaching was influenced by their research 'to a large extent'. In total, approximately three quarters of those who were research active said that their teaching to a large or some extent was influenced by their research (Karseth & Kyvik, 1999).

Another survey among academic staff in Norwegian university colleges found large differences between programmes with regard to the purpose of their research. Of those teachers who reported that they undertook applied research and development work, 58% of the teacher training staff, 47% of the nursing staff and 34% of the engineering staff answered 'to a large extent' on the question whether the purposes of the research was to improve teaching (Larsen & Kyvik, 2006).

Research-Based Learning

The notion of 'research-based learning' is ambiguous and comes in different versions. In this chapter, we will analytically distinguish between two interpretations: (a) Learning should take place in a research culture and (b) learning should take place through student participation in research. The former interpretation implies that the students do not necessarily need to participate in or undertake research themselves. It is sufficient that they are taught scientific theory and methodology in such a way that they understand what science is and how research is undertaken. The latter interpretation implies that students should do some project work under the supervision of an experienced researcher. The collecting and analysing of data, even at a simple level, promotes a critical understanding of the nature of research.

The OECD report on tertiary education (1998, pp. 57–58) argues that 'all students, whether enrolled in university or non-university institutions would benefit from an active research and scholarly culture in which they participate both directly

and indirectly'. According to the report, a reason for this is that 'students need to understand that knowledge . . . is the fruit of inquiry, that it is constructed and reconstructed through criticism, analysis and reflection and that being a student means being an active, reflective, critical inquirer'. The OECD report (1998, p. 58) furthermore states that 'engagement in small group projects directed at solving practical problems is a valid way of introducing students to research conceived as structured critical inquiry'. This interpretation has clear parallels to the notion of project-based learning.

The OECD report (1998, p. 58) also proposes that students themselves, as part of their studies, should undertake projects and field work in which they assume some responsibility for formulating research questions, designing studies and evaluating results. This can be done by integrating students as assistants in research projects undertaken by academic staff or by introducing bachelor theses which should be founded on research or some kind of investigation.

There is some scattered evidence for the argument that students at a bachelor's level will learn more if they come into contact with research. Cousin, Healey, Jenkins, Bradbeer, and King (2003) point to students perceiving research-based learning as an invitation to be part of a research community of practice. Although they saw themselves as peripheral participants, they appreciated to have a legitimate position in research. Neumann (1994) conducted in-depth interviews with students in a range of disciplines and concluded that there were benefits to students of staff research. Students perceived the teaching as up-to-date and reported excitement about the enthusiasm demonstrated in courses taught by researchers. Healey (2005) argues that there is an increasing amount of evidence that one of the most effective ways in which students might benefit from research is through active engagement in the research process. Finally, Lucas (2007) maintains that in teacher education, engagement in research can have positive impacts on student learning.

Turner, Wuetherick, and Healey (2008) report evidence of the effectiveness of problem-based and inquiry-based learning with undergraduate students, both of which encourage students to be engaged with learning in a research mode. On the other hand, they also report that many students identify negative impacts of research on their learning, e.g. lack of interest in teaching and lack of availability of teachers. Similarly, Jenkins, Blackman, Lindsay, and Paton-Saltzberg (1998) found that many students did not perceive themselves as stakeholders in staff research and they saw research as quite separate from their own learning activities. In a study of research-led teaching and learning among undergraduate students, Zamorski (2002) reports that students, as well as lecturers, described research-led teaching and learning in practice in a variety of ways. The students' engagement with research varied to a large extent and occurred in a number of forms and levels of learning. Most students saw it as important to develop research skills as part of the undergraduate curriculum and saw research skills as important for their future career and job applications. They clearly valued being part of a research community and expressed commitment to the academic ethos. On the other hand, they expressed frustration over the lack of access to research activities as well as feelings of being excluded from research and were irritated by the lack of availability to researchers/teachers. Zamorski (2002)

underlines the students' ambivalence; they appreciate being part of a research active community and consider engaging with research as a useful learning experience, but at the same time they lack understanding of the nature of academic work and experience a lack of access to research.

The studies cited above mostly report on students' *perceptions*, and Jenkins (2004) argues that there are few studies analysing the impact of student *learning* related to teachers' engagement in research. The study conducted by Cousin et al. (2003), however, reported that students who participated in research became more confident as learners and that it made them more capable of thinking independently.

In all three programmes, research-based learning takes place through the engagement of students in projects, although there is not much available information on the share of the students who actually participate in research projects. A survey among academic staff in Norwegian university colleges in 2006 shows that about 20% of those who undertook applied research in each of the programmes for engineering, nursing and teacher training reported that students participated 'to a large extent' in these projects (Larsen & Kyvik, 2006).

The extent to which students undertake some kind of research related to bachelor theses varies between countries and programmes. The bachelor thesis is common in engineering programmes, and generally it is regarded as an important part of the learning process. In many of the countries, an important aim of the bachelor thesis is to support the link to local industry. Critical analysis of information, problem-solving, reasoning and argumentation skills and development of work practices and clear written communication skills are important objectives of the thesis. The assumption is that through their thesis work, students can enhance their expertise and relations with working life. However, there seems to be a tension in the engineering programmes between the importance of ensuring that the students learn some core competence with a strong emphasis on mathematics and natural sciences on the one hand and a more application-oriented approach on the other hand (Maffioli & Augusti, 2003).

The rationale behind the bachelor thesis in nursing can be seen in the light of the argument of professionalisation. This holds true at least for Norway and Sweden where the purpose of the thesis is for the students to gain more in-depth knowledge of the scientific methodology and theoretical structures of nursing. The meaning of 'research-based' is closely linked to the disciplinary content of what is defined as nursing science. However, in the curriculum of nursing we also find arguments that emphasise the employability of students. By basing the curriculum and teaching on current research and developments in the nursing field, the students should develop professional attitudes towards continually updating their knowledge and practice. A Norwegian study shows, however, that in nursing programmes there are doubts about whether the students at a bachelor level are competent to participate in research projects undertaken by employees within health institutions (Larsen, Heggen, Carlsten, & Karseth, 2007).

In teacher training, the rationale behind the bachelor thesis is not easy to grasp. Meeus, Van Looy, and Libotton (2004) argue that the thesis in teacher education in most cases is a derivative of the master thesis. They draw on data from a Flemish

university college and conclude that the thesis was subject to fierce criticism. They argue in favour of a more practice-oriented approach with the portfolio as a model. A needed connection to research is not clearly stated. Neither the employability argument nor the argument of professionalisation seems to be advocated.

Research-Based Practice

Another argument for introducing research in professional programmes is that professional practice will improve if professional workers in their training learn how to apply research-based knowledge in their work. Said differently, in order to become well-qualified workers, and thereby guarantee optimal employability in the knowledge society, the education must be based on research (see Simons & Elen, 2007). In a world of rapid change, students must be motivated and enabled to engage in life-long learning, and learning to do research is the best way of acquiring the competence and motivation to do so. Furthermore, in a knowledge society, professional workers are encouraged to continuously upgrade and broaden their skills (Peters & Humes, 2003). A knowledge society is run by expert settings and expert processes and in such a society, '... effective participation and power increasingly rests on access to scientifically legitimated knowledge (expert knowledge) and the capacity to apply such knowledge productively, individually and collectively' (Jensen, 2007, pp. 55–56). Similarly, Scott (2005, p. 64) argues that there are good reasons to associate research and teaching, also at a bachelor's level:

> If one of the goals of mass higher education systems within a 'knowledge society' is to produce knowledge workers – who are 'more' than simply graduates with expert academic or professional skills and who have an active 'enquiry capacity', but are 'less' than professionalized researchers – the significance of the teacher-researcher (and even the teacher-researcher-practitioner) as a role model (and intellectual leader) is correspondingly enhanced.

This kind of argumentation has been used also in a report published by the Commission of the European Communities, and which does not distinguish between undergraduate and graduate education (2002, p. 40):

> When taking a close look at the type of core competencies that appear central to employability (critical thinking, analysing, arguing, independent working, learning to learn, problem-solving, decision-making, planning, co-ordinating and managing, co-operative working, etc.), it appears quite clearly that the old Humboldtian emphasis on the virtues of research-teaching cross-fertilisation remain surprisingly relevant in the current context. It is very striking that the list of 'employability' competencies overlaps quite largely with the competencies involved in the exercise of the modern research activity.

However, the discourse advocated by the Commission is in sharp contrast with the Humboldtian premise of academic freedom which indicated that the pursuit of knowledge should be protected from the rest of the society. The importance of research-based education according to the Commission is its potential to develop students' capacity to apply scientific knowledge to solve practical problems. A similar argument is visible in the communiqué from the Minister meeting of the Bologna

Process in Leuven (28–29 April 2009). It is stated that 'Higher education should be based at all levels on state of the art research and development thus fostering innovation and creativity in society' (p. 4).

In other words research-based education is seen as an instrument to produce knowledge workers who have intellectual and innovative skills necessary for taking a leading position in the development of their professional practice. Following this argument professional programmes have to involve students in research in order to gain the key competences pointed to above by the Commission.

Research-Based Knowledge Production

The final purpose of introducing research in the UAS sector is that professional programmes have an obligation to improve the knowledge basis of professional work in their relevant occupations through research-based knowledge production. Many professional programmes are not provided by universities; subsequently the scientific basis for competent professional practice as well as for the production of text books is insufficient. Applied research and development work in professional programmes is assumed to communicate directly with stakeholders in the field.

The importance of the interaction with the users or practitioners in order to define the research question, as well as professional goals and research design, has been highlighted in the argument for a practice-driven research approach. Close cooperation and partnership between the research institutions and schools, companies or hospitals is seen as a way to improve the knowledge base of professional work. Action research is a well-known label used to underline the importance of participation, involvement and the processes of innovation and change with a strong focus on the local context (see Hollingsworth, 1997; Dick, 2004). Research undertaken across professional boundaries during the previous three decades has articulated the qualities of thorough professional work and emphasised the significance of the individual practitioner's experience, contextual sensitivity and ability to exercise skilful discretionary judgement in various situations (Schön, 1983; Lave & Wenger, 1991; Nielsen & Kvale, 1999). Furthermore, the emphasis on change and innovation corresponds with the paradigm of Mode 2 research (Gibbons et al., 1994), where a new form of knowledge production is distinguished by its close proximity to the context for problem-solving and to the user. Groups that traditionally are separated from the processes of knowledge production are integrated into the definition of, and solution to a problem, and in the evaluation of performance and quality.

Evidence-based practice is another argument used to emphasise the importance of the role of professional programmes in the research-based knowledge production. 'Evidence-based' is one of the most used adjectives in health care today indicating the need to inform patient treatment and care by scientific evidence. It was previously applied almost exclusively to medicine in the term 'evidence-based medicine', but terms like 'evidence-based practice' and 'evidence-based nursing' are becoming more widespread and stress that nursing practice ought to be based on reliable and valid proof for the effects of nursing care. Academic nurses and clinicians advocate

strongly for the necessity of improving the quality of patient care by updating nurses on research findings and making them able to utilise research in the assessment and interpretation of patients' health and illness problems. This movement towards professional practice based on new scientific knowledge is also supported by health politicians who aim at increasing the quality of health care.

Also in teacher training, evidence-based teaching has gained ground. In elementary school teaching and preschool teaching, the emphasis of evidence teaching entails a need to strengthen educational research (see, for instance, Hargreaves, 1999; Davies, 1999). There is a call for increased research activity which might produce a better knowledge base, which in turn might lead to more research-informed educational policies and practices (see OECD, 2003).

A third argument underlines both a strong user orientation and a strong scientific orientation in knowledge production. The principle of user-inspired basic research, as introduced by Stokes (1997), has influenced OECD's (2003) strategy for research in the field of education. Research on education is recommended to focus on problem areas in the educational sector, while also contributing to overall development of knowledge. This argumentation reflects the belief that research can improve professional practice; furthermore, that the interaction between researchers and practitioners should be intensified, practices should adapt to research and research should adapt to practices. The success criteria are related to those of action-oriented research, in which the purpose of the research is to generate new opportunities for action to the same extent as producing new knowledge.

In the arguments about research-based knowledge production in professional programmes, such as nursing, teacher training and engineering, all three approaches are observable and they all emphasise the user. However, while the user is placed as a co-producer in an action research approach, the user's position within an evidence-based framework and a user-inspired basic research approach is restricted to be taken into account in defining research questions.

A recent issue of *Educational Researcher* (2008) – the official journal of the American Educational Research Association – illustrates the tension between these different approaches to knowledge production within the field of education research. Bulterman-Bos (2008) asks for a clinical approach to make research more relevant for practice where teachers and researchers can be reconciled in the context of clinical research practice. She argues that 'in clinical education research practice, the proof of success is not whether arguments are sound or ideas are interesting but whether the arguments and ideas contribute to better practice' (Bulterman-Bos, 2008, p. 419). On the other hand, Labaree (2008), one of the four commentators on Bulterman-Bos article, argues that the attempt to make educational research more relevant is counterproductive. Teachers and researchers have different orientations towards education based on different institutional settings, occupational constraints, daily work demands and professional incentives. Furthermore, the issue of relevance is difficult, and he argues that what seems to be of little relevance may turn out to be highly useful at a later time and in a different place (Labaree, 2008, p. 421).

Furthermore, we may question whether these different approaches to the production of research-based knowledge mentioned above, take place according to

different sets of criteria (Hammersley, 2002; Rasmussen, Kruse, & Holm, 2007). Scientific knowledge defined as basic research is assessed on the basis of the valid/non-valid. On the other hand, we may argue that practice-oriented research is guided by the criterion of useful/useless, or the criterion professional improvement/no professional improvement. This argumentation conflicts with the views of Gibbons et al. (1994) and the idea of a new paradigm where the production of knowledge transcends and interacts with research contexts and practical contexts. Rasmussen et al. (2007) point to the risk that this will dilute research and claim that research will not become more indicative of action by renouncing their scientific criteria. Research which is not produced on the basis of scientific criteria loses its credibility among practitioners and politicians alike.

The criticism that academic staff in professional programmes produce research mainly to promote the vested interests of professions, and less often with the intention to enhance the quality of the services that are provided to users, is also well-known (Elzinga, 1990). Nursing science represents a good illustration of professionalisation through the development of a scientific knowledge base. As an academic discipline, nursing science has evolved in stages (Martinsen, 1986; Elzinga, 1990). Until 1950, the knowledge of nursing can be described within a humanistic tradition based on practical knowledge where caring was the central concept. In the second phase nursing drew heavily upon medical and technical knowledge. According to Elzinga (1990), a 'technification' was taking place. The third period which started in the middle of the 1960s is characterised by the establishment of a research capability. The aim of the nursing education that developed at this stage was to educate independent and reflective professionals who showed responsibility in the use of scientific knowledge and acquired a critical ability in assessing the practice of nursing. Furthermore, the student should learn the history of nursing as a discipline, its main models, concepts and theoretical frame of references (Karseth, 2004). However, the success of this professionalisation strategy can be questioned. The rapid shifts in knowledge and culture undermine the ability to root professional practice in a stable base of collective knowledge legitimised by references to the past. This creates a climate in which any foundation or authorising centre of knowledge is subject to question (Karseth & Nerland, 2007). According to Kessl and Otto (2006), traditional systems of knowledge production and knowledge reception are subjected to a steady loss of legitimacy. Paradoxically, however, the current trends of incredulity and doubt are accompanied by a strong call for increased research activity which may produce authoritative knowledge, which in turn may lead to a more research-informed nursing practice. This call challenges the approach advocated in the universities which argues in favour of theory-oriented and researcher-driven approaches that emphasise academic freedom. But it also challenges the approach defined by the UAS sector which embraces case-oriented and action-based research.

For academic staff within professional programmes the contesting arguments presented above are challenging. However, as we will point to below, the practical relevance aspect is of primary importance in how to define the research project.

A survey undertaken among academic staff in Norwegian university colleges provided information on various aspects of the applied research in the university

Table 3.2 Characteristics of applied research among academic staff in Norwegian university colleges in 2006. Percentage of staff who answered 'to a large extent'

	Engineering	Nursing	Teacher training
Inspired by practical problems	67	62	56
Based upon own experience in the field of practice	27	38	36
The initiative came from the field of practice	26	14	9
Developed in cooperation with the field of practice	31	32	23
(*N*)	(110)	(380)	(490)

colleges (Larsen & Kyvik, 2006). Table 3.2 shows that practical problems are an important point of departure for the staff members in their research. The most apparent importance is the role of practical problems as an inspiration for research. The findings support the significance of a close connection between research and practical problems. Furthermore, almost one third of the academic staff in engineering and nursing answered that their research is to a large extent developed in cooperation with the field of practice, while this holds true for less than one quarter in teacher education. Although there is a strong rhetoric in the field of teacher education about the necessity of a close relationship with the field of practice, such a relationship is unusual.

In another Norwegian study conducted in 2007 on nursing and other health courses provided by university colleges (Larsen et al., 2007), a questionnaire-based survey was combined with a qualitative interview study, in which a small sample of employees in nursing programmes were requested to describe research that transcended the distinction between university colleges and various clinical fields. The respondents were furthermore asked to reflect on the distinctive character of the research efforts they themselves were undertaking. Nursing staff orient their research towards improvement of practices, while at the same time being concerned with making contributions to the overall development of knowledge. The researchers were reluctant to use the label basic research, but were concerned that their efforts should contribute to production of knowledge and extend the research frontier within their own discipline. However, they were clearly and primarily motivated by, and oriented themselves towards, the practical importance that their research would entail for patients, healthcare workers and to improvements in treatment and care for patients.

Taken together, close partnership between research institutions and schools, companies or hospitals, is a central argument in order to improve the knowledge base of professional work. User involvement is seen as one of the key features of knowledge production and knowledge is generated in the context of application. Still, there are different approaches and contesting views of how research-based knowledge is constituted. There is a tradition of regional knowledge development and cooperation in all the three professions as well as an increased emphasis on a more cumulative knowledge production based on rigorous scientific procedures. This challenges the different programmes within the UASs and calls for redefining their research profiles.

Conclusion

In this chapter we have discussed the relationship between research, education and professional practice within bachelor degree programmes in engineering, nursing and teacher training. This review shows that there are different arguments advocating the importance of research-based teaching and learning in professional education at a bachelor's level. It is also clear that these arguments differ among the various professional programmes.

Both academic staff and students welcome a research-based approach to teaching and learning. However, the studies presented reveal doubts, barriers and challenges related to the development of a research culture that facilitates research activities by academic staff as well as by students. To build a professional programme on research-based knowledge is not a straightforward process. As this chapter shows there are many contesting views on the nexus between research and teaching, as well as the meaning of the concepts of scientific knowledge and research.

UASs, as well as politicians, have expressed the wish that their research should have an applied profile, and thereby better serve the interests of professional training. Through this discussion, we arrive at a point of view inspired by Rasmussen et al. (2007), where we show how the criteria for production and assessment of knowledge are different within research compared to practical, professional work. Recognising this difference may represent a favourable basis for maintaining high quality in both professional training and research, and it also points to the need for transcendence and linkages between research and education. The needs and opportunities for linkages are present, and in these efforts to achieve transcendence and linkages, the opportunities for utilisation of research as a means to improve undergraduate professional education are likely to be found.

While professional programmes offered by UASs were established within educational institutions with a knowledge culture related to practical knowledge and working life, the professionalisation of these programmes has to a large extent relied on the development of a scientific knowledge base. As a consequence, these programmes are embedded in different value and reward structures, creating tensions concerning what counts as valuable knowledge and appreciated competences and skills. These tensions have to be recognised in higher education policy aiming at making research relevant for the improvement of professional education and professional practice.

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