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Understanding learning and learning for understanding

Exploring medical students' personal understandings of learning tasks and experiences of learning and understanding in medicine

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Abstract

The central concern of the thesis is to problematise the complexity of the relationship between student learning and the teaching-learning environment in medicine as experienced by students. The thesis argues that learning material presented to students offers only *potential* for learning. What students make of that potential is influenced by a number of different variables and as such this needs to be investigated empirically. High-quality learning is an important goal for all higher education and previous research together with the empirical findings presented in this thesis convey the importance for students to seek a holistic approach to learning. Such a learning approach encompasses not only learning of facts and theories but also includes exercising an ability to reflect and reason, to organise facts and theories into wholes, and to explore how they relate to each other. Most importantly, it involves the ability to understand on the grounds on which facts and theories are chosen for specific purposes depending on context. The thesis explores these issues by drawing on findings from three studies of medical students' experiences of learning and understanding and how students' personal understandings of subject content in medicine come to the fore in their work on learning tasks. By applying a context-oriented methodological perspective on learning, focusing on what students *actually do* in a learning situation, the thesis enables an in-depth investigation of relationships between aspects of content, context and the individual. The results show that the learning environment in the medical programme to a large extent does not make sufficient room for students to express understanding of this dynamic character. In the thesis it is argued that to facilitate such an understanding it is necessary for both students and teachers to increase awareness of the context-dependency of subject content, facts and theories, and the different meanings content takes depending on context of use.

Keywords: Approaches to learning, experiences of learning, higher education, high-quality understanding, medical student learning.

Books are like mountain tops jutting out of the sea. Self-contained islands though they may seem, they are upthrusts of an underlying geography that is at once local and, for all that, a part of a universal pattern. And so, while they inevitably reflect a time and a place, they are part of a more general intellectual geography. This book is no exception (Jerome Bruner, 1993).

List of publications

- Scheja, M., & Bonnevier, A. (2010). Conceptualising students' experiences of understanding in medicine. *The Journal of the Hellenic Psychological Society*, *17*(3), 243–258.
- Bonnevier, A., Josephson, A., & Scheja, M. (2012). Potentialities for learning in medical students' ways of approaching a diagnostic task. *Higher Education*, *64*, 371–384.
- Bonnevier, A., Josephson, A., Lavelle, T., & Scheja, M. (Manuscript submitted for publication). Potential for high-quality learning in medical students' ways of approaching a modified essay question.

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Introduction

The central concern of this thesis is to foreground the complexity of the relationship between student learning and the teaching-learning environment in undergraduate medicine as experienced by medical students and the impact that this relationship may have on the quality of the students' learning. Drawing on findings from an ongoing empirical study of medical students' experiences of what learning and understanding in medicine entails and on findings from two empirical studies of how medical students' personal understandings are expressed in relation to academic tasks, the analyses reveal how the students describe their experiences of learning within the medical programme and how these experiences come to the fore through the students' expressions of their personal understandings of subject content in relation to learning tasks.

The thesis also starts to draw up the contours of a framework for conceptualising and investigating empirically the relationship between student learning and the teaching-learning environment from the student's perspective. This is initiated first by examining relevant research on high-quality learning and understanding in higher education in general and medical education in particular and second by presenting a context-oriented methodological perspective on the learning process.

Since the late 1960s and early 1970s researchers have emphasised the importance of seeking meaningful (Ausubel, 1968) and deep-level (Marton & Säljö, 1976a, 1976b) learning. This might sound like an obvious and simple idea and most educators and students would probably agree on the need to acquire knowledge that goes well beyond rote memorisation and the learning of facts to a deep-level of understanding that involves the ability to “think and act flexibly with what you know” (Perkins, 1998, p. 42) and the use of knowledge in novel ways and new situations. But just what constitutes teaching and learning for a deep-level of understanding is far from self-evident.

One complicating circumstance is that the relationship between teaching and learning often is taken for granted, i.e. teachers present some learning material and students simply acquire the understanding that was intended by the teachers (Coles, 1990; Entwistle, 2009). In this thesis I will argue—based on the empirical studies and on previous research—that learning material presented to students offers only *potential* for learning (Ausubel, 1968; Bonnevier, Josephson & Scheja, 2012; Bonnevier, Josephson, Lavelle &

Scheja, forthcoming; Ellaway, 2011; Svensson, 2009). What students make of that potential and hence the quality of the understanding achieved, is influenced by a number of complex factors related, for example, to the learner's prior experiences, abilities and intentions and to factors related to the situation at hand as experienced by the learner. To enhance the quality of learning and its outcome in any learning situation it is necessary first to attempt to understand how student learning and its outcome in a specific situation are affected by the teaching-learning environment (McCune & Hounsell, 2005) and what students already know (Ausubel, 1968).

In this thesis medical education provides the setting of this specific learning situation, more specifically an undergraduate programme in Sweden educating medical students studying to become medical doctors. The medical programme offers numerous opportunities to study the complexity of the relationship between student learning and the teaching-learning environment. This particular learning environment constantly challenges students to adapt to new situations. In pursuing their medical studies students have to successfully cope, for example, with the transition from pre-clinical studies in the basic sciences (such as anatomy, physiology, microbiology, biochemistry etc.) taught mostly by university-employed scientists in classrooms set apart from clinical settings, to clinical learning settings at hospitals and other health-care facilities involving real patients.

Other examples of transition are those made between the many medical specialties at highly specialised university hospitals (sometimes competing over curricular space and with different ideas of how to practice medicine) as well as clinical practices set in primary-care units with a more generalist oriented practice. Students also meet different sorts of patients, from newborn babies to old people nearing the end of life, men, women, different nationalities, people with minor healthcare problems and people who are dying, where the same illness might manifest in different ways.

Moreover, medical students have to learn how to cope with demands made on them not only by teachers, fellow students and themselves, but also from patients, patients' families, healthcare employers, and by society in general and the economic demands put on healthcare. Additionally, they need to learn how to successfully collaborate with other medical professionals on different levels within diverse specialist areas in medicine, such as super-specialists, researchers, generalists, students and novice physicians. Students also have to learn how to interact and collaborate with students and professionals from other healthcare areas, for example nursing, physiotherapy, biomedicine and occupational therapy.

Adding to the complexity of the teaching-learning environment in medical education are the different epistemological premises within medical education described by Dornan, Mann, Scherpbier and Spencer (2011) as: "While medical education is avidly adopting constructivist pedagogies, what many teachers tacitly hold to be 'normal' or worthy of defending is firmly

rooted in positivism, the acquisition metaphor, and universalism” (ibid., p. xxvii). Patel, Kaufman and Arocha (2000) argue for the existence of essential tensions between characterising medicine as a science “steeped in the theories and methods of basic sciences” (ibid., p. 335) and medicine as a profession “where the practice of medicine is referred to as an art” (ibid., p. 336). They also describe epistemological differences of major importance between basic sciences and clinical sciences that lead to students experiencing considerable difficulty in using biomedical concepts in clinical settings (ibid.).

While this domain offers data for a wide range of studies, this thesis will focus on foregrounding the complexity of the relationship between student learning and the teaching-learning environment in medicine as experienced by the students. By problematising and clarifying this complexity, the thesis can play a role in improving the learning processes and outcomes in medical education.

This thesis draws on previous research on student learning and understanding in higher education, but it also occupies the specific research domain of medical education. Traditionally, research in medical education has developed as its own educational research field with its own conferences and several peer-reviewed educational research journals alongside publication within mainstream medical journals, often separate from contemporary research in higher education in general. Given the nature of educational research, which will be discussed later on, it is important for educational researchers to “use evidence cumulatively to draw conclusions ... judging the strengths and weaknesses of the evidence, and testing the plausibility of the arguments presented. There can be no single study or specific research approach that will reach conclusive, applicable findings.” (Entwistle, 2009, p. 5). In light of this cumulative view of educational research, both research in medical education and research in higher education would gain from acknowledging the body of research produced within the fields separately to a higher extent.

In this thesis I make a modest attempt to bring this gap closer. The theory and methodology used in the empirical studies are derived largely from contemporary educational research in higher education originating mainly from the United Kingdom (UK) and Australasia, and conceptual development as it has been developed in Stockholm. The data was collected from medical education, and the discussions and conclusions drawn make connections to research from both medical education and higher education in general.

Outline of the thesis

The thesis consists of a collection of three research articles accompanied by this integrative, narrative. The articles build on three separate empirical stud-

ies concerned with different aspects of students' understandings in medicine. The first article explores medical students' general experiences of learning and understanding in relation to their studies, while articles number two and three consider medical students' understandings as expressed in relation to specific learning tasks: a patient case constructed for research purposes only (study II), and an authentic modified essay question examination (study III).

The integrative narrative also reviews research literature and concepts related to students' approaches to learning and experiences of understanding in higher education in general and medical education in particular. It also surveys contemporary ideas of meaningful, deep approaches to learning and what learning for high-quality understanding may entail in general and in medicine. Since the learning tasks in two of the empirical studies were based on patient cases, an overview of research on clinical reasoning is provided. The literature review then introduces some of the influences on student learning with a special focus on the strong impact that assessment procedures have on student learning.

Following the review of learning and understanding, the theoretical and methodological basis for the empirical studies comes into focus, specifically the view of learning as a *process of contextualisation* (Halldén, Scheja & Haglund, 2013) and the methodological distinction between *task* and *problem* (Halldén, 1988) on which the analyses rest. The narrative concludes with a presentation of the aims of the thesis.

To frame the empirical studies, there is a brief presentation of the learning environment in which the data was collected, the research designs and methods used in the different studies, including a description of the analyses. More detailed expositions appear in the articles included in the last section of the thesis. There is also an ethical reflection prior to the summaries of the three empirical studies, paying particular attention to the main findings of each study and highlighting aspects of how students express their understandings.

The purpose of the last section of this narrative is to relate the separate studies to one another by offering a discussion of how the research findings relate to the thesis' overall aim: to critically reflect on the complexity of the relationship between student learning and the teaching-learning environment in undergraduate medicine as experienced by medical students. It will also relate the findings to the contemporary literature reviewed and discuss the impact that students' experiences may have on the quality of their learning. Strengths and weaknesses of the thesis are discussed as well as implications for educational practice and theory. Finally, a few suggestions for further research are provided.

Hopefully the research presented in this thesis will give the reader an increased awareness of the complexity of the relationship between student learning and students' experiences of their teaching-learning environment in medicine as well as what meaningful learning and understanding in medicine

may entail for students based on these experiences. My firm belief is that such an appreciation of what medical students' learning and understanding may entail within the medical programme in general, and in relation to specific learning tasks, can contribute significantly to educational research in higher education in general and research and practice in medical education in particular.

Research on learning and understanding

As implied in the opening quote by Jerome Bruner (1993), all research belongs to a field of inquiry, a scientific discourse that provides both a framework for exploring and understanding phenomena in the world and a standard against which new contributions, such as the research presented in this thesis, can be judged and validated. Hence, the following two sections have a twofold aim. The first section presents an overview of contemporary research and concepts related to the results in the empirical studies presented in this thesis. This involves both research from the area of higher education in general and research from medical education in particular. The second section presents learning theories and methodological assumptions for interpretation stemming from the areas of *conceptual development* (e.g. Halldén et al., 2013), *approaches to learning* (e.g. Marton, Hounsell & Entwistle, 1997), and to some extent *cognitive linguistics* (Langacker, 2008) that are of specific significance to the methodology and methods used in the empirical studies.

Research in higher education

Research in higher education is a multifaceted area encompassing a broad range of research issues and topics. It incorporates researchers from a variety of disciplines interested in different aspects of teaching, learning and development (e.g. psychology, education, sociology and medicine). Researchers in higher education typically focus on policy and management issues (e.g. system policy, institutional management or academic work) or they emphasise topics of interest to the academic practice (e.g. teaching and learning, course design, quality, widening participation, professional development, learning in the workplace, or assessment). (See e.g. Tickle (2001), Haggis (2009) or Tight (2012) for an overview of research in higher education.). Research on teaching and learning has usually explored issues of teaching and learning either from a teaching perspective *or* a learning perspective, where research on contextual aspects traditionally has been concerned with what goes on outside the class room (or other learning situation). Such research has focused on, for example, gender, race and class issues of relevance to teaching and learning (Haggis, 2009).

A large proportion of research in higher education is carried out within different subject areas, which makes it a difficult field to survey. The following section will not attempt to give a complete systematic review of literature in higher education. Rather, it aims to provide the reader with the necessary background and concepts to determine the value of the research presented in the thesis in relation to contemporary research on student learning and understanding in higher education in general and in medical education in particular, and the methodological foundations on which the thesis rests.

Approaches to learning

Since the 1970s when Marton and Säljö first presented the idea of a distinction between *surface* and *deep level of processing* in relation to reading an academic text (Marton & Säljö, 1976a, 1976b) the progress of research on teaching and learning in higher education in Sweden and internationally (at least in the UK and Australasia) has largely followed the developments in the UK where the ideas of a distinction between deep and surface level processing were developed further resulting in the terminology *deep* or *surface approaches to learning* (Entwistle & Ramsden, 1983; Marton, Hounsell & Entwistle, 1997).

One contributing factor to the tremendous impact on research on student learning posed by the idea of *approaches-to-learning* was that the idea, instead of building on theories from other fields of inquiry (such as cognitive psychology) built on empirical data from the area of education. This probably appealed to researchers and teachers and made the theory more *ecologically valid*¹ (Entwistle, 2009). It brought to educational research both the notion that learning is always directed towards an object and it placed the learning individual in focus by adding a new perspective on learning focusing on “individuals as having their own intentions and seeking to make sense of the world for themselves within a social setting” (ibid, p. 28).

From this perspective, students approach learning in different ways depending on their personal intentions, which could be either to memorise facts and details (*a surface approach*), or to understand the meaning of something (*a deep approach*), initially an academic text. The research on approaches to learning managed to establish a functional relationship between the student’s intention when studying and learning and the quality of the understanding achieved. This intention is affected by the learner’s previous individual experiences and beliefs about teaching and learning and an idea of what is required in the specific situation at hand. By studying the understanding achieved and asking students about how they had gone about studying and

¹ *Ecological validity* refers to whether the methods used, the data material, the context of the study and the results come close to the everyday social world that is being examined (Kvale, 1989).

what their intentions were, the researcher drew inferences and modelled the students' learning process that led up to the understanding achieved. This approach resulted in the pairing of a surface approach with an intention to reproduce course content in order to cope with course requirements. Leading the student to "studying without reflecting on either purpose or strategy. Treating the course as unrelated bits of knowledge. Memorising facts and procedures routinely" (Entwistle, 2000, p. 174). Likewise, a deep approach was paired with an intention to seek meaning and understand "ideas for yourself leading to: Relating ideas to previous knowledge and experience. Looking for patterns and underlying principles. Checking evidence and relating it to conclusions. Examining logic and argument cautiously and critically" (ibid., p. 174).

Approaches to learning has been one of the fundamental starting points for research acknowledging the context dependency of student learning and research concentrating on qualitative differences in learning and understanding in higher education. The deep approach to learning, which by now is based on more than 30 years of qualitative and quantitative research involving students from numerous subject areas and settings (for an overview see e.g. Lonka, Olkinuora & Mäkinen, 2004; Tickle, 2001), is in this thesis viewed as the starting point for describing high-quality learning and understanding in higher education.

Although researchers working in the approach-to-learning tradition originally perceived themselves as distinct from cognitive psychology (cf. Marton & Booth, 1997) in terms of, for example, ontology, the perspective arose within a cognitive tradition, and as time has passed this distinction has become somewhat blurred (Haggis, 2009). Another common blurring of concepts is between approaches to learning and *learning styles* (Dunn, Beaudry, Klavas, 2002), which originates foremost from North American literature and stems from cognitive psychology. In medical education, research has to some extent investigated medical students' learning styles (Curry, 1999; Newble & Entwistle, 1986; Newble & Gordon, 1985). However, learning styles are, compared to approaches, seen as more of less stable personality traits of an individual, whereas approaches are seen as influenced by both content and context.

Newble and Gordon (1985) showed that medical students tended to adopt a surface approach to learning, while Coles (1985) was able to demonstrate that the number of students expressing a reproduction orientation (cf. surface approach) to learning tended to increase during the pre-clinical years in a medical programme with a traditional curriculum.

In the European higher education literature research on approaches to learning is often carried out within the everyday learning environment with an emphasis on trying to explore and explain variations in students' ways of approaching learning and how these variations in approaches affect the learning outcome (Newble & Entwistle, 1986). In medical education, how-

ever, this is not the typical way of conducting research. However, Fyrenius, Wirell, and Silén (2007) conducted semi-structured interviews with undergraduate medical students to investigate differences in their approaches to achieving understanding of physiological phenomena related to blood pressure. This study is interesting in several ways. First, it offers a more fine-grained analysis of students' approaches to learning than what is typical for the area of medical education, and so it also makes a solid contribution to research on students' approaches to learning and studying in higher education in general. Second, the results are also interesting in that they describe variations in students' deep-level processing. In particular, the researchers found two different types of deep approaches: *moving* and *holding*.

The moving approach is characterized by an intention to continuously refine understanding in an open-ended process. The student strives for a change in perspective and deliberately creates actions that are rich in variation and challenge. The holding approach is characterized by an intention to reach a final goal. This is achieved by high degrees of structure and control in the learning act. Understanding is sometimes sealed, "held on to" and can be threatened by new input and other students' viewpoints (ibid, p. 149).

In a subsequent study (Fyrenius, Silén & Wirell, 2007) these researchers explored students' conceptions of underlying principles in medical physiology. The findings suggest that although many students exhibited evidence of causal reasoning—which is often seen as a characteristic of a deep-level of understanding—they still revealed an understanding typical of a surface approach to learning where long and complex causal relations were rote memorised. The researchers argued that causal reasoning is an important aspect of achieving understanding, but that this reasoning needs to be of a special kind that goes beyond the ability to recite long reasoning chains. This way of reasoning "is qualitatively different in the sense that phenomena are not simply mentioned or explained in terms of causal relations, but processed and contextualized in various ways" (ibid, p. 367).

Students' experiences of learning and understanding

As described in the previous section, research on approaches to learning and studying has established a distinct relationship between the approach used by a student and how this student experiences the teaching-learning environment (Entwistle, 2000; McCune & Hounsell, 2005; Richardson, 2006). Research has also established that students' general epistemological perceptions or *conceptions of knowledge and learning* influence how they approach learning (Edmunds & Richardson, 2009; Lonka & Lindblom-Ylänne, 1996; Loyens, Rikers & Schmidt, 2007; Marton, Dall'Alba, Beaty, 1993; Perry,

1970; Säljö, 1979; Vermunt & Vermetten, 2004). In higher education, this has been explored in some detail, often through the use of self-reports in inventories. Research findings have suggested a successive transformation in students' conceptions of learning and knowledge indicating a development from a dualistic, reproduction-oriented conception of learning and knowledge towards more refined and academically acceptable ones, conceptualising learning and knowledge as transformative and relativistic (e.g. Perry, 1970).

Askell-Williams and Lawson (2006) have criticised this research for being too reductionist in limiting the descriptions of students' approaches and conceptions to, for example, deep and surface or dualistic versus relativistic. Based on an empirical study they conclude that students' cognitive models about learning are much more complex and differentiated than what is usually emphasised in research and that this complexity needs to be accounted for in teaching.

In Britain, Entwistle and Entwistle (1992) discerned five distinctly different experiences of understanding expressed by students in interviews when preparing for exams. The different forms of understanding described by students were seen as originating in the students' intentions related both to reasons for attending the programme as a whole and to the specific examination under revision (Entwistle & Entwistle, 1992). The understandings were seen as progressive individual variations in terms of breadth, depth and structure. Students describing experiences of achieving understanding expressed feelings of satisfaction, connectedness and coherence, while students failing to understand characteristically conveyed feelings of confusion, disconnectedness and incoherence (ibid.).

Although interesting in themselves these studies also stimulated further research into student understanding. Entwistle and Marton (1994) found—by analysing the same interview data—that students putting massive effort into their studies when revising for exams or dealing with other particularly challenging learning tasks described their personal understanding in terms of cognitive and highly flexible structures, what the authors called *knowledge objects*, described as virtually visual entities ready to be used to structure their thinking and adapt explanations to meet requirements in relation to, for example, exam questions (Entwistle, 2009; Entwistle & Marton, 1994).

In medical education, both students' approaches to learning and studying and students' experiences of learning and understanding have been explored to a limited extent. Researchers in educational psychology using psychometric methods and inventories (e.g. Clarke, 1986; Lindblom-Ylänne & Lonka, 2001; Lonka & Lindblom-Ylänne, 1996; Newble & Entwistle, 1986) have, for example, shown that medical students (in comparison to psychology students) experienced learning to a greater extent as “externally regulated and reproduction-directed” (Lonka & Lindblom-Ylänne, 1996, p. 15), that is, as a mere intake of knowledge ready to give back to the teacher. Medical

students in the same study also scored higher on items related to an active *professional orientation* defined by solely appreciating information readily applicable in a professional setting (ibid.). It is worth mentioning that previous studies by the same researchers indicated that this kind of professional orientation is not related to study success in most preclinical courses (Lonka, Lindblom-Ylänne & Maury, 1993).

Other studies in medical education focus on students' experiences of or attitudes towards aspects of their learning environment, such as aspects that can potentially prove to be emotionally challenging for students (Pitkala & Mantyranta, 2003), for example, autopsies (Weurlander, Scheja, Hult & Wernerson, 2012), or dealing with the death of patients (Kelly & Nisker, 2010).

While these studies have contributed significantly to our understanding of how students experience the process of coming to understanding in higher education in general, there is still a lack of research on students' experiences of learning or achieving understanding in relation to specific learning and assessment tasks in higher education in general. The number of studies dealing with this problem in medicine are even less. This is surprising given the importance of high-quality understanding expressed by the research communities in both higher and medical education, and the great number of studies showing a clear relationship between students' experiences, approaches and the learning outcome.

Meaningful learning and high-quality understanding

Learning can be described as the outcome of a process—that is the knowledge, skills or understanding acquired through a learning process—or it can refer to the actual process of acquiring this outcome. In this thesis I will use the term learning to refer to the *learning process*. The outcome of the learning process will be mentioned in terms of for example *knowledge*, *skills* or *understanding* where understanding should have, as we shall see, a special character that is of great importance to high-quality learning in higher education. Understanding is sometimes used in the literature as the result of learning in general and sometimes as being of a special character (cf. Stone Wiske, 1998). To emphasise the qualitative character of the concept I will henceforth use the term *high-quality understanding*.

The issue of meaningful learning and high-quality understanding has been extensively researched from different perspectives in higher education, including, for example, the *personal understandings* (Entwistle, 2009; Entwistle & Smith, 2002) achieved by students, *students' experiences of learning and academic understanding* (Vosniadou, 2010 a, 2010b), influences of the learning environment on the quality of student learning (Biggs, 2012; Entwistle, 2000; Entwistle & Smith, 2000; Kreber, 2009; McCune &

Hounsell, 2005) and what *teaching for understanding* may entail (Biggs & Tang, 2007; Stone Wiske, 1998).

The expression *meaningful learning* as opposed to *rote learning* originates from David Ausubel's (1968) research in cognitive psychology. Rote learning involves knowledge being assimilated unchanged and arbitrarily into cognitive structures (or long term memory) while meaningful learning requires that the learner carefully integrates new knowledge into knowledge that is already established (cf. Piaget's (1953) assimilation and accommodation theory). Hence, meaningful learning is a prerequisite for developing high-quality understanding.

But what does high-quality understanding involve? The answer to that question depends, of course, on who you ask. The medical programme has lots of stakeholders: students, teachers, university management, employers, the government, and, perhaps most important, the patient: Ultimately, the education of future physicians is about improving human health. All these groups can have different ways of defining high-quality understanding.

For example, in 2003 the Swedish government stated that evaluation of the quality of higher education (on undergraduate and graduate level) should mainly relate to quality aspects of the *outcome* of an educational programme (Prop. 2009/10:139); an educational programme should meet with the aims as specified in the Higher Education Act (SFS 1992:1434) and Higher Education Ordinance (SFS 1993:100). Evaluating whether these aims are realised should be based on (1) aims and examinations (i.e. whether all aims expressed in the ordinance are covered and examined in an appropriate way), (2) the learning outcomes (e.g. through inspection of the students' independent/degree projects), (3) students' experiences of and influence over their education (e.g. through alumni surveys) (Prop. 2009/10:139). For example, the Higher Education Degree Ordinance for a medical degree includes the following aims:

To obtain a medical degree, the student should demonstrate the knowledge and skills required of the medical profession, and necessary to fulfil the residency [AT] that is compulsory to qualify as a medical doctor.... To obtain a medical degree the student should demonstrate both broad and in-depth knowledge within the area of medicine.... demonstrate a deep ability to independently diagnose patients with common illnesses and diseases and, in collaboration with patients, treat them.... show the ability to critically and systematically integrate and use knowledge and analyse and evaluate complex phenomena, issues and situations (SFS 1993:100, author's translation).

A holistic perspective on learning—to form coherent wholes

As mentioned in the beginning of this section, approaches to learning is an important starting point for the definition of high-quality learning and under-

standing in this thesis (and higher education research and practice in general). With approaches to learning followed a strong emphasis on the importance for students to adopt a deep approach to learning. Svensson (1997) described the deep and surface dichotomy as involving either a *holistic* or an *atomistic* character. In this view, a surface approach could be described as being atomistic; the learner profiles parts, details and facts without reflecting on the grounds on which they are chosen, or if, how, and why they relate to each other. A holistic approach, on the other hand, involves trying to understand the topic as a whole, while fitting together and integrating the pieces, facts and details. The deep holistic approach has been shown to be of utmost importance in learning for high-quality understanding at university (Entwistle, 2012; Perkins, 1998; Svensson, 1997).

Although learning is always related to a particular subject and content, there are some general qualities that research has defined as being essential to meaningful learning and high-quality understanding in the *super-complexity* (Barnett, 2007) of modern society.

As we near the close of the twentieth century, the equity and excellence of our schools are being criticized and interest in teaching for understanding is once again on the rise. The basic skills-oriented education that has tended to dominate the last two decades seems too little. Once more school critics are calling for students to go beyond facts, to become problem solvers and creative thinkers, to see multiple possibilities in what they are studying, and to learn how to act on their knowledge (Perrone, 1998, p. 24).

To meet with these new demands David Perkins and colleagues at the Harvard Graduate School of Education in USA developed the Teaching for Understanding Framework (Stone Wiske, 1998). Perkins' way of defining understanding has had great impact on definitions of understanding made by researchers in higher education. Perkins (1998) suggests a *performance view* of understanding (as opposed to a *representational view*):

Understanding is the ability to think and act flexibly with what one knows. To put it another way, an understanding of a topic is a "flexible performance capability" with emphasis on the flexibility ... Learning facts can be a crucial backdrop to learning for understanding, but learning facts is not learning for understanding (ibid., 1998, p. 40).

Moreover, this flexible, dynamic understanding must be *extensive* (Lawson & Kirby, 2012), which means that it must include a great variety of significant information, facts and experiences highlighting different aspects of a phenomenon (cf. Schmidt & Rikers, 2007). But it should also go beyond that; it has to be *integrative* (Entwistle, 2012; Fyrenius, Wirell & Silén,

2007; Lawson & Kirby, 2012; Svensson, 1997) and *internalised* (Perrone, 1998). Knowledge that is only extensive can be *fragmentary* (Lawson & Kirby, 2012) and atomistic (Svensson, 1997) relying solely on memorisation with focus on facts and details. An integrative and holistic understanding involves creating relationships between facts and details, which again brings us back to approaches to learning theories:

The concept of holistic approach... suggests that, in learning for understanding within a deep approach, the student forms wholes corresponding to complex phenomena of the world, including facts and their interrelations. It is the skill of forming integrated wholes that constitutes the most central aspect of the skill in learning through understanding [And this] is dependent upon sensitivity to the material and the exploration both of the content of the material and of the relevance of organisational principles to the content (Svensson, 1997, pp. 60, 68).

When learning takes on this extensive and holistic character it can become not only integrated but also *integrative* (Entwistle, 2009), which in a sense makes it *generative* (Lawson & Kirby, 2012) in that it can extend (Perkins, 1998) already existing knowledge, lead to new understanding and facilitate transfer of knowledge between settings making the learner able to use the knowledge under many different circumstances.

For students, this form of extensive, integrative, generative understanding does not come easily. It can only be obtained through hard work on behalf of the learner. To be successful, students need to cultivate the intention to understand the content in this deep and holistic way. This way of approaching learning has been described by McCune and Entwistle (Entwistle & McCune, 2013; McCune & Entwistle, 2011) as a *disposition to understand for oneself* (cf. Perrone's (1998) definition of internalised).

The deep approach, as originally described, depended on the intention to understand the meaning of a specific topic and on using the learning strategies necessary within a specific discipline to develop a thorough academic understanding of that topic. The disposition to understand for oneself depends on similar learning strategies but with a broader focus directed towards the discipline as a whole, while the intention to understand is more wide ranging and involves an ongoing and strong desire to understand that carries with it a recognisable emotional charge. The disposition also involves an awareness of the process of learning within specific contexts that leads to the monitoring of understanding in relation to both specific tasks and the discipline as a whole (McCune & Entwistle, 2011).

Hence, in order to achieve high-quality understanding students need not only put in massive effort into their learning, they must also explicitly be

metacognitively aware of and reflect on the nature of what such a meaningful learning process entails within the subject area studied and take responsibility for *self-regulation* (Boekaerts, 1999) of their own learning. Such metacognitive awareness and self-regulation inevitably involve active reflection on (1) the learner's own learning processes and strategies, and (2) the characteristics of any particular learning object in light of the situation at hand. In this thesis, reflection is viewed as an important and integral part of achieving high-quality understanding and in continuing professional development (Kolb, 1984; Lew & Schmidt, 2011; Mann, Gordon & MacLeod, 2009; Moon 1999; Schön, 1983), and is defined broadly a cognitive process of "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends" (Dewey, 1933 in Mann et al., 2009, p. 597).

Influences on learning and understanding

Student learning is highly influenced by the setting in which it takes place (Lave & Wenger, 1991). As the theory of approaches to learning has established, learning is always directed towards an object and this object is always associated with an intention. Students do not just study. They have an intention to do something in response to what they believe to be required in a specific learning situation, belief influenced by a highly complex framework that includes course aims, examinations, teacher demands, other students, the university or department environment and much more. It is essential to emphasise that, given the theoretical and methodological foundations of this thesis (i.e. learning as a process of contextualisation of, for example, learning tasks), it is not the context as such that is foregrounded (as will be discussed later on), but students' experiences or perceptions of this context (Cobb, 1990; Entwistle, 2009; Halldén et al., 2013).

Contemporary research in higher education, especially in northern Europe/UK and Australasia, has produced a great number of studies on different aspects of the influences of the teaching and learning environment on the quality of student learning in order to be able to improve this quality by informing teaching practice. For example, the influence of teaching on learning has been investigated through the use of inventories by Ramsden (2003) who explored students' perceptions of good teaching, and by Meyer (1991) who measured students' perception of aspects of the teaching-learning environment such as books, lectures, assignments etc. (see e.g. Entwistle, 2000).

Learning is a highly situated phenomenon that has to be understood in relation to the specific learning environment in which it takes place. Literature suggests that different disciplines hold their own norms, languages, procedures and practices (Becher & Trowler, 2001; Kreber, 2009), that every subject is associated with its own *inner logic* (Entwistle, 2009), and that learning is bounded by the specific *ways of thinking and practicing* (WTP) en-

dorsed within a particular discipline or educational programme (McCune & Hounsell, 2005). Ways of thinking and practicing in a subject area involve:

The richness, depth and breadth of what students might learn through engagement with a given subject area in a particular context. This might include, for example, coming to terms with particular understandings, forms of discourse, values or ways of acting which are regarded as central to graduate-level mastery of a discipline or subject area.... WTP can potentially encompass anything that students learn which helps them to develop a sense of what it might mean to be part of a particular disciplinary community, whether or not they intend to join a given community in the future, for example, by pursuing a particular profession (ibid., p. 257).

But not only aspects of teaching and the physical or sociocultural environment have an impact on student learning. Student learning is also affected by characteristics and conceptions held by the individual learner. As already described, research in both higher and medical education provides evidence that students' *conceptions of learning* (e.g. Lonka et al., 2004; Marton et al., 1993; Perry, 1970; Richardson, 2006; Säljö, 1979; Vermunt & Vermetten, 2004), i.e. their epistemological beliefs of the nature of learning itself and what it involves to learn something, are complex and highly differentiated (Askill-Williams & Lawson, 2006) and that these conceptions affect learning and its outcome.

Ever since the late 1960s educational research has stressed the importance of teachers taking as a point of departure what students already know (Ausubel, 1968). Students may also hold beliefs about their own knowledge and skills and what they are able to perform in a learning situation. *Motivation* is another important variable influencing student learning (Barnett, 2007; Pintrich, Marx, Boyle, 1993). Students must, of course, want to learn, but the character of student motivation is also of importance. Typically, research makes a distinction between *intrinsic motivation* generated by the individual student through a genuine interest in what is being learnt and *extrinsic motivation* coming from outside the student depending on rewards such as high grades or fear of failure (Ryan & Deci, 2000); the former is seen to be more likely to lead to a personal high-quality understanding. An important finding of special interest to medical education (given the layout of a typical medical programme), and in view of ideas of extrinsic motivation, is the statistically highly significant correlations between a surface approach, heavy workload and the use of exams promoting memorisation (Entwistle, 2000).

Influences on student learning constitute a complex and multi-dimensional area of study. Researchers typically address one or a few aspects of what may influence learning. However, in recent work Entwistle and colleagues (Entwistle, 2000, 2009; Entwistle & McCune, 2013; McCune & Entwistle, 2011) have tried to bring more of these aspects together, i.e.

student characteristics and features of the teaching-learning environment, to provide a conceptual framework useful for reflecting on the dynamic relationship between student learning and the teaching-learning environment in higher education. This thesis does not investigate specific aspects of the teaching-learning environment and the impact they might pose on student learning. As elaborated on later, it is not the teaching-learning context per se that is of interest here, but students' individual experiences and perceptions of this context as they come through in the students' narratives. The term WTP (McCune & Hounsell, 2005) can from such a perspective be used to symbolise all potential aspects of what might influence the relationship between student learning and the teaching-learning environment, as experienced by the students.

The influence of assessment on student learning

It is by now generally agreed in educational research that assessment is one of the most powerful factors influencing student learning (see for example Entwistle & Entwistle, 1992; Newble & Jaeger 1983; Norman, Neville, Blake & Mueller, 2010; Ramsden, 2003; Scouller & Prosser, 1994; Struyven, Dochy & Janssens, 2005; Wass & Archer, 2011). Assessment indirectly steers student learning and it is also one of the most important instruments available for determining whether students have achieved course aims and intended learning outcomes. With a renewed interest from the Swedish Government in evaluating the outcome of learning, assessment procedures in higher education take on added importance. It is imperative that assessments are congruent with course aims (Biggs & Tang, 2007) and that they test what was intended (Tan, Sutton & Dornan, 2011), but as we shall see such *constructive alignment* (Biggs & Tang, 2007) is far from self-evident in the practice of higher education. The influence of assessment on learners is of particular importance for learners adopting a *strategic approach* (Entwistle & Ramsden, 1983), which is an approach shown to be well represented among medical students (Lonka & Lindblom-Ylänne, 1996).

Working as a physician in today's modern super-complex (Barnett, 2007) society definitely demands an understanding of the high-quality character described above. Unfortunately, for many reasons students and teachers are encouraged to "engage in lower-quality learning and teaching" (Lawson & Kirby, 2012, p. 1). It is easier to design assessment methods to assess knowledge and skills on a lower level (Feletti & Smith, 1986; Palmer & Devitt, 2007), which means that many exams tend to be constructed for testing knowledge on a level that is inadequate in relation to the aims described in course plans and curricula.

Although medical students and residents are among the most frequently tested groups in higher education, it is surprising how often the assessment methods still focus primarily on low-level skills. [...] It is relatively easy to test basic factual knowledge; it is not uncommon to find postgraduate examinations still assessing at this level (Wass & Archer, 2011).

Assessment is one of the most central research themes in medical education (Norman, 2002; Regehr, 2004). Higher education in general is following a policy trend that shifts accreditation requirements from educational-process criteria to learner-outcome (i.e. assessment) criteria (ACGME, 2014; Regehr, 2004). An important issue in research on assessment in medical education is how best to assess clinical or professional performance (van der Vleuten, 1996). This question has inspired research into, for example, how simulations can be used to assess students, different aspects of the OSCE (objective structured clinical examination), the use of portfolios in assessment etc. (Norman, 2002; Regehr, 2004). However, studies on assessment in medical education tend to focus on quantitative measurements of validity and reliability of tests (see e.g. Wass, van der Vleuten, Shatzer & Jones, 2001). Few studies are concerned with qualitative aspects of students' understandings and how high-quality understanding can be supported through assessment or what learning activities students *do in fact engage in* when presented with an assessment task.

Medical education

Contemporary medical education is usually defined as involving undergraduate, postgraduate, and continuing medical education generally including the educational programmes leading to a medical doctors degree (MD) and excluding other health-care professions. Occasionally, educational institutions and journals in the area have a more inclusive definition including other health-care professions, but the medical programme, medicine and its professional areas will often have a privileged position:

Medicine has a privileged position in society and, as a result, medical education is itself set apart from the humdrum of higher education. In many countries it luxuriates in separate funding streams and higher rates of remuneration for its clinical teachers; is the beneficiary of status and patronage through its colleges, academies and professional institutions ... (Swanwick & Buckley, 2010, p. xv).

Although medicine and the education of physicians are ancient arts and practices, the discipline or “domain” (Dornan et al., 2011, pp. xv) of medical education research has a much shorter history. It began in the early 1960s in

North America (Norman, van der Vleuten & Newble, 2002) and has since then grown to be a global research field involving a colourful mix of researchers, methodologies and research interests with several hundreds of articles published yearly in both peer-reviewed journals within its own area but also in mainstream medical journals (Norman, 2011). Among the research issues of special interest in the field are: curriculum development (including problem based learning), methods and issues of teaching, assessment and evaluation, development of expertise and professionalism, selection for admission of students and student characteristics such as learning styles and motivation (Calman, 2006; Dornan et al., 2011; Norman, 2002; Regehr, 2004; Swanwick, 2010).

Although the past fifty years of educational research in the area of medicine has contributed substantially to the understanding of the reasoning processes—in particular the expert reasoning process involved in clinical reasoning and outcomes of medical training—little effort has been put into investigating medical students' experiences of coming to understand such reasoning or the essence of students' experiences of understanding in medicine. "In most medical schools considerable attention is given to the definition of the content of the curriculum, to the organisation of assessments and examinations. Hitherto, little attention has been given to the impact of these activities on the way students learn" (Newble & Entwistle, 1986). As pointed out earlier, if you want to be able to improve the quality of student learning and understanding and support students in learning what you want them to learn, you must first come to terms with the character of student learning in a subject field and how students' understandings develop in relation to their teaching-learning environment.

Clinical reasoning in medicine

Clinical reasoning is at the core of medical practice and one of the most important outcomes expected of a medical curriculum. The terms clinical reasoning, medical reasoning, clinical decision-making and diagnostic reasoning are frequently used synonymously. In this thesis I use the term *clinical reasoning* and give it a rather wide and simple definition as "the mental activities involved in arriving at a diagnoses and a management plan" (van der Vleuten, Norman & Schuwirth, 2008, p. 413) for a patient. There is a good deal of research and extensive discussion in medical education on the complex process of clinical reasoning (for an overview see Higgs, Jones, Loftus & Christensen, 2008). Much effort has been put into studying qualitative differences between novice and expert reasoning (Norman, Brooks, Colle & Hatala, 2000; Schmidt & Rikers, 2007) and the role of basic science/biomedical knowledge in clinical reasoning (see for example Rikers, Loyens, te Winkel, Schmidt & Sins, 2005; Woods, 2007; Woods, Brooks & Norman, 2007).

Woods (2007), for example, argues that developing evidence suggests that medical students do benefit from learning biomedical knowledge in the sense that it helps them develop coherent cognitive representations of disease categories that are shown to be stable over time. In other words, it may work as an organising principle (Svensson, 1997) for the students, helping them to categorise medical information and giving meaning to signs and symptoms (Woods, 2007, p.1175).

There is an interesting parallel between research on clinical reasoning and the research on approaches to learning theories in that clinical reasoning is regarded as a highly contextual and content dependent phenomenon (Epstein, 2007; Smith, Higgs & Ellis, 2008).

Common contextual factors include the practice setting, the local prevalence of disease, the nature of the patient's presenting symptoms, the patient's educational level, and other demographic characteristics of the patient and of the physician. Many aspects of competence, such as history taking and clinical reasoning, are also content-specific and not necessarily generalizable to all situations (Epstein, 2007).

Research in medical education (although contradicted) has depicted the process of acquiring clinical reasoning skills as a stepwise developmental process involving changes in cognitive structures, resulting in a decreasing need for explicit reasoning along with growth of experience (Boshuizen & Schmidt, 2008). Students as novice doctors organise knowledge in more or less coherent network structures, which requires explicit and time consuming reasoning activity. As experience grows, parts of the networks become increasingly encapsulated into clusters, enabling the student to skip intermediate reasoning steps making the reasoning process less time-consuming. Finally, these encapsulated knowledge clusters are transformed into so called *illness-scripts* encompassing salient features of a specific illness or diagnosis such as enabling conditions, pathophysiological genesis, signs and symptoms (Boshuizen & Schmidt, 2008; Schmidt & Rikers, 2007). With access to such illness-scripts, which are activated as a whole when encountering a clinical problem, experts do not need to reason when presented with everyday problems. But, when faced with difficult problems, or problems from another area of expertise, even experts tend to revert to the use of reasoning (Woods et al., 2007).

It has been argued that clinical reasoning—like high-quality learning—is not a generic skill that can be taught separate from content and context. Developing clinical reasoning expertise (and illness-scripts) relies on an *extensive* (cf. Perkins, 1998) exposure to a wide variety of clinical problems (Schmidt & Rikers, 2007) but also on opportunities for continuous reflection on reasoning, articulation of reasoning and feedback (Ryan & Higgs, 2008).

A few research projects have taken it upon themselves to explore the conceptions and experiences of clinical reasoning held by medical students. For example, Meyer and Cleary (1998) investigated, through the use of The Approaches to Study Inventory (ASI) developed by Entwistle and Ramsden (1983), medical students' conceptions and engagement of the diagnostic process. The researchers found interesting sources of variations in students' approaches that were consistent with the research literature on clinical reasoning. They were, for example, able to capture pathological approaches to diagnosis, such as errors in data collection, inability to think probabilistically and premature closure (i.e. reaching a diagnosis prematurely) (ibid., p. 579). Lindblom-Ylänne and Meyer (1999) also examined medical students' (in Finland) approaches to diagnosis by using an inventory under development for the context of medical education: The Conceptions and Experiences of Diagnosis Inventory (CEDI). It was argued in both these studies that the inventories (ASI and CEDI) and the resulting descriptions of students' approaches to diagnosis can be used in teaching as well as a self-assessment tool for students to enhance student learning.

Concluding summary

This section has provided an overview of research on higher education in general and medical education in particular to form a background to the issue of learning and understanding relevant to this thesis. The literature presented has, from different perspectives, emphasised to the importance for students in higher education to achieve high-quality understanding (which seems to be a troublesome issue) and that this understanding needs to take on a specific character: it should be extensive, integrative, holistic and generative (Entwistle, 2009; Fyrenius, Wirell & Silén, 2007; Perkins, 1998; Schmidt & Rikers, 2007; Svensson, 1997).

Research has also suggested that learning is a highly individual and contextual phenomenon and that the quality of the outcome, students' understandings, is dependent on the students' intentions potentially influenced by a number of contextual and individual factors. Hence, learning is always related to a learning object or content (Marton & Säljö, 1976a, 1976b, 1997) and this content is associated with the inner logic of the subject taught (Entwistle, 2009). Learning is also always influenced by contextual aspects such as the ways of thinking and practicing in a discipline or subject area (McCune & Hounsell, 2005), as well as by individual characteristics, such as motivation, beliefs, experiences and conceptions of learning held by the individual student (Entwistle, 2009; Halldén et al., 2013).

Even though some of the most fundamental work influencing research in higher education internationally originates from Sweden (i.e. Marton & Säljö, 1976a, 1976b; Marton et al, 1997), the most recent surveys of research

in higher education in Sweden (Kim & Ohlstedt, 2003; Rosengren & Öhngren, 1997) point to a shortage of research in the area. There is a lack of research on student learning and understanding in higher education in general in Sweden and a shortage of research in medical education of the character presented here internationally. In particular, more research is needed on qualitative aspects of medical students' experiences of understanding in relation to *specific subjects and learning tasks*, the essence of high-quality understanding in medicine from a student perspective, and how such an understanding within a specific subject can be described, understood and facilitated.

Another incentive for the research presented here are the new requirements from government and administration in Sweden and internationally to improve the quality of the outcome of higher education together with new conditions for funding of educational programmes based on evaluations of this quality (Prop. 2009/10:139). This increases the need for educational research and practice to define, investigate and question the nature of high-quality understanding in specific academic programmes, what such understanding entails for students and teachers, the influences on it and how it can be investigated and brought about.

Learning as a process of contextualisation

The aim of this section is to present the theoretical and methodological perspective underpinning the empirical studies in the thesis. This perspective on learning and how learning can be investigated is fundamental to how the research aim is formulated, how data was selected, collected and interpreted as well as how findings are explained.

Traditionally, research in medical education has often built on experimental studies based on theories and methods from the cognitive sciences, which are epistemologically and methodologically adjacent to a biomedical model of science and research, and therefore possibly appeals to medical professionals. Medical professionals can be somewhat sceptical towards qualitative research and may question whether it can produce results that are as valid as results from the quantitative methods they are used to (Albert, Laberge & Hodges, 2009; Kuper, Reeves & Levinson 2008; Norman, 2010). However, as proposed in the introduction, learning is a highly contextual endeavour influenced by a number of complex characteristics attributed to the individual, the subject content and the teaching-learning context. Therefore, if we are interested in highlighting the complexity of the relationship between all these factors, we need a theory of learning and a methodology that can account for the individual, the content, and the context.

Learning is usually viewed as a process in which an individual acquires new knowledge or skills related to some particular content—a learning object (Marton & Säljö, 1976a, 1976b). But learning also occurs in a learning context that determines the boundaries and cultural rules for what counts as learning and knowledge in the specific situation (Bruner, 1996; Vygotsky, 1978). Traditionally, educational research has focused on *one* of these two aspects of learning: either the individual's conceptual development, building on constructivist theories from cognitive psychology based on, for example, Piaget (1953), *or* it has focused on sociocultural aspects of learning inspired by researchers such as Vygotsky (1978). Both these theoretical stances have criticised the other for not considering important aspects of learning. The constructivist perspective has been criticised for not sufficiently considering the impact that social and cultural factors have on learning (Schoultz, Säljö & Wyndhamn, 2001). Sociocultural perspectives foreground the situation holding on to a view of cognition as socially constructed, claiming that it is inadequate to assert “that students hold conceptions and that these concep-

tions can be changed; there are only situations that can be arranged” (Halldén, 1999, p. 53).

On the other hand, the criticism of the sociocultural perspective has been that if we do not consider the individual character of learning the continuity of the learning process is lost, i.e. we cannot explain, for example, what happens to meaning created through experiences and approaches acquired in one setting when a student encounters a learning task or phenomenon in another setting. Another problem following from a sociocultural perspective is that it does not account for the variation in how *individuals* experience the learning of a task within the same learning context. Therefore, if we are interested in understanding and improving learning in an educational practice, we need to maintain a perspective that captures the individual differences that may potentially characterise individuals’ learning in different educational settings.

We can neither treat the pupils in a class as a whole nor can we subdivide them on the basis of any external criteria. If we are interested in their learning and in their learning difficulties we have to treat them individually and try from time to time to ascertain what each individual pupil is trying to accomplish (Halldén, 1988, p. 125).

Hence, parallel to, but also influenced by, the emerging research on approaches to learning in Gothenburg (Marton et al., 1997), a methodological framework was developed in Stockholm (Booth, Wistedt, Halldén, Martinsson, Marton, 1999; Halldén et al., 2013) based on a cognitive and constructivist perspective on learning and conceptual change and with an interest in students’ meaning-making activities when coming to know a subject content. This framework has described learning as an *intentional process of contextualisation* (Halldén, 1999) on behalf of the learner in order to meet with the critique presented from a sociocultural perspective while still remaining within an individual and cognitive constructivist theory (ibid.).

Arguably, every contemporary educational practice refers to constructivist ideas of some sort where constructivism usually is (more or less explicitly) defined as a process whereby learners actively construct their knowledge. Therefore, constructivism has often been equaled with student centered education or student activating methods. In education, constructivist theories usually refer to Piaget’s (1953; 1972) theories of cognitive development even though there are other theories of constructivism, such as *radical constructivism* a further development of Piaget’s ideas by von Glasersfeld (1995), or *social constructivism* (Berger & Luckmann, 1984) holding on to somewhat different ontological and epistemological beliefs.

The present thesis, however, rests firmly in a cognitive constructivist theory of learning where students’ personal understandings are seen as being actively constructed by the individual in relation to the surrounding world

through a cognitive process involving *assimilation* (Piaget, 1953) of new information into existing cognitive categorisations (schemata), and a simultaneous *accommodation* of these categorisations to fit this new information (*ibid.*). The driving force in this process is the organism's constant efforts to adapt to its environment and search for equilibrium or to use a medical term: *homeostasis*². But, as pointed out by sociocultural researchers, an individual and cognitive perspective is not enough if you want to learn more about the nature of student understanding as we have defined it. Learning is a highly contextual phenomenon and “you cannot understand mental activity unless you take into account the cultural setting and its resources, the very thing that give mind its shape and scope” (Bruner, 1996).

By viewing learning as involving an *intentional process of contextualisation*—of, for example, learning tasks—it is possible to “combine analysis of cognitive (or conceptual) processes with sociocultural considerations within a constructivist framework context in this research does not refer to the spatiotemporal setting occupied by the learner, but rather to the cognitive context in which the learner makes sense of the information at hand” (Scheja, 2002, pp. 34, 53). Hence, context is, from this perspective, always referred to as the individuals' cognitive construction (cf. Cobb, 1990; Koens, Mann, Custers & Ten Cate, 2005)—a *contextualisation*. Learning, i.e. meaning-making (Bruner, 1993), in this perspective, involves for the individual learning to identify and discern the specificity of the situations in which knowledge or skills are to be used and developing sensitivity to the situated character of knowledge (cf. Perry, 1970), i.e. a process of *differentiation* between contextualisations (Halldén et al., 2002; Petersson, 2005; Wistedt, 1998).

Contextualisation—an intentional meaning-making activity

In this thesis, the students' personal understandings (cf. Entwistle, 2009) are explained methodologically as resulting from such an intentional meaning-making process involving contextualisation (Halldén et al., 2013). In this process students interpret learning material, concepts or tasks based on a complex repertoire of beliefs on different levels, creating for a task an inter-

² *Homeostasis*: The maintenance of a dynamically stable state within a system by means of internal regulatory processes that tend to counteract any disturbance of the stability by external forces or influences; the state of stability so maintained; spec. in *Physiol.*, the maintenance of relatively constant conditions in the body (e.g. as regards blood temperature) by physiological processes that act to counter any departure from the normal (Oxford English Dictionary, 2015).

pretative cognitive context in which the task makes sense under the perceived circumstances (see figure 1 below). This research stance should not be seen as a psychology of learning but rather as a methodology developed to model students' meaning-making activities on a micro-level when they are coming to understand a subject area and in their work on specific learning tasks.

Through teaching, students are presented with facts, concepts and theories, but also with norms and cultural ideas of what constitutes knowledge and culturally accepted ways of thinking and practicing (McCune & Hounsell, 2005) within a subject area. These two different dimensions influencing students' contextualisations can be referred to as *determinants* or *resources* and *rationale for action* (see figure 1). They can be either *internal*, encompassing individual characteristics such as: physical and cognitive abilities, previous knowledge, conceptions and experiences, learning style, dispositions and motivation, or they can be *external* in the sense that what influences the students' contextualisation resides outside the individual and comprises the basis for the individuals' interpretation of what the social and cultural situation holds in potential and limitations and ways of thinking and practicing (WTP) (McCune & Hounsell, 2005).

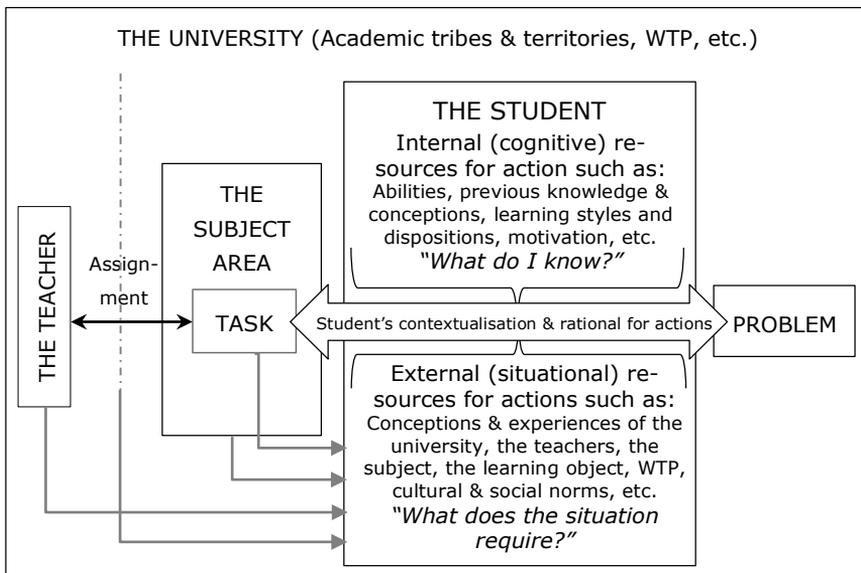


Figure 1. A methodological model of the contextualisation process from the researcher's viewpoint. Adapted from Halldén et al., 2013 and Halldén, 1988.

This modelling of students' understandings and influences on it necessitates ascribing meaning to students' behavior. To explain their behavior we see this behavior (in this thesis how they communicate their understanding in interviews or in answers to learning tasks) as meaningful in the light of an *intention* to achieve something in the situation. "From such an intentional perspective, to explain an action involves identifying circumstances within or around the agent that can clarify why the act was undertaken" (Halldén et al., 2013, p. 81). Hence, as researchers we set the students' behavior in a wider perspective—a context of aims and cognitions (von Wright, 1971).

This does not mean that we see intentions as conscious acts (cf. Searle (1983) *prior intentions*) but rather as a quality of human action (in this case communication of learning and understanding) (cf. Searle (1983) *intention in action*) and a method of analysis, i.e. a way to gain knowledge of perceptions and beliefs held by an individual based on activities that we can empirically observe and document. Without such attributed intent, behavior might merely be seen as a series of movements or reflexes (Halldén, 1999); i.e. by attributing intentions to an individual's behavior it becomes an action (cf. Wertsch, 1998).

As stated by von Wright: "Behavior gets its intentional character from being seen by the agent himself or by an outside observer in a wider perspective, from being set in a context of aims and cognitions" (von Wright in Halldén et al., 2013, p. 81). In other words, learning is intentional and can therefore be described in terms of a process of meaning-making on behalf of the learner. Ascribing meaning to students' utterances must therefore rest on an epistemological assumption that it is possible to understand other individuals. This tenet of rationality has been described by Davidson (2001) as a *principle of charity*, which implies that to make sense of other individuals' actions in a particular situation it has to be assumed that these actions rely on a certain amount of coherence (Halldén et al., 2013).

Davidson (2001) described interpretation as an adjustment between what seems to stand out as salient features for individuals and the coherence in their meaning-making processes. This implies that individuals, to some extent, overlap in how they view the world, and that this shared world-view enables intersubjectivity and mutual understanding... what is perceived as salient for the individual is contingent on the situation in hand and on prior experiences (Halldén et al., 2013, p. 83).

To understand individual learners' activities as meaningful it is necessary to reflect on the variations of potential contextualisations involved in this meaning-making process. In such an interpretative process of analysis some interpretations will be plausible while others will fall. This process of analysis will be further explored in relation to the presentation of the empirical studies.

A methodological distinction between task and problem

In a number of studies carried out at Stockholm University within this intentional framework (e.g. Halldén, 1988; Halldén et al., 2013; Wistedt, 1994; Wistedt & Martinsson, 1996) the observation was made that students who were assigned a particular learning assignment sometimes ended up approaching this assignment in a way not predicted by the teacher and that students presented with the same task often varied in their approaches to the this task (cf. Säljö & Wyndhamn, 1993). These findings led to the introduction of a distinction between *task* and *problem* (Halldén, 1988).

A task is defined as “what is presented to the pupils by the teacher with the intention that they are to do something and/or that they are to learn something” (ibid., p. 125). A problem on the other hand is defined as the individual student’s personal understanding of this task (ibid, p. 125) as resulting from the cognitive process of contextualisation in which the learner constructs a personally meaningful understanding of tasks or concepts by creating for them an interpretative context or framework where the task or concept makes sense for the student under the perceived circumstances (Halldén, 1999); i.e. the learner creates a problem to solve or project to work on (see figure 1 above). This way of conceptualising learning involves a shift from focusing on students’ understandings of concepts (conceptions or misconceptions) as such to an interest in why conceptions held by an individual take on a particular meaning in a certain situation by focusing on how the individual understands the situation surrounding a concept and the meaning a concept is attributed in this setting.

Viewing learning as a process of contextualisation and making a methodological distinction between task and problem makes it possible to account for individual interpretations of content and context; and by foregrounding the situation surrounding a concept rather than the concept itself it is possible to obviate critique from socio-cultural research. The distinction between task and problem also enables methodologically giving particular attention to aspects of the often underemphasised complex relationship between teaching and learning. The methodology is also ecologically valid in that it is empirically and inductively derived from the teaching-learning environment.

Aim of the thesis

It seems to be generally agreed that learning and its outcome in higher and medical education should be on a level well beyond rote memorisation and learning of facts. Students should develop an integrative, high-quality, deep-level or holistic personal understanding of the subject area being studied. However, given the complexity of the relationship between teaching and learning, this is not an easy task. If you want to enhance the quality of learn-

ing and its outcome it is essential to recognise and problematise the complexity of this relationship. You must attempt to understand how student learning is influenced by the ways of thinking and practicing (McCune & Hounsell, 2005) within a particular learning situation, subject or discipline and what students *are actually doing* when faced with specific learning tasks. Only then is it possible to assess the learning potential of any situation, task or programme.

The aim of this thesis is to contribute to research on student learning in higher and medical education by taking as the point of departure this concern for understanding learning in its context. This is done by applying a context-oriented framework to medical students' learning, a framework that enables an in-depth, particularised exploration of the impact that the learning environment has on students' experiences of learning and understanding in relation to their subject and to specific learning tasks. To be more precise, based on the view of learning as a cognitive process of contextualisation on part of the learner the thesis explores how medical students express their:

- personal experiences of developing understanding within the medical programme, and
- personal understandings of subject content in relation to learning tasks, i.e. what personal problems students are acting on as a result of contextualising a task.

The results are discussed relative to significant contemporary research literature on high-quality student learning and understanding in higher and medical education.

The thesis also starts to draw up the contours of a framework for conceptualising and empirically investigating the relationship between student learning and the teaching-learning environment from the student's perspective. This is initiated first by examining relevant research on high-quality learning and understanding in higher education in general and medical education in particular and second by presenting a context-oriented methodological perspective on the learning process.

The empirical studies

The thesis includes three studies presented in three separate papers. Two papers have been published in two different peer-reviewed journals and the third paper has been submitted in manuscript form to a third journal and is currently under review. In order for the reader to assess the quality of the research studies, this chapter first presents a short overview of the teaching and learning environment in which data were collected, followed by a description of the methods used to collect and analyse the empirical material before presenting a summary of the main findings of the studies.

All three studies explore aspects of students' experiences of learning and understanding in medicine. The studies will be referred to as study one (I), two (II) and three (III). The first study (Study I) outlines a basis for conceptualising students' experiences of understanding in medicine and investigates, through interviews with medical students', their experiences of understanding in relation to their studies in general. Studies two (II) and three (III) examine medical students' understandings as expressed in relation to specific learning tasks. The summaries focus on the main findings of each study with emphasis on aspects of the students' personal understandings as expressed by the students either directly in interviews or as it comes through indirectly in the students answers to learning tasks. The individual articles are presented in full at the end of the thesis.

The medical programme

The data in this thesis were collected at a prominent medical university in Sweden. The students participating in the studies were enrolled at the medical programme. This programme offers, as described in the introduction, endless possibilities for investigating the complex relationship between student learning and the learning environment since students are constantly challenged to adjust to new situations and circumstances. The programme at this university has a traditional curriculum approach which is basically built on a dual view of the relationship between *basic science* or *biomedical knowledge* and knowledge of *clinical practice*. This means that students during the first four semesters complete courses in biomedicine (e.g. anatomy, physiology, microbiology, biochemistry) taught usually by university-employed scientists in classrooms set apart from the clinical setting involv-

ing patients. During this period, students have limited contact with patients. From the fifth semester the students move on to clinical learning settings at university hospitals, primary care units and other health care facilities where the teaching responsibility lies foremost on medical practitioners and often involves contact with patients.

Data collection

Study I: Students' experiences of understanding in medicine

The first study was based on semi-structured individual interviews with some 20 students in their fifth semester of the medical programme. These students were chosen because they had recent experiences of both preclinical and clinical studies as well as the transition from the preclinical to the clinical part of the programme. This transition is often experienced by students as a major and stressful change. Students can, for example, experience anxiety in interaction with patients or senior staff and/or they can be frustrated by their inability to apply their biomedical and preclinical knowledge to solving clinical problems in practice (Godefrooij, Diemers & Scherpbier, 2010; Morrison & Moffat, 2001; Moss & McManus, 1992). The interviews were designed to encourage the students to reflect on and describe their experiences of what it means to achieve understanding in relation to the programme under study.

Study II & III: Students' personal understandings of learning tasks

Students participating in study II and three were at the end of their eighth semester of the medical programme which means that they were nearing the end of their undergraduate studies (the programme comprises a total of 11 semesters). After semester eight the students have completed the majority of their basic clinical training and can be expected to have general experience of training and assessment of clinical reasoning both through the use of paper-based and computer-based patient cases and through clinical experience involving real patients.

Data material for study II comprised of students' written answers to a patient case produced for research purposes only. However, the case was designed together with two medical doctors, one involved in the study and one involved in teaching the clinical course in surgery that the students were presently taking. The assignment was optional and fourteen students completed the task through a web-based learning platform. The task was con-

structed to potentially involve a broad spectrum of illnesses and injuries from different sub-specialties.

Data for study III derived from students' answers to a summative assessment of a clinical course in surgery. The task was a modified essay question (MEQ) designed to integrate knowledge in surgery, oncology, intensive care and anaesthesiology. The sample consisted of all enrolled medical students during a specific semester which yielded a total of 118 answers for analysis.

The combination of these three different types of data provides a rich foundation for beginning to sketch the contours of a conceptualisation of students' experiences of understanding in medicine and how this conceptualisation can be described in general and in relation to specific learning tasks.

Ethical considerations

All three studies, the presentation of them in papers and this thesis as well as management and storing of the data material itself (recordings of interviews and copies of students' answers), followed national and international ethical guidelines for research involving human subjects (SFS 2003:460). The studies were part of a research project funded by grants from the Swedish Research Council's Committee for Educational Sciences and ethical considerations were conceived in conjunction with the approval for funding (The Swedish Research Council, 2006).

In the execution of the three empirical studies the participating teachers and/or students were informed of the aim of the respective study. They were also informed that their participation was optional and that they had the option of saying no to and/or at any time terminating their involvement in the study. However, no teacher or student made this claim. No additional information (apart from students' expressed understandings through interviews or written answers) about the students or teachers involved was collected. The students' answers to the patient case in study II were anonymous and the exam papers used in the third study were marked anonymously and teachers and researchers could not connect a specific student to a specific answer. It was made clear to students that their participation in the research would not affect their teachers' evaluation or grading of their performance in the courses (the papers in study III were collected after the teachers' markings).

Permission to re-print the published papers in this thesis has been obtained from the respective journal. The final publication of article II is available at: link.springer.com.

Method of analysis

Interpretation of students' utterances

The thesis explores students' personal experiences of understanding in medicine as expressed in interviews and in relation to specific academic tasks. Students' understandings are explained methodologically as resulting from an intentional process of contextualisation (described above) (Halldén et al., 2013). In this process students interpret learning material, concepts or tasks based on a complex repertoire of beliefs on different levels, creating for the task or concept a cognitive context (a contextualisation) in which these makes sense, see figure 1 above.

By describing the problems students are working on as resulting from a process of contextualisation we are able to comprehend the meaning of variations in students' ways of approaching tasks and how these approaches are influenced by the teaching-learning environment, the subject under study, as well as by individual characteristics. The analytical framework used also enables studies of learning at a micro-level with focus on individuals' actions in relation to a local context.

The analysis in an intentional approach usually relies on linguistic data, i.e. individuals' utterances seen as intentional *speech acts* (Searle, 1983) that can be described in terms of aims and goals that the individual is trying to achieve in a given situation. Hence, in the analysis we are looking for the subjective meaning of an individual's activity. The intentional explanations can be illustrated by a practical syllogism (cf. von Wright, 1971):

- P1. A person (P) intends to achieve x (where x is a verb or a verb phrase) in a situation (s).
- P2₁. P believes that he/she can achieve x by performing y (where y is a verb or verb phrase).
- P2₂. P believes that performing y is the meaningful and reasonable way to achieve x in s.
- C. Hence, P performs y in s in order to achieve x.

What the researcher does in the analysis is observing P performing y and by ascribing to P the intention to bring about x, the researcher can analytically account for P's beliefs about the situation (s) and what is required under the circumstances as experienced by P (Scheja, 2002). The external and internal determinants for action described above (see figure 1) are the premises for the syllogism.

The processes of analysis

The processes of analysis used in the three studies are described in detail in the individual papers. They all rely on the interpretative framework described above including viewing students' utterances as intentional speech acts and viewing learning as a process of contextualisation. This section will only give a general overview of the procedures involved in an analysis of students' contextualisations of learning material, concepts or more broadly—as in study I—general experiences of understanding within the medical programme. The analysis stemming from the intentional contextualisation perspective described above has previously been referred to as “intentional analysis” (Halldén et al., 2013). The object of analysis in an intentional analysis is the individual's actions, usually written or spoken speech acts (Searle, 1983).

The first study relied on transcripts of interviews with medical students and the second and third study relied on students' written answers to two different assignments. Consequently, the analyses in all three studies relied on utterances documented in written text, but since the studies had somewhat different aims the procedures for analysis differed to some extent.

In the first study the aim was to consider a basis for conceptualising students' experiences of understanding in medicine. At the time the paper was published the interview data were still being collected. Hence, the analysis was in its infancy and the analysis of transcripts focused mainly on finding telling illustrations and examples of how students described aspects of understanding and experiences of coming to understand. Even so, the criteria on which the choices of utterances rested was of an intentional and contextual character.

The process of analysing students' answers to the two assignments in study II and III followed a procedure similar to a phenomenographic method (Marton & Booth, 1997) involving first becoming familiar with the material by repeatedly reading all texts over and over again to establish an overall impression and to find indicators of qualitative differences in students' ways of approaching the task and the problems students were working on. After working thorough the material thoroughly, preliminary interpretations were formulated based on differences and similarities between students' utterances, particularly what information was foregrounded in them. These comparative findings were again systematically applied to the whole data material resulting in a number of interpretations of individual students' ways of approaching the tasks through which certain contextualisations became plausible and others fell away. The analysis was an iterative process of moving among all students' answers as well as the individual texts and parts of these texts. The interpretations were then applied to the material several times resulting in empirically grounded interpretations. The analyses in both stud-

ies drew on aspects of medical content as well as on how it was communicated, as well as what aspects of content students profiled in the answers.

In both studies the analyses involved collaborative analytic efforts. The interpretations were made by the first author and subsequently checked against the material by—in study II—two linguistics researchers and an educational researcher (not involved in the research project) and—in study III—a medical doctor, one of the co-authors. The analysis of medical information in students' answers was in both studies validated by one of the co-authors, a medical doctor.

Using linguistic structures to validate the analysis

In study II the analysis of students' contextualisations was supported by an analysis of linguistic structures present in the students' writing. The analysis, which was carried out in collaboration with two linguists, sought to develop tools that could verify and support the intentional analysis. As noted, an intentional analysis considers students' utterances to be meaningful actions given an intention to fulfil a goal (cf. intention *in* action and speech acts according to Searle, 1983).

In both study II and study III the data material consisted of students' written answers to a particular task. This meant that the only empirical material actually available for analysis was the written results of students' interpretations of a task. Intentional analyses are often performed on richer data material in the sense that they often utilise interviews or other means (e.g. observations of problem solving situations) of capturing a broader or interactive view of the meaning-making process that the individuals are involved in. Interviews or group-work discussions enable the researcher (interviewer) to ask participants to reflect on, describe or clarify aspects of the phenomena under study. In these two studies we only had access to the students' written statements—the verbal activities or speech acts constructed within an instantaneous learning situation. The purpose of these studies was to investigate the students' conceptualisations as expressed within the immediate context of the tasks at hand and not to make inferences about students' conceptualisations on the basis of students' reflections on a task at a later point.

The view on context(ualisation) on which this theses rests embraces the idea that contexts are not fixed entities in an individual's mind. They are not 'carried around' ready to be used in a suitable situation. Rather, contexts are cognitively created in response to a specific learning object, in a specific learning situation based on previous experiences, and individual and situational conditions. This view of contextualisation entails that meaning-making involves processes of conceptualisation that are always situated in use and in response to specific situations. It is important to explore the meanings that particular concepts are afforded in a given learning situation. A guiding assumption for the studies was that the language used by the students in their

answers reflected their understandings of the tasks and their perceptions of them and their contextualisations.

Faced with language data (the students' written utterances) we turned to linguistic theories and methods in search of more fine-grained instruments of analysis. These instruments were used to complement the intentional analysis and to better describe the students' actions (what they were trying to achieve in the situations through their utterances). Given the cognitive, constructivist perspective on which this thesis rests we needed a theory of language that recognises a relationship between language and thought. This assumption is also of importance to the problem of how we can claim to make inferences about an individual's cognition (experiences or conceptions of phenomena) through what this individual verbalises.

Hence, the view of language used here is based on a *cognitive linguistic* approach to language (Evans & Green, 2006; Langacker, 2008), a relatively recent movement in linguistics. To understand the methodological value of this linguistic contribution it is necessary to explain a few of its assumptions. Cognitive linguistics assumes that linguistic competence is not separate from other cognitive abilities (cf. Piaget, 1972) such as perception, memory, categorisation (Langacker, 2008) and that language reflects patterns of thought (Evans & Green, 2006).

Therefore, to study language from this perspective is to study patterns of **conceptualisation**. Language offers a window into cognitive function, providing insight into the nature, structure and organisation of thoughts and ideas. The most important way in which cognitive linguistics differs from other approaches to the study of language, then, is that language is assumed to reflect certain fundamental properties and design features of the human mind. (Evans & Green, 2006, p. 5)

But, according to cognitive linguistics, language does not simply reflect conceptualisations, it also gives rise to and facilitates conceptualisation (cf. a weak version of the *Sapir-Whorf hypothesis* (e.g. Evans & Green, 2006)) on the part of the individual. "Conceptualization emerges from language use in context" (ibid, p. 367). This assumption is of special interest when considering the importance of reasoning in learning for understanding as will be discussed below.

Finally, cognitive linguistics also considers language to be situated and context dependent:

The context in which an utterance or usage event is situated is central to the cognitive explanation. This is particularly true for word meaning, which is **protean** in nature. This means that word meaning is rather changeable. While words bring with them a conventional meaning, the context in which a word is used has important effects on its meaning (ibid., p. 112).

Context dependency does not only apply to words but to language as a whole. Language offers the user various ways of constructing a given content depending on the usage situation and the speaker's intention. Meaning is created in language use and outside of context only potential for meaning remains (Langacker, 2008).

The supporting linguistic analysis enabled a more in-depth and fine-grained illustration of the intentional differences between the students' answers. It was, for example, possible to describe how students through language use *profiled* (Langacker, 2008) the medical content and what their communicative actions rested on, i.e. what was given attention to, placed in foreground and what was relegated to the background of attention (cf. Marton & Booth, 1997). This analysis enabled a description of differences in the students' answers between: a generalised phenomenon vs. a particularised phenomenon, an entity vs. a process, and descriptions vs. explanations. The linguistic markers used were established based on the data material through an iterative analytical process, by asking what the students did linguistically and what that meant they were doing intentionally.

Summaries of the studies

Study I

Scheja, M., & Bonnevier, A. (2010). Conceptualising students' experiences of understanding in medicine. *The Journal of the Hellenic Psychological Society*, 17(3), 243–258

The objective of the first study was to outline a framework for conceptualising students' experiences of understanding in medicine. The paper reviews contemporary research on student learning in higher education on topics such as the nature of students' experiences of understanding in general and in medicine, students' personal understandings in terms of knowledge objects and the description of the development of personal understanding in relation to specific academic programmes—especially in medicine—and in terms of threshold concepts. This research was then combined with and related to contemporary research stemming from the area of conceptual development describing learning and understanding as a process of the individual's personal contextualisation of learning material. It was argued that a combination of these two research traditions allows reflection on students' personal experiences of the understanding achieved in relation to their studies as well as on the personal cognitive and contextual processes through which these experiences develop. The paper also provided preliminary re-

sults of semi-structured interviews with fifth-semester medical students exploring these students' overall experiences of understanding in relation to their studies at the medical programme at a large medical university in Sweden.

Since the analysis was performed on data that were being collected at the time and in view of the character of qualitative research, the results should be viewed as an analytical framework for thinking around variations in medical students' experiences of understanding and how these experiences develop in interaction with the learning environment, rather than an empirically validated, final assessments of students' experiences of understanding in medicine. It is surprising, however, how little research effort has been put into considering students' experiences of understanding in medicine, in particular given the significance of the notion of high-quality understanding in both higher and medical education.

The students participating in the interviews had recently ended their first four preclinical semesters encompassing mostly a wide range of courses in the basic sciences and with limited contact with clinical practice or patients. They were in their first year of more clinically oriented courses. The students described their experiences of understanding within the first preclinical part of the medical programme as involving mostly the recall of facts and details at a micro level with little room for reflection and integration into larger wholes.

However, when the programme moved on to a more clinically oriented phase the students described how their experiences of understanding went through a marked transformation as this new context enabled them to actively bring some of the previously disparate facts and details to bear on clinical problems. As mentioned earlier a research stance stemming from the area of conceptual development and the conception of approaches to learning has described learning as a process of contextualisation where students develop personal understandings of learning tasks or concepts by creating for them a cognitive interpretative context in which they make sense for the student under the perceived conditions. In light of this view of learning the evident change in students' experiences of understanding when moving on to a more clinically oriented phase of the programme may be described as a shift in contextualisation to (for the student) a more accurate context—given the professional aim of the programme—where the previously experienced incoherent bits of facts and information may be given medical meaning through understanding of how they bear on clinical problems and their significance to the practice of medicine.

Study II

Bonnevier, A., Josephson, A., & Scheja, M. (2012). Potentialities for learning in medical students' ways of approaching a diagnostic task. *Higher Education*, 64, 371–384

Study II investigated medical students' ways of answering a written case involving a patient with chest pain. The aim of the study was to investigate how the students approached the task by looking at what medical content they deemed appropriate and how this content was conceptualised in their individual answers. The assignment, which was developed for research purposes only, was written in co-operation with two physicians involved in the medical programme and read as follows (translated from Swedish):

You are working as a medical intern at a general practice clinic. A woman, 55 years old, seeks acute help. She has been bothered by chest pain since after lunch, approximately three hours. The woman works at a retirement home and has recently been widowed. Describe your thoughts on the patient's symptoms and your handling of the case.

The case was distributed to a group of medical students in their eighth semester taking a clinical course in medicine and surgery. Fourteen students completed the task. The analysis of the students' answers built on a theory of learning and understanding as a process of the individual's personal *contextualisation* of learning material in which the researcher attributes to the individual beliefs on different levels including aspects of subject matter, competence, and discourse (sociocultural aspects). The analysis was supported by an analysis of linguistic structures to aid in distinguishing between the terminology used by the students and the meaning they ascribed to this terminology in the specific context of the task.

All students seemed to agree that one objective of the task was to demonstrate knowledge of a variety of medical information relevant to the symptom chest pain and that the problem was to be identified as a diagnostic problem involving the different steps in the diagnostic process, i.e. patient's (medical) history, physical examinations, laboratory tests and differential diagnoses. There were no substantial variations found in the students' understanding of the medical facts that applied to the task. However, there were marked differences in the students' ways of applying and organising and hence profiling the facts in their answers. In light of a theory of learning and understanding as a process of contextualisation, it was found that—based on the different ways in which students expressed their conceptualisations of the different concepts involved—students worked either primarily on a prob-

lem of theoretical interest (*a purely academic problem*) or they worked on a problem of clinical importance (*a professional academic problem*).

The analysis made it clear that eight of the fourteen students believed that a suitable way of approaching the task was to treat it as a *purely academic problem*, which involved showing mastery of medical information related to chest pain. Hence, they listed relevant questions to ask, physical examinations to perform, laboratory tests to order, and possible diagnoses organised under the headings they ascribed to the process of diagnosis (patient's history, physical examinations, laboratory tests and differential diagnoses). These students had a more or less taken for granted approach to the task involving little more than knowledge of medical theory or facts. They placed little or no importance on reflecting on how or on what grounds these facts were chosen or on what implications different aspects would have for a patient. These students' communicative priority rested on *description* rather than on *explanation* although they were asked to 'describe their thoughts'.

The alternative way of answering the task used by six students was to treat it as a hypothetical clinical situation accounted for from a novice physicians' point of view. These students were working on a *professional academic problem* profiled to be functional in an academic context as well as applicable to a hypothetical clinical situation. These students profiled clinical diagnoses as a reasoning process where they explicitly argued and justified the decisions they made. They had a dynamic and iterative way of answering the task applying the steps in the diagnostic process over and over again, trying out different interpretations of the symptom. They also elaborated on consequences for the patient involved. For these students the communicative priority rested on *explanation* and *elaboration* rather than *description*.

Study III

Bonnevier, A., Josephson, A., Lavelle, T., & Scheja, M. (Manuscript submitted for publication). Potential for high-quality learning in medical students' ways of approaching a modified essay question.

The third study explored how medical students in their eighth semester of the medical programme answered a modified essay question (MEQ), which was part of a summative examination assessing an approximately sixteen weeks long clinical course in surgery. The sample consisted of all Swedish speaking students enrolled in the programme during a specific semester (n=120) with 118 answers analysed. The aim of the study was to investigate students' personal understandings as communicated in relation to the task and to discuss the potential for high-quality learning in these expressed un-

derstandings as well as how they related to the target understanding as broadly expressed in the curriculum for the medical programme.

It was argued in the paper that high-quality, meaningful learning involves and leads to a deep integrative personal understanding and that this form of understanding is a desirable outcome of higher education in general and in medicine in particular. This meaningful learning process encompasses not only the learning of facts and theories ready to give back to the teacher but also includes exercising the dynamic ability to reflect and reason and to organise facts and theories into wholes in order to understand how they relate to each other and on what grounds they are chosen for specific purposes depending on context.

By exploring the content of students' answers as well as the structuring of this content and the quality of students' answers in relation to aspects of high-quality learning and teachers' corrections/markings, the analysis enabled an in depth description of the involved students' personal understandings as expressed in relation to the exam. As in the previous study, there were no marked differences in students' answers concerning the medical information present. Overall, relating to content the students exhibited basically a uniform understanding of the task. However, beyond the understanding expressed of the medical content applicable to the task, there were distinct differences in how students applied or organised this content, i.e. how they communicated their personal understanding. They seemed to be working on different problems resulting in qualitatively different outcomes.

The most fundamental difference between answers concerned the students' interpretations of the directive in the question to justify their answers. Approximately one fourth of students did not give any justifications and students including justifications did so quite sparingly and on a very low level of understanding. Moreover, and perhaps surprisingly, the examiners did not seem to value students' justifications in their assessments of students' answers; a large number of answers without any justifications were awarded the highest score on the item. Another important result was that when submitted to an analysis with point of departure in a taxonomy on qualitatively different levels of understanding suggested by Entwistle (2000), most of the students' answers showed a lower-level of understanding, an understanding far below what can be expected of medical students in their eighth semester. However, it is important to emphasise that the study does not tell us what the students are exhaustively capable of. It only tells us what they understood as being necessary to perform given their experiences and beliefs of what the situation required.

Summary of the results

By exploring medical students' experiences of coming to understand in medicine (study I) the research presented here allows reflection on how the stu-

dents experience the *process* of coming to understand within the teaching and learning environment of the medical programme. The students' descriptions can also function as potential background and explanation to why students do what they do when presented with learning tasks. In this sense the research potentially expands and enables a fuller description of the interpretative context in studies II and III. Studies II and III enable fine-grained descriptions of how medical students expressed their personal understandings of medical subject matter in relation to specific learning tasks (study II & III). As such, these studies focus on describing the *outcome* of learning—i.e. the understandings that the students communicated—but they also, given the theoretical perspective used in this thesis, tell us something about the *process* leading to this outcome.

The results show that (semester five) medical students experienced that being able to connect parts to wholes was very important to their learning of medicine. Many of the interviewed students repeatedly reflected on aspects of parts and wholes and the importance of relating bits of information to one another and to be able to see the *big picture*. The interviewed students also experienced that the pre-clinical part of the programme gave little opportunity for this kind of learning and that it mainly focused on facts and details, leaving little room for thorough understanding. However, when the programme entered a more clinically oriented phase, students experienced that their understanding started to gradually fall into place and the merging of details into larger understandings of wholes was facilitated.

Studies II and III both focused on students' interpretations of learning tasks involving clinical reasoning. Both studies showed that most students had a uniform understanding of what medical content or facts were applicable to the tasks. Apart from that, there were marked differences in the students' ways of applying and organising the facts in their answers, i.e. the meaning they ascribed to these facts. Both studies showed, from slightly different perspectives, that many of the involved students' approaches to the tasks rested on *description* rather than *explanation*. The students did not explicitly argue for or justify their choice of facts or elaborate on their implications. They did not try to explicitly relate bits of information to larger wholes. Many of these answers were simply lists of relevant medical information, facts or procedures.

Both studies also showed that although the questions put to the students in the tasks were meant to encourage explicit reflection and reasoning: "...describe your thoughts..." (Bonnevier, Josephson & Scheja 2010) vs. "Justify your answer!" (Bonnevier Josephson, Lavelle & Scheja, forthcoming), many students did not reason or explicitly communicate any reflection. Hence, they were working on other problems than the ones intended. What was also interesting was that the teachers (in study III) did not seem to value students' reasoning in their markings of the students' answers, nor mark

down its absence. Hence, the teachers—most likely unconsciously—supported the unreflected form of understanding expressed.

Interestingly, some students in study II and a small number of students in study III had a more dynamic way of approaching the tasks although it was not experienced as requested by most students or valued by their teachers (in study III). These students' communicative priority rested on explanation and elaboration, rather than on description. The value of such an approach will be discussed later on.

Discussion and conclusions

The aim of the following section is to summarise the results and provide interpretations of the findings from the three studies in light of the research presented in the introduction. It also discusses the findings in relation to the research aims posed and offers reflections on strengths and weaknesses of the thesis as well as potential implications for educational practice in medicine and suggestions for further research.

Problematising the relationship between teaching and learning

The three studies in the thesis illustrate the complexity of the relationship between the teaching-learning environment and student learning from different perspectives. In the first study, this complexity is shown through students' apparent difficulties in interpreting what relevant *organising principles* (Svensson, 1997) (i.e. *the wholes*) to relate content and details to. The students explained their experiences of learning and understanding during the first four (preclinical) semesters as involving a massive amount of disparate details and facts without a real grasp of "the real point" (Scheja & Bonnevier, 2010, p. 253). During the third year when the programme enters the clinical phase students describe their experiences as undergoing an important transformation when they start to see the relevance of these facts and details and the bigger picture. Suddenly they are, to a greater extent, able to connect details and facts into larger wholes that make sense.

This is hardly a surprising picture of the medical programme. It is well known for demanding a cramming of information especially during the early years. Students find this exhausting but, interestingly, this is also perceived by the interviewed students as something you just have to get through. Due to their perceptions of the culture and tradition of the medical programme they seem to trust in the system, which can account for them, as opposed to students in for example engineering (Scheja, 2006), being quite comfortable with the "delay in understanding" (ibid.) involved. As one medical student in study I expressed:

The structure of the program is that it continually adds on. First term it's the structure and function of the cell... that course is pretty difficult and boring. You have to get through it. Then you realise, as the terms pass, that it was probably quite a good idea to take that course, because everything keeps coming back and you tend to grasp things afterwards (Scheja & Bonnevier, 2010, p. 252).

These results are valuable in several ways. The transformation students describe resembles descriptions of high-quality understanding and holistic approaches (Svensson, 1997). For these students starting the clinical component initiates a process in which systems and details merge into a "larger system.... [and details being] linked together" (Scheja & Bonnevier, 2010, p. 253), a process that is potentially integrative and generative. The results also highlight learning as a process of contextualisation. The medical programme offers vocational training to become medical doctors and so it is crucial that students are able to use their knowledge (cf. Perkins (1998) performance view of learning and Lonka & Lindblom-Ylänne (1996) professional orientation) in a clinical setting involving patients. The preclinical setting is an entirely different context than the clinical setting and the ways of thinking and practicing (McCune & Hounsell, 2005) in that milieu differ from those in the ones where students are later to put their biomedical knowledge to use. For example, Patel and colleagues (Patel et al., 2000) suggest that biomedical knowledge and clinical knowledge belong to different worlds and:

...differ in important respects, including their *ontology* ... and the kinds of reasoning they support. For example, clinical reasoning involves the coordination of diagnostic hypothesis with clinical evidence and incorporates an elaborate taxonomy that relates clinical symptoms to disorders. Biomedical reasoning involves the use of causal models at varying levels of abstraction (e.g., organ and cellular levels) (ibid, p. 333).

Although the two-world distinction is a simplification of the relationship between the biomedical and clinical contexts in medical education (as the authors also point out) (ibid, p. 386), it serves as an illustration of the difficulty that students have in relating knowledge from basic science to clinical situations (Godefrooij et al., 2010). It is likely to assume that theories and how they are put to use differ between these two contexts and that, in view of their future professional role, students tend to feel frustrated when knowledge is not readily usable to their future work as clinicians (cf. a professional orientation (Lonka & Lindblom-Ylänne, 1996)). It is also likely to assume that experts in the biomedical sciences, teaching students during the pre-clinical years, have a:

...richly organized and highly differentiated knowledge base that enables them to develop coherent explanations and account for most of the data in a problem. Experts' explanations are also typically supported by a deep understanding of their domain of expertise (Patel et al., 2000).

But, from a perspective of contextualisation, the deep understanding that supports these explanations and the organizing principles (i.e. what makes up 'the whole') they bring to a problem, or even what problems they are likely to define, are most certainly different from those posed by a professional clinician (cf. Magnani, 1997). Many clinicians perceive of the basic sciences as only "peripherally relevant to their daily practice" (Woods, 2007). The qualities of a deep understanding of, for example, the function of the circulatory system will differ between a specialist in (basic science) physiology and a specialist in (clinical) anaesthesiology. This distinction was illustrated by one of the students in study I:

...but you get that 'aha'-feeling that that's the essence of it, that's the important stuff; oxygen is actually left in the muscle and then the blood cell must return and get refilled. That was the essence of what we learned, but we didn't 'get it' then, because we were staring ourselves blind at figures showing how much carbon dioxide there was in the air, what the pressure differences were between the pulmonary artery and the capillaries, and so on. You never grasped that the real point was to leave the oxygen and remove the debris (Scheja & Bonnevier, 2010, p. 253).

This is not to say that biomedical knowledge should ultimately be taught in a clinical context (Schmidt & Rikers, 2007), as is sometimes claimed in medical education and by advocates and practitioners of problem based learning (PBL), or that all knowledge taught should be usable in a clinical setting. It is simply pointing to the fact that it is necessary to explicate the importance of recognising these contextual differences to both students and teachers and others planning and executing instruction in higher education (cf. Woods, 2007). Students must be encouraged to explore and cultivate a constructivist and relativistic conception of learning and knowledge in general, a conception that involves the insight that subject content, knowledge, skills and understanding are context dependent (cf. Perry, 1970).

Svensson (2009) has described this need to explicate differences between contexts in relation to the importance of focusing aspects of language in relation to learning within the subject areas:

In education subject matter is presented based on collectively shared language. Then learning of subject matter easily becomes learning about theories, where a given language is a central part of the theories and the learning of those. In the form the theories are given, content of knowledge and

language expressions are closely related often through definitions. There is most often little of context given to the choice of expressions. This lack of context is a problem to the students, who have access to other language expressions that may be experienced as relevant, and when the expressions used in the theory are used with other meanings in other contexts (Svensson, 2009, p. 375).

In studies two and three the complexity of the relationship between teaching and learning comes through in the descriptions of students' approaches to the learning tasks involved, which implied that students do not always do what was intended by their teachers. These two studies built on students' answers to academic tasks (patient cases). In both studies the analyses of the students written accounts proceeded from the medical content present revealing no marked differences. However, in both studies it was clear that students presented with the same task varied greatly in how they approached that task. In both studies students used an array of medical information that did not differ in any important respect, but they employed this medical content in qualitatively different ways. In both studies one group of students profiled the content itself without giving any reasons for how or why this content were chosen; instead their answers simply relied on listing relevant facts or procedures—questions to ask, tests, differential diagnoses etc. In study II these students were described as working on a *purely academic problem*. In study III they were described as expressing a level of understanding as *mentioning*, *describing*, and to some extent *relating*.

In both studies the level of understanding that these students interpreted as being accurate to communicate was on a level well below what could be expected of semester eight medical students. Going back to what research on high-quality understanding tells us about a deep holistic character as Svensson expresses it:

It is the skill of forming integrated wholes that constitutes the most central aspect of the skill in learning through understanding. ... [And this] is dependent upon sensitivity to the material and the exploration both of the content ... and of the relevance of the organizing principles to the content (Svensson, 1997, pp. 60, 68).

The level of understanding expressed by most students in study III (98 of 118) and approximately half the students (8 of 14) in study II did not live up to these characteristics. From a theoretical point of view, seeing learning as contextualisation, this does not tell us what students are exhaustively capable of, but it reflects what kinds of understanding they interpreted as being appropriate to communicate under the given circumstances and in relation to the specific task. In study III the teachers' feedback in terms of grading and correction of the students' answers was also considered. The results emerg-

ing from this analysis show that the teachers involved did not value reflections and justifications in the students' answers. Their markings simply relied on checking for correct medical terminology. Although the MEQ is a tool invented for assessing clinical reasoning and integration of knowledge, this is not how the exam was interpreted in use by most students and teachers. Test formats or methods intended to assess higher levels of cognitive skills may simply assess bare factual knowledge. This depends on the content of the test (Palmer & Devitt, 2007; van der Vleuten, 1996) and how this content is contextualized by students. Constructing tests to assess higher order cognitive skills such as clinical reasoning may prove challenging to teachers (Feletti & Smith, 1986; Irwin & Bamber, 1982; Palmer & Devitt, 2007) and cannot be taken for granted. The students in this study did not express reasoning simply because they did not find it necessary to do so in order to pass the exam—and they were right. Thus, the results showed that many of the students were not doing what was supposedly intended. This tells us that it is important to investigate empirically what students actually do when presented with a task.

It could perhaps be suggested on the basis of research on development of expertise and illness scripts, i.e. that experts do not explicitly reason when encountering everyday problems (Schmidt & Rikers, 2007), that students did not need to reason to ascertain a diagnosis. However, the lack of explicit reasoning entails several problems. First of all, and perhaps most obvious, is the fact that without explicit reasoning this ability cannot be evaluated. In this case the reasoning leading up to the choice of facts or procedures is redundant, i.e. it leaves to the reader (in this case the examining teachers) to presuppose the reasoning. Theories in cognitive linguistics (Evans & Green, 2006; Langacker, 2008) suggest that language does not only enable us to communicate our thoughts and conceptualisations, but also facilitates cognitive development and learning. In light of this, it is important for students to express linguistically, as in this case through reasoning and reflection, how facts and procedures are connected and why they are chosen depending on contextual factors. Research on expertise and the development of illness-scripts shows that a fundamental prerequisite for their growth is an extensive exposure to a wide variety of clinical cases. But experiencing lots of different cases is not sufficient. These experiences must, according to research on both expertise, medical education and high-quality understanding, be submitted to *reflective thoughtful practice* (Lawson & Kirby, 2012). Otherwise, these extensive experiences run the risk of being fragmented. Research (Woods, 2007) has also suggested that reflecting on biomedical knowledge in clinical reasoning can facilitate the process of encapsulation and illness-script formation (i.e. the development of coherent cognitive representations of disease categories) and that it helps in sustaining knowledge. In other words, biomedical knowledge works as an organising principle for medical

content, helping students to categorise medical information and giving meaning to signs and symptoms.

In a study of medical students' understandings of physical phenomena, Fyrenius and colleagues (Fyrenius, Silén & Wirell, 2007) argued that medical students were able to rote memorise long and complex chains of reasoning. The researchers argued, based on their empirical study, that reasoning expressing a high-quality understanding therefore needs to take a special form. This dynamic reasoning "about physiological phenomena is qualitatively different in the sense that phenomena are not simply mentioned or explained in terms of causal relations, but processed and contextualised in various ways" (Fyrenius, Silén & Wirell, 2007, p. 367). In light of these results, the answers given by many of the students in this thesis (study II and III) did not communicate such dynamic reasoning.

To summarise, research from the areas of higher education, medical education, cognitive linguistics and professional development have all provided resilient arguments for the importance of reasoning and reflection and for the ability to relate parts to wholes when developing high-quality understanding. This was also expressed by students in study I. The results from the three studies mediate a picture of the learning environment in medicine as having and sustaining a strong focus on core content, facts, details and summative assessments (cf. Newble & Entwistle, 1986). This is a learning milieu that does not make enough room for expressing understanding of the qualitative character necessary for students to achieve a deep personal integrative understanding.

Higher education must, of course, be normative to some extent; ultimately students should be able to put their acquired knowledge to use in a professional situation. But, putting too much emphasis on outcome runs the risk of trivialising the necessary dynamicity of the learning process. It is the process and students' intentions in that process that must change if the learning outcome is to change from simply acquiring knowledge and skills to a dynamic high-quality understanding. Students without a disposition to understand for themselves (McCune & Entwistle, 2011) can only change their intentions and learning processes if the teaching-learning environment (including assessment practices) cultivates and rewards understandings of a high-quality character.

Implications for educational practice

The results presented in this thesis are not intended as an evaluation of teaching or learning within the medical programme, but to serve as an illustration of what students actually do when presented with a task. It shows that the problems students end up working on as a result of contextualising tasks are not always those intended by the teacher. By addressing this discrepancy, it

highlights the complexity of the relationship between student learning and the teaching-learning environment. In medicine best practice and evidenced based practice in clinical work as well as in education is often highlighted. The results and methodology presented here suggest that it is not about finding the best universal practice or method but about asking in any learning situation: Who are the students? What do they already know? What do we want them to know and why? In what contexts should they be able to use their knowledge, skills or understandings and what kinds of understandings does that entail? Answers to these questions then provide a basis for deciding what methods suit all these given parameters, and how methods can facilitate the creation of a learning environment, situation and task where selected theories and concepts come into play in a way that is congruent with intended learning outcomes (Halldén, 1988; van der Vleuten et al., 2008). This cannot be done by educational researchers, but must be performed by subject specialists who know the students' starting points and the subject well enough to be able to ascertain what the *inner logic of a subject* is (Entwistle, 2009).

Educational research has often been criticised for being too theoretical and not oriented enough towards research on problems that teachers and students encounter in their actual teaching-learning environment. Research stemming from an authentic milieu has a better chance of coming to practical use but this is no guarantee. For research results to be put into practice they must first be communicated to teachers, administrators and students *in* that practice and their use must be problematised together with those who are supposed to use them: teachers and students. It is important to emphasise that students have a responsibility for their own *self-regulated* (Boekaerts, 1999) learning, which makes it necessary also for them to understand learning and what learning for understanding entails.

Hopefully, the results presented in this thesis can elucidate the complexity of the relationship between student learning and the teaching-learning environment as experienced by the students, provide a methodological framework for exploring students' personal understandings in relation to learning tasks, give the reader an idea of the complexity of what learning for high-quality understanding may entail for students in medicine, and start sketching a conceptualisation of medical students experiences of understanding. My hope is that teachers can use the results and discussions presented here to start reflecting on how they relate to the teachers' personal experiences and conceptions of what teaching for understanding in their own subject area may entail.

Panaceas in education, as in medicine, prove illusive. Claims that any one method, whether e-learning or enquiry-based learning, or whatever, is the way to present course material cannot be sustained, either logically or empirically. No single method could ever be equally effective across the

whole of education, given the range of differing institutions, the contrasts between subject areas, the differences among both students and teachers and the differing views about the purpose of education. What research can offer is a way of thinking about how teaching affects learning and a range of concepts and principles that allow academics to think about pedagogic issues in a more precise way (Entwistle, 2009, p. 2-3).

Further research

The thesis belongs to the small-scale area of research on student learning in higher and medical education, and has been concerned more with depth than offering overviews giving rise to broad generalisations. Hopefully this thesis has begun to offer a fine-grained description of student learning in medicine. However, it is in the nature of research in any area that it often produces more questions than it answers. Suggestions for future research could therefore go in many different directions. I will in this section highlight a few reflections that I have made in the course of working on this thesis.

Although many students in the studies did not express an understanding of the qualitative kind described above, some students did, at least to some extent. For example, in the interview study (I) students described the experience of beginning to understand as pieces coming together etc. Some of the students interviewed also reflected on the importance of a holistic approach, (Svensson, 1997), that is, being able to connect details to wholes and that this ability makes it easier to understand not only the overall picture but also the details.

There's like a lot of systems that merge, but they merge into a larger system which is a human being. I think that's good, it works for me to look at it as a system. Obviously, you can narrow things down and get even smaller systems; the cell is also a system but if you have complete control of slightly larger systems of the human body, for instance heat regulation or the regulation of fluids, it's much easier to concentrate on the details. If you don't know anything about [the larger systems] you won't be able to remember the details. [...] The things that you have a general understanding of remain much longer in memory (Scheja & Bonnevier, 2010, p. 253).

In the second study some of the students situated the task within a hypothetical clinical situation; their work on a professional academic problem showed a more advanced way of communicating their understanding. These students have a reflective and dynamic way of approaching the task. They tried out alternative interpretations of the learning object and elaborated explicitly on the implications of their interpretations. In study III a few student answers expressed an understanding on a qualitatively higher level (explaining). These students related facts and details to each other and they also con-

veyed the importance of justifying and explaining *how* or *why* this information is connected.

Although none of the studies went on to elaborate on the significance of the ways in which these students approached the tasks or elaborated on their experiences, when reflecting on the results of all three studies it becomes clear that some students seemed to have a disposition to express their understanding that goes beyond what was interpreted as adequate by most of their peers. Similar findings have been described by, for example, Biggs and colleagues (Biggs & Collis, 1982; Biggs & Tang, 2007) as *extended abstract*, by Fyrenius, Wirell and Silén (2007) as *moving*, by Marton and colleagues (Marton, Asplund Carlsson & Halász, 1992) as *reflective variation*, by McCune and Entwistle (2011) as *a disposition to understand for oneself* and by Perkins and Tishman (2001) as *thinking dispositions*. This emerging evidence suggests that some students might have a personal disposition to understand and that this disposition is relatively stable over time and across different contexts (McCune & Entwistle, 2011). As a future research project it would be interesting to dwell deeper into the character of these answers in light of the research described above and investigate whether it is possible to instil in learners such an approach to learning in relation to specific subject areas, as in this case different subject areas in medicine.

During the work on this thesis I have become more and more aware of and interested in the importance of language and its contextual dependence, not only to the interpretations of data material, but also as a prerequisite for learning and conceptual development. It is crucial when investigating what students are actually doing in a learning situation to separate the *expressions* used from the *meaning* that students intentionally apply to these expressions in use (cf. Svensson, 2009). The supporting search for linguistic structures in study II was a first modest attempt to develop such a method of analysis. However, to be a fully developed tool this method needs to be developed further in co-operation between researchers in cognitive linguistics, education and subject specialist as in this case medicine.

In higher education in general and medical education in particular, student learning is still investigated mostly from within the perspective of cognitive psychology (Haggis, 2009). When aspects of context are focused on it often regards aspects outside the classroom, such as gender and ethnicity issues. Henceforth, we need to focus our investigations more on social perspectives within the learning context. But as our methodological framework proves, we do not have to leave the cognitive frame. A theory of learning involving contextualisation and an intentional methodology can prove useful in such investigations, but the method of analysis could benefit from being fine-tuned in relation to interpretation of data if it is to be used on written utterances only. In this process linguistic research can be most helpful.

Research in medical education has as mentioned described the growth of expertise in clinical reasoning as a process of developing illness-scripts

(Boshuizen & Schmidt, 2008; Schmidt & Rikers, 2007) incorporating aspects of an illness or diagnosis ready to be used in relation to clinical problems. Reflecting on the notions of knowledge objects (Marton & Entwistle, 1994) and contextualisations (Halldén et al., 2013), it would be interesting to dwell deeper (both theoretically and empirically) into these different concepts, how they might relate to each other and how they can be used to enhance our understanding of the breadth and depth of students' cognitive structures as they are expressed and used in relation to specific learning tasks.

Methodological and theoretical remarks

The thesis seeks to problematise the complexity of the relationship between student learning and teaching in medicine through exploring medical students' experiences of understanding in medicine in general and how this understanding comes through in their work on specific tasks. This kind of research aim requires a qualitative research approach able to account for aspects of content, context and the individual.

Issues of validity and reliability in qualitative research are different from those in quantitative research—as the knowledge claims differ—but quality and trustworthiness are nevertheless equally important. The issue of validating qualitative research has been described in various ways. Entwistle describes good educational research as depending “on using *disciplined enquiry*, in other words collecting and interpreting evidence in systematic ways and according to agreed procedures, but not restricted to any dominant methodology” (Entwistle, 2009, p. 5). According to Kvale (1989) validating qualitative research “involves checking the credibility of knowledge claims, of ascertaining the strengths of the empirical evidence and the plausibility of the interpretations” (p. 78) and that the process should be rigorous and characterised by repeatedly reflecting on and questioning of the credibility, plausibility and trustworthiness (ibid, pp. 76).

There should be an openness, accessibility, precision and consistency within the individual steps involved in the research process as well as between steps (in how they fit together)—from formulation of research questions, choice and presentation of theory, methods used for collecting and interpreting data, and presentation of research findings and discussions. In practice this means that validation and reliability in qualitative research is built into the research process and that this process must be described in such detail that it is possible for the reader to determine whether methodological demands have been adequately addressed.

In this thesis this has been done through a thorough presentation of relevant research literature and concepts in higher education in general and medical education in particular and by portraying the theory of learning as in-

volving contextualisation. This theory and related methodology underpins both the research questions asked, choice and collection of data and the methodological distinction between task and problem as a basis for the analysis. The process of analysis has been described in detail in the research papers and the introductory chapter. In the discussion, the findings from the papers are interpreted by being related to theories of learning and research in higher and medical education.

As described above the analyses involved collaborative analytic efforts to validate results and the categories found. Quotes from student interviews and answers to assignments were offered to make it easier for the reader to follow the interpretations made. Validation of the interpretations of students' written accounts and interview transcripts (the ascribing of intentional actions and contextualisations to them) lies in the plausibility and credibility of argumentation and explanations offered to the reader in the presentation of the results. It may not be possible for another researcher to apply exactly the same process of analysis, but the resulting descriptions and categories describing the investigated phenomenon should be replicable.

Another way of validating qualitative research is to make sure it is ecologically valid—acknowledging the fact that learning is a highly situated and context dependent phenomenon—which in this thesis means that what is measured should be of educational importance and performed in the setting where students' learning normally takes place and through learning tasks that are part of their ordinary academic course work (Bruner, 1996; Entwistle, 2009). To meet these demands the thesis rests on interviews with medical students focusing on their perceptions of their learning environment, an assignment developed for research purposes only but of a type frequently used and developed within the medical programme, and finally an authentic examination. To investigate learning and understanding in a subject area can be difficult for an educational researcher without a profound understanding of the inner logic (Entwistle, 2009) of the subject area under investigation. Since my own background is within education I have tried to compensate for this by taking courses in biomedicine, reading an extensive amount of literature in the area, observing student learning in different contexts within the medical programme, meeting with and discussing learning and understanding with medical teachers and students. The research process (collection, interpretation and writing) has also been supervised by a medical doctor.

The individual papers in this thesis offer small-scale empirical qualitative studies aiming at fine-grained in-depth analyses of aspects of students' understanding in medicine rather than broad-scale investigations leading to generalisations. The use of different sorts of data (interviews and students answers to assignments) made it possible to examine the issue of students' understanding from different perspectives. Although interesting in themselves, given the emphasis on the importance of relating details to wholes presented in this thesis, it may have strengthened the results if they were to

have been assisted by large-scale overviews of students' experiences of understanding in medicine in general and in relation to the specific tasks involved in the studies by using inventories. The results of study II and III could perhaps also have been further explored if presented to the participants in the studies and then elaborated on through interviews with both students and teachers.

The thesis is to a large extent based on research from the area of higher education (particularly from the UK, Sweden and Australasia), and it also rests on research stemming from conceptual change contributing with a perspective on learning as a process of contextualisation. Both these perspectives build on approaches to learning theories and both can contribute significantly to the investigation of student understanding in higher education. The contextualisation theory (especially when assisted by a linguistic approach) enables fine-grained analyses of students' utterances on a micro-level which adds to our understanding of how individual students interact with their learning environment and interpret particular learning assignments presented in the teaching. Such fine-grained and contextualised analyses of learning processes complement the more general descriptions found in research on student learning in higher education, which have focused on mapping influences on learning in higher education from a slightly different perspective, to explore potential pathways of enhancing students' personal understanding in relation to the ways of thinking and practicing endorsed within particular disciplines.

Given the notion of qualitative educational research as cumulative (cf. Entwistle, 2009), more research—both in-depth and general—is needed before the empirical value of a conceptualisation of students' experiences of understanding in medicine as the one described in this thesis can be fully assessed. The empirical results from study II and III should be considered as illustrations of methodologically interesting variations in medical students' ways of approaching learning tasks and as indicators of the complex relationship between teaching and learning. These illustrations and methodological ways of problematising student learning and understanding can provide a framework useful as a basis for additional systematic empirical investigations and function as an analytical tool for studying crucial variations in the process through which students' subject-matter understandings emerge in interaction with their learning environment. In that sense, the findings through the methods used are more broadly applicable. Hence, the thesis extends previous research on learning and understanding in higher education in general and medical education in particular by applying a framework to student learning in medicine that takes into account aspects of the individual learner, content and context.

Understanding learning and learning for understanding in medicine

Evaluation of education has lately turned from a focus on process to a focus on outcome. However, research shows that what students learn is closely associated with and dependent on how they go about learning it and the influences on this process. To understand learning you must acknowledge its context dependency and students' experiences in context. The debate between sociocultural research, on the one hand, and cognitive constructivist research, on the other, regarding the meaning and significance of context is perhaps not as prominent today as it was twenty or thirty years ago. We now share an understanding of the contextual and cultural importance to student learning. Notably, research in the UK has been able to establish such a dependence. Despite this, even now little attention is paid in medical education (research and educational practice) to the influences put on learning and understanding by context, culture and sociocultural phenomena. Putting the context up front does not have to be complicated. "To take a cultural view on education does not really require constant cultural comparison. Rather, it requires that one consider education and school learning in their situated, cultural context" (Bruner, 1996, p. x).

To achieve high-quality understanding you cannot only be concerned with outcome, you must also take into consideration the quality of the process leading up to this learning outcome and the influences placed on it. In this thesis, this has been accomplished by methodologically viewing students' utterances as speech acts telling us what they were trying to achieve in relation to learning tasks depending on how they contextualised the task. Learning for understanding has been defined as involving the ability to connect details to wholes. But this is not enough, from a context sensitive point of view it is of utmost importance to consider which whole to connect parts and details to. The organising principle (Svensson, 1997) for the same concept (i.e. the whole) will differ between contexts and this must be explicated in teaching.

My firm belief is, based on the research presented here, that facilitating high-quality understanding in medical education is not about putting *integration* of subjects, courses, content and so on up front (which is a contemporary and common way of discussing curricula improvement in medicine, leading to excitable and problematic discussions between specialists from different professional areas), but to focus on *differentiation* (cf. Halldén et al., 2002; Marton & Fai Pang, 2006). It is crucial to explicate the different meanings that theories and concepts have depending on context. Bearing in mind that the same linguistic expression or concept may undertake different meanings in different contexts (Svensson, 2009) as in, for example, different specialist areas within medicine or different professional areas in health care. In this process, giving attention to language is central.

Sammanfattning på svenska

Att förstå lärande och att lära för förståelse

Studier av läkarstudenters personliga förståelse av studieuppgifter och upplevelser av lärande och förståelse i medicin

Introduktion

Det övergripande syftet med den här avhandlingen är att problematisera den komplexitet som finns i relationen mellan undervisning och studenters lärande. Denna relation tas ofta förgiven, dvs. man förutsätter många gånger att studenterna lär sig det som läraren avser att de ska lära sig. I avhandlingen hävdas, med utgångspunkt i empiriska studier och mot bakgrund av tidigare forskning, att det som presenteras för studenter i en utbildningssituation endast utgör *potential* för lärande. Vad studenter gör av denna potential beror på en mängd olika faktorer.

Relationen mellan undervisning och studenters lärande studeras här empiriskt i tre olika studier som belyser fenomenet på olika sätt. Som utgångspunkt i analyserna tas studenternas perspektiv, dvs. fokus är riktat mot hur studenterna uppfattar lärande och förståelse i sin studiemiljö och hur studenters uppfattningar kommer till uttryck i deras tolkningar av och förhållningsätt till studieuppgifter. Det är alltså inte situationen som sådan som studeras, utan studenternas uppfattningar och erfarenheter av denna. Avhandlingen diskuterar också hur studenternas uppfattningar och förhållningsätt relaterar till aktuell forskning om vad hög kvalitet i studenters lärande innebär. Avhandlingen skisserar dessutom ett ramverk som gör det möjligt att begreppsliggöra och empiriskt studera relationen mellan undervisning, som denna uppfattas av studenterna, och studenters lärande. Detta görs dels genom att analysera relevant forskning om lärande och förståelse, dels genom att presentera ett kontext-orienterat metodologiskt perspektiv på lärande.

Forskning om lärande i högre utbildning och medicinsk pedagogik

Forskning har visat att lärande i allra högsta grad är ett kontextberoende fenomen och därför måste det studeras och beskrivas i nära relation till där lärandet sker. Den här avhandlingen handlar om läkarstudenters lärande

inom grundutbildningen i medicin, dvs. läkarprogrammet. Litteraturbakgrunden omfattar därför nödvändigtvis forskning från både högre utbildning och medicinsk pedagogik som under de senaste trettio åren har kommit att utvecklas till ett eget forskningsfält. Läkarprogrammet erbjuder oändliga möjligheter att studera just kontextuella aspekter av lärande eftersom utbildningen ständigt utmanar studenterna att anpassa sig till nya situationer av mycket skilda slag såväl teoretiskt som praktiskt och kliniskt.

Vikten av att utveckla en djup och holistisk förståelse

Forskning i såväl högre utbildning som medicinsk pedagogik har från olika perspektiv betonat vikten av att studenter strävar efter att uppnå förståelse (eng. *high-quality understanding*). Förståelse, till skillnad från kunskaper och färdigheter i allmänhet, har visats ha en särskild, dynamisk och kreativ karaktär som involverar förmågan att kunna tänka kring och använda kunskaper på ett flexibelt sätt med lyhördhet för vad situationen kräver (se t.ex. Lawson & Kirby, 2012; Perkins, 1998; Perrone, 1998). En sådan förståelse involverar också att kunna skapa sammanhang i sitt lärande, att förstå hur fakta och detaljer relaterar till varandra och till större helheter. Detta har beskrivits som en *holistisk inriktning* i lärandet (Svensson, 1997). I denna läraprocess är fakta och detaljer viktiga men inte tillräckliga (Perkins, 1998; Svensson, 1997) för att utveckla förståelse.

Som nämndes tidigare så är lärande ett högst kontextuellt fenomen och varje disciplin eller ämnesområde kan sägas vara förbundet med egna sätt att tänka och agera (eng. *Ways of thinking and practicing*) (McCune & Hounsell, 2005). En mängd faktorer påverkar studenter, skapar erfarenheter, uppfattningar och värderingar. En av de mest centrala aspekter som påverkar studenters lärande är examinationer. De är också det viktigaste instrument en lärare har för att bedöma om studenterna uppnått lärandemålen. Därför är det nödvändigt att examinationen stödjer lärandemålen (Biggs & Tang, 2007) och att examinationssituationen testar det som den är avsedd att testa (Tan et al., 2011). Forskning i både medicinsk pedagogik (Wass & Archer, 2011) och i högre utbildning generellt (Lawson & Kirby, 2012) har visat att lärare ofta har svårt att konstruera examinationstillfällen som testar högre nivåer av förståelse vilket ofta leder till att examinationer (till och med på forskarutbildningsnivå) tenderar att testa kunskap på en alltför låg nivå i relation till kursmålen.

Att lära sig resonera kliniskt

Ett av de mest centrala lärandemålen i läkarprogrammet är förmågan att kunna resonera kliniskt (eng. *clinical* eller *diagnostic reasoning*) vilket involverar att kunna ställa diagnos och utforma en behandlingsplan för en patient (van der Vleuten et al., 2008). Det finns en massiv mängd forskning inom medicinsk pedagogik om kliniskt resonemang där man bland annat beskrivit utvecklingen från novis till expert. Denna forskning har visat att

experter mycket sällan engagerar sig i ett explicit och systematiskt resonande när de arbetar med vanliga rutinfall. Om de däremot ställs inför utmanande, komplicerade fall eller fall utanför det egna specialistområdet så faller de tillbaka på sina kunskaper att resonera (Boshuizen & Schmidt, 2008; Schmidt & Rikers, 2007; Woods et al, 2007). Beroende på var i sin lärandeutveckling en student befinner sig så behöver studenten resonera i större eller mindre utsträckning och processen att ställa diagnos blir därmed mer eller mindre effektiv. Precis som med den förståelse som beskrivits ovan kräver utveckling av kunskaper i att resonera kliniskt, från novis till expert, att studenten både möter en stor mängd exempel, dvs. patientfall, men också att studenten ges möjlighet att aktivt och medvetet reflektera över variationen och betydelsen av dessa exempel i relation till andra exempel och ämnet i stort (Schmidt & Rikers, 2007).

Lärande som en kontextualiseringsprocess

Lärande ses ofta som en process i vilken en individ utvecklar nya kunskaper eller färdigheter i relation till ett innehåll, ett lärandeobjekt (Marton & Säljö, 1976a, 1976b). Men lärande sker också alltid i en situation, en kontext som bestämmer de kulturella och sociala reglerna och ramarna för vad som anses vara lärande och kunskap i det aktuella sammanhanget (Vygotsky, 1978; Bruner, 1996). Vanligen har pedagogisk forskning fokuserat den ena av dessa två aspekter, den kognitiva utvecklingen hos individen *eller* hur kunskap skapas och situeras i en social och kulturell diskurs. Som en konsekvens av detta har båda perspektiven kritiserats av det andra för att missa viktiga aspekter av lärandet (Schoultz et al., 2001; Sinatra, 2007).

Som svar på denna kritik utvecklades vid Stockholms universitet ett metodologiskt perspektiv och en analysmetod (s.k. Intentionell analys) för att kunna studera studenters individuella kognitiva lärande samtidigt som de kontextuella aspekterna av detta lärande kunde placeras i förgrunden (Halldén et al., 2013). Denna metodologiska ansats bygger på en konstruktivistisk teori och beskriver lärande som en *kontextualiseringsprocess* i vilken individen tolkar fenomen (t.ex. innehåll, begrepp och uppgifter) baserat på en komplex repertoar av föreställningar på olika nivåer och skapar för fenomenet ett kognitivt sammanhang för sina tolkningar, en *kontextualisering*, genom vilken fenomenet blir meningsfullt. Lärande blir då en fråga om att lära sig identifiera och urskilja variation och likheter mellan olika sådana kontextualiseringar och komma till insikt om lärandets situerade karaktär, dvs. att ett fenomen får olika betydelse beroende på i vilket sammanhang det placeras (Halldén et al., 2002; Petersson, 2005).

Marton och Säljö (1976a, 1976b) fastställde redan under 1970-talet en funktionell relation mellan studenters intentioner, deras förhållningsätt eller *inriktning* (Marton et al., 1997) till lärande eller studier (eng. *approaches to learning or studying*) och lärandets utfall (ibid.). Kontextualiseringsperspek-

tivet beskrivet ovan bygger vidare på denna ansats och utgår från att: Hur studenter väljer att ta sig an (inrikta sig mot) till exempel en uppgift är beroende av studentens intentioner i relation till en specifik situation och ett specifikt innehåll som dessa uppfattas av studenten baserat på dennes individuella kognitiva förmågor, föreställningar och tidigare erfarenheter (Booth et al., 1999).

Syfte

Syftet med avhandlingen är att mot bakgrund av den ovan beskrivna konstruktivistiska teorin om lärande som en kontextualiseringsprocess, problematisera den komplexa relationen mellan undervisning och studenter lärande. Detta görs genom att empiriskt utforska hur studenter på grundutbildningen i medicin (läkarprogrammet):

- uttrycker erfarenheter av lärande och förståelse i medicin och
- kommunicerar personlig förståelse av ämnesinnehåll i medicin i relation till specifika uppgifter.

Resultaten från de empiriska studierna diskuteras i relation till tidigare forskning om förståelse och kvalitéer i studenter lärande. Avhandlingen skisserar dessutom ett metodologiskt ramverk som kan användas för att studera komplexiteten i relationen mellan undervisning, som den uppfattas av studenter, och studenter lärande.

Metod

Avhandlingen bygger på tre studier. Den första var en intervjustudie som fokuserade på hur läkarstudenter termin 5 ($n \approx 20$) uttryckte sina erfarenheter av att lära och förstå inom ramen för läkarprogrammet. Studenterna valdes för att de nyligen hade tagit steget från pre-kliniska basvetenskapliga studier till kliniska kurser förlagda till hälso- och sjukvården. Detta skifte i sammanhang uppfattas ofta av studenter som problematiskt på många sätt (Godefrooij et al., 2010). Studie två och tre byggde på kopior av termin 8 studenters skriftliga svar på studieuppgifter. Den första var ett patientfall konstruerat enbart för forskningssyfte och delades ut i samband med en kurs i kirurgi och utformades i samarbete med två undervisande läkare. Fallet besvarades av 14 studenter. Den sista uppgiften utgjordes av en autentisk sluttentamen i kirurgi och omfattade alla studenter antagna en viss termin ($n=118$). Termin 8 studenter valdes för att de närmar sig slutet av sin utbildning och kan förväntas ha stor erfarenhet av att arbeta med patientfall, både simulerade och riktiga.

Studenternas utsagor analyserades mot bakgrund av perspektivet beskrivet ovan (ett kontextualiseringsperspektiv). Att modellera studenter förstå-

else på detta sätt kräver att vi tillskriver deras beteenden meningsfullhet (Davidson, 2001). I analysen görs detta genom att studenternas utsagor ses som *talakter* (jmf eng. *speech acts* hos Searle, 1983), dvs. studenternas sätt att uttrycka sig ses som meningsfullt agerande givet en *intention* (von Wright, 1971) att uppnå något i en specifik situation (Booth et al., 1999; Halldén et al., 2013).

Resultat

Läkarstudenterna termin 5 beskrev upplevelsen av att lära och förstå under utbildningens fyra första (pre-kliniska) terminer som en period av intensiva studier som lämnade lite utrymme för förståelse och reflektion. Istället upplevde studenterna att mycket fokus låg vid att memorera fakta och detaljer. Detta är inte direkt en förvånande bild av läkarprogrammet som är känt för att kräva av studenter att de ska klara av att tillägna sig stora mängder stoff på liten tid, särskilt under de första terminerna. Det som är intressant är att för läkarstudenterna, till skillnad från t.ex. ingenjörstudenter (Scheja, 2002, 2006), verkar detta sätt att tackla studierna vara relativt oproblematiskt även om de inte anser att det är ett optimalt sätt att studera. De intervjuade studenterna förmedlar ett förtroende för utbildningssystemet: Det är en period man måste gå igenom. Många av studenterna i den första studien beskrev att en viktig del av lärande i medicin är att kunna relatera delar till helheter och förstå hur fenomen hänger ihop. De beskrev också att de första terminerna gav små möjligheter till sådant helhetstänkande, men att när studierna övergick till den kliniska delen av utbildningen så ökade möjligheterna och saker började falla på plats.

Studie två och tre byggde båda på resultatet av studenters arbeten med studieuppgifter i form av patientfall där studenternas förmåga att resonera kliniskt sattes på prov. I båda studierna visade det sig att skillnaden i det innehåll (medicinska fakta och detaljer) som studenterna bedömde var adekvat för lösningen av uppgiften skiljde sig mycket lite åt mellan studenter. Vad gällde innehåll så tycktes de flesta studenter i båda fallen ha tolkat uppgifterna likartat. Utöver denna likhet så fanns dock stora skillnader i studenternas tolkningar av uppgiften. Dessa skillnader hade att göra med hur studenterna valde att organisera innehållet i sina skriftliga svar. Genom sina olika sätt att uttrycka sig kommunicerade de olika former av förståelse av vad uppgiften handlade om. Många av studenterna i båda studiernas förmedlade en förståelse som utgjordes av att nämna eller beskriva fakta och detaljer snarare än förklara och resonera. Dessa studenter kommunicerade inte förutsättningarna för sina val av fakta och förklarade inte heller hur olika delar av innehållet relaterade till varandra. Många av svaren arrangerades helt enkelt i formen av listor med medicinsk fakta och åtgärder. Båda studierna visade också att trots att frågan i båda fallen var ställd för att uppmuntra till resonemang ("Beskriv hur du tänker." och "Motivera ditt svar!") så fanns

en stor grupp studenter som underlät att explicit resonera i sina svar. I de studentsvar som i studie tre antydde resonemang var dessa på en låg nivå och de flesta handlade i huvudsak om att relatera olika aspekter av medicinskt innehåll till varandra utan att förklara hur eller varför dessa aspekter hängde ihop. I studie tre analyserades även lärarnas rättning (poängsättning) av studenternas svar och intressant nog visade det sig att lärarna inte värderade studenternas motiveringar eftersom även svar utan motiveringar fick full poäng.

I både studie två och tre fanns dock studenter som hade ett mer dynamiskt sätt att förhålla sig till uppgifterna. Dessa studenter resonerade och förklarade explicit grunderna för sina antaganden, beslut och val. Särskilt i studie två var det ett antal av studenterna som mer ingående bearbetade informationen och explicit reflekterade över dess betydelse i olika sammanhang.

Diskussion och slutsatser

De tre studierna belyser komplexiteten i relationen mellan undervisning och lärande på olika sätt. I den första studien visas detta genom studenternas tydliga svårigheter i att uttolka vilka större helheter som all fakta och detaljer som de konfronteras med i utbildningen kan relateras till. De upplever att det är viktigt att förstå hur saker hänger ihop, men utbildningen ger inte uppenbart ett utrymme för sådan förståelse. När utbildningen övergår i de kliniska terminerna blir det plötsligt lättare för studenterna att förstå vilka helheter som är relevanta att relatera stoffet till. Dessa resultat är intressanta dels om man beaktar idéer om förståelse och djupinriktat lärande eftersom en holistisk inriktning (Svensson, 1997) är viktig för utveckling av en djup förståelse. Men resultaten är också intressanta om man betraktar lärande som en kontekstualiseringsprocess. Forskning (Lonka & Lindblom-Ylänne, 1996) har t.ex. visat att läkarstudenter ofta uppvisar en strategisk inriktning till lärande och att de i hög grad tenderar att primärt värdera kunskap som är användbar i en professionell kontext (ibid.). Läkarprogrammet utbildar läkare som främst ska arbeta med patienter i en klinisk kontext. Den basvetenskapliga (prekliniska) delen av utbildningen utgör en helt annan kontext än den där studenterna ska använda sina kunskaper. Där undervisas studenter av lärare som ofta är universitetsanställda forskare och studenterna har begränsad kontakt med patienter. Det är rimligt att tänka sig att de helheter och principer som ska organisera fakta och detaljer i ett ämne till stor del skiljer sig åt mellan dessa två sammanhang. I en undervisningssituation är det därför ytterst viktigt att explicitgöra, dels att sådana skillnader finns mellan olika sammanhang (jmf Perry, 1970) och hur denna skillnad närmare bestämt ser ut.

I studie två och tre framträder komplexiteten i relationen mellan undervisning och lärande främst i beskrivningarna av hur studenterna tog sig an uppgifterna. I båda studierna uppmanades studenterna att resonera kring och motivera sina svar. Trots detta saknade många svar motiveringar och reso-

nemang helt och i studie tre var nivån på de flesta studenternas svar långt under vad man kan förvänta sig av studenter som går termin 8 på den aktuella läkarutbildningen. Båda studierna visade att studenterna delvis gjorde något annat än vad som var tänkt och uttryckt i styrdokument för utbildningen. Lärarna i studie tre belönade indirekt, och sannolikt omedvetet, ett oreflekerat förhållningssätt till uppgiften. Den avsaknad av explicit reflektion som studenternas svar uppvisade i förhållande till de uppgifter de hade att lösa leder till flera problem. Forskning om lärande i högre utbildning och medicinskt pedagogisk forskning om att utveckla expertis i att resonera kliniskt visar att studenter behöver dra lärdom av många olika typer av exempel, dvs. patientfall, men att om dessa fall inte bara ska förbli fragmenterade exempel så måste studenterna också aktivt uppmuntras till att engagera sig i en bearbetning av stoffet och de egna erfarenheterna genom att explicit reflektera över relationer, variationer och betydelse av olika aspekter (Lawson & Kirby, 2012; Woods, 2007).

Forskning (Fyrenius, Silén & Wirell, 2007) har också visat att det är möjligt för studenter att memorera långa och relativt komplexa kedjor av resonemang. Därför är det extra viktigt att studenters resonemang uppvisar kvalitéer utöver att endast relatera fakta till varandra. Studenter behöver utmanas till att kontextualisera innehåll på en mängd olika sätt och uppmanas att förklara hur betydelsen av fenomen skiljer sig åt, givet de olika kontextualiseringar som görs. Genom att lägga för stort fokus på innehåll, fakta och detaljer och på utfallet av lärande riskerar man att trivialisera nödvändigheten av en dynamisk lärprocess och hur lärprocessen påverkas av hur studenter uppfattar undervisningen och sin studiemiljö. Förståelse har definierats som att kunna använda kunskaper och att kunna relatera delar och helheter till varandra. Men ur ett kontextualiseringsperspektiv är detta inte tillräckligt. Det är också nödvändigt att tydliggöra vilka helheter som de olika delarna av stoffet ska relateras till, vad dessa bygger på för antaganden och perspektiv och hur dessa kan förstås inom ramen för ett större sammanhang och andra kunskapsområden där samma fenomen kommer till användning. I en sådan lärandemiljö handlar det inte främst om att *integrera* kunskaper och ämnesområden (vilket är ett vanligt sätt att tala om förbättringar av utbildning i medicin) utan att i utbildningen understryka vikten av att *differentiera* (Halldén et al., 2002; Petersson, 2005), dvs. tydliggöra den egna tolkningskontexten och hur den relaterar till andra tolkningskontexter inom utbildningen.

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