

Thesis for the degree of Doctor of Philosophy

**Teacher Change in Relation to
Professional Development in
Entrepreneurial Learning**

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Department of Physics
Faculty of Science
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Abstract

Compulsory school teachers' perceptions and change in relation to Continuing Professional Development (CPD) in entrepreneurial learning are investigated in this thesis. The teacher level focus is based on evidence pointing to the teacher's strong impact on student interest and learning and the teacher as the single most influential actor on the implemented curriculum. All the distinct studies included are framed in a qualitative research approach, however from different perspectives.

Entrepreneurial learning can be rewarding, for students as well as for the teachers, and has been suggested as one possible way to increase student interest in science and technology. Teachers may need inspiration and support to provide entrepreneurial learning environments for their students. This support can be provided by CPD.

Collaboration with the surrounding world in the teaching practice is one of the components which may be included in entrepreneurial learning. The findings from this thesis show that teachers perceive requirements and barriers for integrating collaborations. The directions which are indicated to be of most concern; i.e. the main categories of requirements, are school management, the teacher's personal character traits and disposition, colleagues and time. The teachers' statements provide detailed information on what types of issues the teachers perceive as important to have addressed. These findings correspond with factors that other teachers seem to perceive as critical for teacher change and growth in relation to CPD in entrepreneurial learning. The categories of requirements illustrate strong interdependencies, as do the critical factors.

Narratives on five different teachers' individual paths of growth, from a longitudinal study, illustrate that teachers respond differently to external factors from their professional context. The individual responses may be explained by personally related factors. Teachers' perceptions, including the one of the CPD message (entrepreneurial learning in this thesis), are personally related factors which seem to have influence on the degree of teacher growth. Additionally the findings indicate that a high degree of collegial coherence in the teacher team may compensate for lack of school management support on an organizational level. However, moral support from the school management does not seem to compensate for lack of collegial coherence when organizational support is not provided.

Findings from this thesis additionally illustrate the added variation and diversity in quality of outcome; i.e. different outcome types, from exploring two courses with different foci in relation to a teacher's professional knowledge. The course which focused on general teaching strategies inspired by entrepreneurial learning generated outcomes on a general level, whereas the course which focused on specific content, knowledge in an authentic learning environment, rendered outcomes

which were more specifically related to content knowledge. Thus, transfer of teaching strategies, from a self-experienced learning in an authentic setting, to the teacher's own practice does not automatically occur, even though the experience results in strong affective as well as motivational and attitude outcomes.

The results from the investigation of the two courses with different foci, point to the importance of specifying what the CPD is effective at in evaluations of CPD effectiveness. Furthermore, the longitudinal study on teacher change and growth indicate that the outcome from evaluations of CPD effectiveness may vary with the point of time after CPD at which the measurement is conducted.

The detailed replies from the qualitative research approach provide information on issues related to changes in teaching practice to include (more) entrepreneurial learning components. The general character of the categories of requirements and the critical factors for teacher change and growth indicate that the findings are valuable also on a more general level. The issues may guide future CPD efforts and future research on CPD.

The thesis additionally includes an overview of entrepreneurial learning and authentic learning. The overview may help in efforts aiming at understanding entrepreneurial learning from a broad perspective, which would be the perspective which is most relevant in relation to the national curriculum in Sweden, Lgr11. The overview also points to strong resemblance between the two concepts, as well as with other related concepts. This resemblance may be one reason for the common perception among teachers, that a concept which is introduced into the field of education is not new at all.

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Preface

One needs to have walked through the meadow to be able to know how soft it feels (p. 18, author's translation).

These are words from 1910 by Hans Larsson, a philosopher from Lund University. They were written in the same context from which this whole study emerged; the context of schools' collaborations with the surrounding world in the purpose of facilitating the students' process of learning new concepts and skills in school.

When I returned to Sweden after 7 years abroad, Lpo94 had been introduced as a new curriculum for compulsory school. Apart from the reformed grading system, the school subject of technology was introduced in a novel manner; all students were going to gain technological literacy apart from other more traditional and already emphasized 'literacies'. Technological literacy was and still is seen as an important component in the students' preparation for their future lives, personally as well as professionally, as active members of the society. Additionally, technology was introduced in its reshaped fashion with the aim, national and international, of creating an increased student interest in school technology, in turn with the purpose of securing the recruitment perceived to be essential for the nation's economic growth.

During my first position as a teacher in Sweden, shortly after my return, I happened to come over information on academic courses on technology for teachers, applied and got accepted at the University of Gothenburg. Looking in the rear mirror, this coincidence followed by an active choice turned out to be a critical incident in my life.

The Swedish government's appeal to teachers in technology, and in science, to maintain and/or create the students' interest in school technology and science could be perceived as a heavy burden for a compulsory school teacher dealing with diminishing economic resources. When I returned to Sweden after another 2 years abroad I enjoyed the privilege of being part in building a science and technology department at the newly built Kullaviksskolan. The investment budget was more generous than annual spending budgets, but still was not enough to buy the materiel and equipment needed to present the students with the sparkling entertainment which they seemed to expect more than ordinary education. Fortunately and possibly critically incidentally, Maria Svensson was introduced to me as my new teacher colleague and she was and still is sparkling to me. Tuning in on the same wave-length, just as our main principal, Hans Wettby, had hoped for, we ignited each other further from the first time we met. It was obvious to both of us to accept the government's challenge of creating a student interest in school technology and science as a source for professional

development rather than allowing us to perceive it as a burden. Already in our very first version of Kullaviksskolan's local curriculum for science as well as technology we clearly stated, with the support from our main principal, that we were going to collaborate with the surrounding world as an integrated part of our teaching practice. We wanted to present the school subjects as they are used in real life, in authentic contexts, for our students to create an interest and a sense to them of learning something meaningful. The extra resources which can be provided by the surrounding world through their sheer essential equipment and processes seemed to us to be obvious boosters of the students' interest.

Maria and I were so strongly convinced about the educational benefits from the collaborations that we did not hesitate to apply for various monetary prize awards on inventive school development projects. The fact that Kullaviksskolan received several awards from our initiatives, awards which granted us large amounts – relatively speaking - of extra economic resources, encouraged us to continue on our chosen path, a path which I continued on my own or, at times, together with other colleagues after Maria had chosen to accept an offer to teach technology teacher students at the University of Gothenburg. Although money initially was the strongest motivator for applying for awards, the confirmation as well as the positive exposure for Kullaviksskolan in media took over as the strongest motivator. I realized the invaluable impact from the recognitions on the development of my teaching practice as well as the uplifting sense of pride shared among students, parents and colleagues.

The two critical incidents, already mentioned, seem to have caused yet another critical incident in my teaching practice and life. My way of teaching technology, my approaches and attitudes, turned out to have an impact on my teaching practice in science as well. I also had a school management which held a clear vision for educational change away from atomistic learning of facts towards a more holistic learning emerging from a focus and point of departure in interdisciplinary skills and competences. I experienced a rather heavy back-pack filled with traditional teaching practices in science education, a back-pack which I struggled to remove. I did not dare, I did not have courage to stop teaching certain facts, although I sometimes had a hard time justifying to myself and my students why they had to learn them. Some of these mental struggles also stemmed from my experience as I got a job at a genetic engineering company in San Francisco, CA, some years prior to start working as a teacher at Kullaviksskolan. At the genetic engineering company I realized that the company "owned" facts on enzyme kinetics which were not present in the text books which I had used as a student at Lund University. Also, I was expected to *use* these facts to come up with ideas on how to mutagenize the protease which was going to be used in laundry detergent. I was expected to do more with the facts, which I had learned, than to just be able to re-present them. My experience

at the genetic engineering company made me reflect on what would be most useful for my student to learn from the science and technology education. Fortunately, within the subject of technology, I did not have a back-pack of traditional experiences; I did not even have any text books to feel obliged to 'cover' since they did not exist. I learned to lean more against the goals to strive for in the curriculum, and in line with the school development at Kullaviksskolan I slowly started using the same approaches in my science teaching. I had discovered the 'free room' in the Swedish curriculum also in my science teaching. I grew into an ever increasingly 'entrepreneurial teacher' providing opportunities also for my students to learn in an entrepreneurial learning environment. However, it must be noted that I, at that time, did not know that my teaching practice approaches could be termed 'entrepreneurial learning'. This way of teaching just seemed to make sense to me and I hoped that it would help my students to reach the 'goals to strive for' in the curriculum. Along the same line, when I have been asked later on, what my students say about entrepreneurial learning, my answer is that they do not know what the term means. They can list several initiatives and approaches from my teaching practice which they might have an opinion about, but they do not know that several of these would be termed 'entrepreneurial learning'.

With the encouragement from another friend at the University of Gothenburg, Gunilla Mattsson, I sent in a proposal to an IOSTE conference in 2004 as a practicing teacher. The proposal was around a project which I had initiated around our green house. The whole school worked together with the pensioners on the other side of the street, in cultivating plants for a spring market. All teachers contributed with their special competences and in my case I included the project in my science and technology teaching practice. My proposal got accepted for an oral presentation, which, needless to say, became yet another critical incident; as I returned to school, my main principal, thought that it was time for me to look closer into teaching practices including collaborations with the surrounding world. It was time to problematize the issue. I applied for and got accepted to the CUL Research School at the University of Gothenburg, externally financed by the county of Kungsbacka, for a PhD exam in Educational Sciences.

Shortly thereafter, at a national conference on schools collaborations with the working life sector, I was approached by Ulf Mattsson after my key note speech about collaborations in my teaching practice. Ulf made me understand that I was shaping a teaching practice which is referred to as 'entrepreneurial learning'. From there on my thesis work focused entrepreneurial learning in which collaborations with the surrounding may be regarded as one major component.

I would guess that every researcher wants to feel that his/her research makes a difference. This was and is the case also for me. Having had many years of experience of taking part in collaborative

projects initiated by an actor from the surrounding world and having noticed that I often met the same teachers – out of which two of them are now also PhD students in the same research school as I am – I started wondering why certain teachers take any chance they can to collaborate while others hardly ever attempt to do so, in spite of the curriculum strongly suggesting collaborations. In my ambition to contribute to as many students as possible, and to their interest in school science and technology, or any school subject for that matter, I chose to focus, in my research, on the actor within education with the single largest influence on the teaching practice and on the students' learning in school; the teacher.

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Articles and manuscript included in the thesis

Paper I

Sagar, H., Pendrill, A-M. & Wallin, A. (2012). Teachers' Perceived Requirements for Collaborating with the Surrounding World. *NorDiNa*, 8(3), 227-243.

Paper II

Sagar, H. & Mehli, H. (In press). Expanding Teachers' Competences in Authentic and Entrepreneurial Teaching Issues in Science and Technology - an Investigation of two Approaches. *NorDiNa*, Accepted for publication on 2013-09-26.

Paper III

Sagar, H. (In manuscript). Long-term Teacher Growth from Continuing Professional Development in Entrepreneurial learning – a Narrative Approach.

1. INTRODUCTION

This thesis focuses on teachers' perceptions and change in relation to introducing entrepreneurial learning in the teaching practice in the purpose of increasing the students' interest and learning in school science and technology.

Out of all actors interested and influential in school education, the teacher is argued by researchers to be single most influential actor on the teaching practice; i.e. the implemented curriculum (e.g. Aikenhead 2004; Anderson, 2007; Brynolf, Carlström, Svensson & Wersäll, 2007; Leffler, 2006; Watters & Ginns, 2000). Additionally, it has been found that the teacher is the single most influential actor on the students' interest and learning in school (e.g. Hattie, 2009; Totterdell, Hathaway & la Velle, 2011). Research also provides information which is valuable for teachers to assimilate in the purpose of increasing compulsory school students' interest in science and technology. Additionally, these findings are valuable in the teachers' commission of helping the students to gain scientific literacy (e.g. Roberts, 2007; Sjøberg's 1997; 2005) and technological literacy (e.g. Svensson, 2011) for an active participation in a democratic and rapidly changing society. Entrepreneurial learning (e.g. Leffler, 2006) is one of the responses to the calls for changes in teaching practice. Continuing Professional Development, CPD, may be helpful for teachers to include new methods in their practice.

The purpose of this introduction is to present the runway from which this thesis takes off; i.e. what is the problem which needs to be solved and what do we already know which may help solve this problem? On the basis of the teacher's strong influence on the students' interest and learning, the focus of this thesis is on teacher change in relation to introducing changes in teaching practice such that it generates positive impact on the students' interest and learning in science and technology.

1.1. The teacher as the single most influential actor on the teaching practice

There are many actors interested in education. Basically everybody in our society has some kind of relation to school and hold opinions on content, methods and the teacher's working conditions (Strömberg, 2010). Furthermore, as Leffler, Svedberg and Bohta (2010) state:

*Since schools and education play an important role in the development of societies and countries, there are many interests that want to gain attention as regards how education is best justified and organised and what knowledge should be given priority.
(p. 309)*

During the last decade the school has been in focus in the political debate in Sweden (e.g. Strömberg, 2010). Generally, in a democratic society 'everybody's' opinion may hold a bearing on the teaching

practice, at least on the governmental and municipal *intentions* for the teaching practice. The changed intentions result in changed curricula; hence the teachers' professional assignments have changed over time (Strömberg, 2010).

The curriculum constitutes the formal steering document for the teachers. The degree to which the intentions of the curriculum get realized lies in the hands of the teacher (e.g. Sharma & Anderson, 2007; Watters & Ginns, 2000). Teachers' interpretations of the curriculum vary (Schubert, 1986). The interpretations may be influenced by the teachers' attitudes and beliefs, which are known to have significant impact on the implementation of the curriculum (e.g. Anderson, 2007; Crawford, 2007; van Driel, 2001). In turn, teachers' own schooling experiences have been found to have influence on their attitudes and beliefs towards teaching and the teachers' practice (e.g. Crawford, 2007; Windschitl, 2004). At the introduction of a new curriculum, teachers may verbally agree to changes without actually realizing them (Keys, 2005). Amaral and Garrison (2007) observed how teachers, who had made a lesson plan according to a new curriculum including inquiry learning actually ended up performing a teacher directed lesson. There is valid ground for distinguishing between the *intended curriculum*, which is the formal curriculum provided by the government, and the *implemented or enacted curriculum* (Lynch, 1997), which is how the education is actually shaped in the teachers' practice. Amaral and Garrison (2007) conclude that professional development is strongly advised for curriculum changes to come into practice.

This thesis includes three distinct empirical studies: Paper I, II and III. They do not aim at specifically investigating implementation of a new curriculum. However, changes in teaching practice to include more entrepreneurial learning, which is the focus of this thesis, coincide to some degree with changes in the two national curricula which have been current during the time period for this thesis. The previous curriculum, Lpo94 (National Agency for Education, 1994) emphasized a broad definition of entrepreneurial learning in 'goals to strive for' and criteria for assessment. The current curriculum, Lgr11 (National Agency for Education, 2011), bring forward entrepreneurial learning in even more explicit terms by pointing to all teachers' responsibility to promote student entrepreneurship. Entrepreneurial learning and entrepreneurship will be discussed in Chapter 2, which also discusses related concepts, in particular 'authentic learning', as well as different interpretations of the concepts.

On the basis of the strong bearing that the teacher has on the teaching practice; i.e. the implemented curriculum, and on student learning, this thesis focuses on changes from CPD on a teacher level. The CPD initiative, which is included in Papers II and III, aim at supporting and inspiring teachers to change the teaching practice in the purpose of stimulating student interest and

learning in school in general. With the aspiration of contributing to reversing the current trend of a declining student interest in school science and technology, the respondents are predominantly science and technology teachers.

1.2. Student disinterest in school science and technology

School activities in science and technology undertaken by students normally differ from the activities of practitioners in science and technology, and would not make sense if transferred to science practices outside school, where authentic activities can be defined in the simplest way as ordinary practices of the culture (Brown, Collins & Duguid, 1989). In relation to context in school chemistry, Sharma and Anderson (2007) point to the fact that science teachers and students in compulsory school, upper secondary school and undergraduate school levels rarely see scientists at work or read journal articles written by them. They conclude that school science is shaped to fit into the school organization and the school's demands on assessment rather than being shaped into a simplified version of science resembling science for scientists, including true inquiries, deliberations, and critical thinking. Additionally, results from the ROSE-project, 'The Relevance of Science Education' (e.g. Jidesjö, 2012; Schreiner, 2006), indicate that students are dissatisfied with school science and that this is related to a school curriculum which rarely addresses contemporary issues of science in society. The content does not relate to the students or their interests within the fields of science (Gilbert 2006; Ryder 2001; Schreiner 2006) and the methods of teaching enhance the negative impressions. In her longitudinal study on compulsory school students' interest in science and technology, Lindahl (2003) confirms that students express low interest in physics and chemistry for reasons of not understanding why they need to know the content in these subjects. In all, the students find school science 'dull, authoritarian, abstract, theoretical, fact-oriented and fact overloaded, with little room for fantasy, creativity, enjoyment and curiosity' (p. 57). Gilbert (2006) confirms the concerns about the overload of isolated concepts for the students to learn, the lack of relevance and context and the lack of connections to science as an enterprise in modern society. The overall result is that students do not get introduced to science as it is shaped in its authentic context. At compulsory school levels this lack of authentic context could additionally explain the stereotyped images which students hold of professionals within the sectors of science and technology (Aikenhead, 2004; Schreiner, 2006). Many of these characteristics are additionally relevant for technology education (Jidesjö, Oscarsson & Strömdahl, 2009; Schreiner & Sjöberg, 2005).

These findings may explain some of the decline in students' interest in school science and technology in the Western world, which is found in numerous research studies (e.g. Aikenhead, 2004; Gilbert, 2006; Jidesjö, 2012; Osborne, Simon & Collins, 2003; Reiss, 2004; Schreiner, 2006; Sjöberg, 2005).

The decline has been observed for decades and is more pronounced for older students (Tytler, 2007), particularly in physics, technology and chemistry (Gardner, 1985; Osborne et al., 2003; Ramsden, 1998).

On the other hand, the surveys in the ROSE project reveal a strong general interest in science and technology; 'popular science magazines, books, and radio and television programs do attract an audience, and science museums and science centres report lots of visitors' (Schreiner, 2006, p. 16). Hence, there seems to be a discrepancy between interest in science and technology generally speaking and *school* science and technology. The next section will review research studies which include teaching practice initiatives that are found to have positive impact on students' interest in school science and technology.

1.3. Student interest in school science and technology

Education research provide evidence not only for the students' declining interest in school science and technology, but also for changes in teaching practice which result in an increase in student interest.

It has been found that students are more interested and motivated to learn when offered opportunities to work with societal issues of science and technology (e.g. Aikenhead, 2004; Krogh & Thomsen, 2005; Osborne & Collins, 2001; Sadler, 2009). Societal issues are situated in the surrounding world, which then becomes the context for and an extra resource in the students' learning process. Furthermore, students who perceive the content to be more personally relevant are more motivated to learn (Schreiner, 2006). Furthermore, Jarman and McClune (2002) studied students' motivation to learn from a learning activity which was based on reading and reflecting on newspaper articles which required knowledge of science content. They explained the observed increase in motivation to learn the content by the secondary school students' understanding of the need to learn the content. Being able to read and understand science related newspaper articles is an example of a task framed in an authentic or real-life context. Nicaise, Gibney and Crane (2000) report that most of the students participating in a study on an 'authentic classroom' had a positive experience and that they 'described the classroom as fun and exciting with real-world relevance' (p. 79). Furthermore, Lombardi (2007) writes that students express themselves as being 'motivated by solving real-world problems' and that they have a 'preference for *doing* rather than *listening*' (p. 2). She concludes that students who are engaged in authentic activities persevere to a higher degree even though they may initially feel confused and frustrated. The perseverance and motivation is even larger when the task and learning resembles situations which really count in the real-life context (Lombardi, 2007; Otterborg, 2011; Surlemont, 2007)

The National Research Council (2000), NRC, further lift the value added by the students being able to recognize that the learning is useful:

Learners of all ages are more motivated when they can see the usefulness of what they are learning and when they can use that information to do something that has an impact on others – especially their local community. (p. 61)

There is also research evidence from other educational fields to support the importance of the students' sense of working with an authentic assignment which is of value to others. Otterborg (2011) finds from a study on students' perceptions of working with an assignment which is connected to the surrounding world that:

...it challenges the student to develop a sense of responsibility for the school work. The students understand that they are part of a working chain and that their work is of value for the enterprise which is operated and from which their school assignment is drawn. (p. 165, author's translation)

Creating value for other individuals than oneself has been shown to generate strong feelings of meaning, relevance and sense of well-being (Baumeister, Vohs, Aaker, & Garbinsky, 2013).

1.4. Calls for changes in science and technology teaching practices

The characteristics of school science and technology presented in relation to a low student interest are seen as contrary to desires of making school science and technology meaningful and engaging for young people, and to make it work as a means to democratic participation. These characteristics also work against national and international aims of helping our students gain scientific literacy (e.g. Roberts, 2007) and technological literacy (e.g. Svensson, 2011).

These characteristics also fail to make students sufficiently interested in science and technology to motivate them for further education and work within science and technology (e.g. Aikenhead, 2004; Bungum, 2003, Schreiner & Sjøberg, 2005). These concerns are often expressed from the political arena. Recruitment in the science and technology sectors is seen as important for economic growth and in a perspective of a sustainable development (EU, 2004a; 2007; National Agency for Education, 1994; 2011; Sgard, 2005). However, political concerns are not only based in economic growth and technological development:

There is obviously a need to prepare young people for a future that will require good scientific knowledge and an understanding of technology. Science literacy is important for understanding environmental, medical, economic and other issues that confront

modern societies, which rely heavily on technological and scientific advances of increasing complexity. However, the key point is equipping every citizen with the skills needed to live and work in the knowledge society by giving them the opportunity to develop critical thinking and scientific reasoning that will enable them to make well informed choices. (EU, 2007, p. 6)

It can be concluded that both fields; education research and politics, share a concern around the students' scientific literacy and technological literacy (e.g. Roberts, 2007; Svensson, 2011; EU, 2007).

1.4.1. Scientific literacy and technological literacy

Scientific literacy and technological literacy form the basis for one line of argumentation for more authenticity in science and technology teaching practice. There are many different views on what should be the learning focus in science and technology education. The arguments for more authenticity emerge from a conviction of a necessity to divert away from what is referred to as traditional teaching practices (e.g. Watters & Ginns, 2000), meaning an approach to learning in an atomistic, non-contextualized and content focused manner. Instead, it is argued for a more holistic and contextualized approach in which reflective and analytic skills are required and where the processes of learning and the thinking about learning is also focused (e.g. Watters & Ginns, 2000). Again, the arguments are presented in the aim of increasing students' interest in science and technology and of providing for a learning which is meaningful as a preparation for a future professional and personal life (e.g. Ausubel, 1968; Boddy, Watson & Aubusson, 2003; Bruner, 1977; Dewey, 1997; Doppelt, 2005; Leffler, 2006; NRC, 2000; O'Tuel & Bullard, 1995; Roberts, 2007). In an overview of the discussion on what constitutes scientific literacy, Roberts (2007) introduced Vision I and Vision II as 'two legitimate but potentially conflicting curriculum scores: science subject matter itself, and situations in which science can legitimately be seen as playing a role in other human affairs' (p. 729). Vision II can be interpreted to include Sjøberg's (1997; 2005) four categories of arguments for why science education is needed; 1) preparation for work, 2) mastery of daily life, 3) citizenship and democratic participation and 4) science for cultural literacy, science as a major human product. The discussion on scientific literacy has been extended to the concept of technological literacy and with a similar approach as the one which Robert's (2007) Vision II reflects. Svensson (2011) refers to the tradition of approaching scientific and technological literacy with a focus on knowing concepts, subject matter and theories within the fields in contrast to the later discussions in which it is argued that the literacy concepts need to include situations where science and technology play an important role in daily life and in the society; i.e. in decision making processes and in social contexts.

Watters and Ginns (2000) introduce a study on the effect of collaborative and authentic learning practices in pre-service education by emphasizing the role of science education as playing a major role 'in the development of critical and informed citizens in a rapidly changing technological society' (p. 301). Their study points to the connection between authentic learning practices and the aforementioned components and motives for scientific literacy and technological literacy. The CPD effort in this thesis aims at supporting and inspiring the participating teachers to changes in teaching practice which may better help their students to gain scientific literacy and technological literacy inspired by Robert's (2007) Vision II.

The intentions of helping compulsory school students gain scientific literacy and technological literacy lead to arguments for more authentic approaches in science and technology education. These approaches have also been found to have a positive impact on student interest in school science and technology.

1.4.2. Calls for authentic approaches in science and technology teaching practices

Herrington and Oliver (2000) and Rule (2006) refer to Resnick's Presidential Address to the Nation in 1987 as somewhat of a starting point for arguments for more authenticity in the students' learning environment: i.e. the progress of the concept of *authentic learning*. Herrington and Oliver (2000) emphasize Resnick's argument that 'The separation between knowing and doing traditionally has been the hallmark of school and university learning' (p. 23). Resnick (1987) called for a revision of schooling to "redirect the focus of schooling to encompass more of the features of successful out-of-school functioning" (p. 10).

Other concepts related to authentic learning environments include Collin's (1988) summary of the concept of *situated learning*; 'learning of knowledge and skills in contexts that reflect the way the knowledge will be useful in real life' (p. 2). Furthermore, Brown et al. (1989) introduce *cognitive apprenticeship* in response to teachers "ignoring the situated nature of cognition" (p. 32), which would make "education defeats its own goal of providing useable, robust knowledge" (p. 32). Lave and Wenger (1991) introduce *legitimate peripheral participation*, and point to that would-be scientists, mathematicians and other professionals need to be 'enculturated' into their respective discipline and that it is better the sooner in education and schooling this process starts. Several years later, Niscaise et al. (2000) conclude that educational reformers still find that classroom instruction needs to be more authentic and that learning activities need to be based in real-life contexts to a higher degree, to avoid lack of student engagement learning at superficial levels.

In addition to this, Lombardi (2007) points to the issue of our ever more rapidly changing world, in which “the half-life of information is short and individuals can expect to progress through multiple careers” (p. 10) and states that this may make authentic teaching practice more important than ever.

So far, the progress of *authentic learning* has been presented. Entrepreneurial learning (e.g. Leffler 2006; 2009) is rather recently introduced into the field of education and arguments from the field of research for changes in teaching practices inspired by this concept are not as frequent as from *authentic learning*. However, several of the arguments put forward for authentic learning may equally well be put forward to argue for *entrepreneurial learning*. One such example is Resnick’s argument from 1987:

Rather than training people for particular jobs - a task better left to revised forms of on-the-job training - school should focus its efforts on preparing people to be good adaptive learners, so that they can perform effectively when situations are unpredictable and task demands change. (p. 8)

Røe Ødegård (2000) regards the call for entrepreneurial learning, which gets more and more visible in the field of education research (e.g. Harte & Stewart, 2012; Leffler & Svedberg, 2005; Sarasvathy & Venkatraman, 2011) as a response to the ever increasing demand for renewal and adjustment in the western, industrialised part of the world. Schooling needs to provide the students with ‘life skills’ in an increasingly complex society (Säljö, 2010) and for this reason analytical and synthetic capacities and entrepreneurial talents ‘should not be accidental outcomes of schooling, they should be at the centre of the competences we try to cultivate’ (Säljö, 2010; p. 35).

Arguments for a shift in teaching practices in science and technology towards more authenticity may be found from earlier times than the ones presented so far:

Science teaching has suffered because science has been so frequently presented just as so much ready-made knowledge, so much subject-matter of fact and law, rather than as the effective method of inquiry into any subject-matter (Dewey, 1910; p. 124).

Not only did Dewey (1910) argue for more practical student work, but also for the laboratory activities to be provided in a more authentic context and for teaching practices to encourage authentic working methods.

A student may acquire laboratory methods as so much isolated and final stuff, just as he may so acquire material from a textbook. One’s mental attitude is not necessarily

changed just because he engages in certain physical manipulations and handles certain tools and materials (p. 125).

This problem of turning laboratory technique to intellectual account is even more pressing than that of utilization of information derived from books (p. 126).

It can be concluded that arguments for changes in teaching practice to provide more authenticity is neither a new nor a resolved phenomenon. The rapidly changing demands on our young citizens further strengthen the actuality and importance of the arguments.

Aspects of authenticity in science and technology education are often discussed in relation to expressing desires for changes in teaching practice, for the purpose of an increased student motivation and learning. Such arguments are often connected with an introduction of a concept relating to a new way of or approach to teaching. Authentic learning (e.g. Lombardi, 2007; Nicaise et al., 2000; Rule, 2006) is one such concept. Another one is entrepreneurial learning (e.g. Leffler, 2006; 2009). These concepts have been mentioned in this introduction and will be further elaborated on in Chapter 2. All studies in this thesis relate to entrepreneurial learning. Paper II additionally takes an interest in authentic learning in relation to the participating teachers' learning environment at a rocket range; i.e. in an authentic context. Both concepts are included in CPD with the ultimate aim of having positive impact on student interest and learning in school science and technology through inspiring and supporting teacher change and changes in teaching practices.

2. LEARNING ENVIRONMENTS

The field of education research, and the political field, is concerned about compulsory school students' declining interest in school science and technology. There are research findings which may be helpful in reducing this problem and can be used to guide changes in teaching practices.

There are many concepts related to the teacher's practice which have evolved partly as a response to the students' declining interest in school science and technology and as a response to the research findings discussed in Chapter 1. Several of them are closely related and difficult to distinguish between. *Entrepreneurial learning* is one such concept (e.g. EU, 2006; Falk-Lundqvist, Hallberg, Leffler & Svedberg, 2012; Jones & Iredale, 2006; Leffler, 2009; Leffler & Svedberg, 2005; 2010; Mbebeb, 2009; Schelfhout, Dochy & Janssens, 2004). *Authentic learning* (e.g. Bencze & Hodson, 1999; Braund & Reiss, 2006; Herrington, 2013; Herrington & Oliver, 2000, Hill & Smith, 2005; Lombardi, 2007; Nicaise et al., 2000; Rahm, Miller, Hartley & Moore, 2003; Rule, 2006) is another related concept, as are the following:

- meaningful learning (Ausubel, 1968; Bruner, 1997; Dewey, 1997; Doppelt, 2005)
- situated learning/cognition (Brown et al., 1989; Collins, 1988; Greeno, 1998)
- cognitive apprenticeship (Brown et al., 1989)
- legitimate peripheral participation (Lave & Wenger, 1991)
- community-referenced learning (Kluth, 2000)
- community service learning (Roakes & Norris-Tirrell, 2000)
- inquiry learning (e.g. Anderson, 2007, Crawford, 2007; Dewey, 1910; Minner, Levy & Century, 2010; Linn, Davis & Bell, 2004; S-TEAM, 2012)
- out-of-school learning (Braund & Reiss, 2006; Caleon & Subramaniam, 2007; Rennie, Feher, Dierking & Falk, 2003; Rennie, 2007)
- context-based learning (Bulte, Westbroek, de Jong, & Pilot, 2006; Gilbert, 2006; Vos, Taconis, Jochems & Pilot, 2011)
- service learning (Bonnette, 2006)
- informal science learning (Dierking, Falk, Rennie, Anderson, & Ellenbogen, 2003)
- learning in an informal setting (Anderson, Lucas & Ginns, 2003; Rennie, 2007)

The abundance of phrases used to describe closely related concepts can lead to confusion. Different studies have different foci and points of departure. The studies may be focused on a project (e.g. Roakes & Norris-Tirrell, 2000), the teaching practice (e.g. Anderson, 2007) or the students' perceptions (Otterborg, 2011). Additionally, there are political documents which discuss some of the concepts (e.g. EU, 2007). In the research studies, the term for the concept appears to be chosen with

the purpose of narrowing down on and clearly reflecting a specific focus. The listed, related concepts share aspects and components which are central to this thesis. These aspects and components will be discussed in more detail for entrepreneurial learning and authentic learning. All studies in this thesis relate to CPD in entrepreneurial learning. Paper II additionally relates to authentic learning in the way that the CPD is arranged as an authentic learning experience for the participating teachers; they are learning space science and technology at a rocket range. Thus, a comparison of entrepreneurial learning and authentic learning is of interest and will be presented below.

Although several of the concepts listed above are termed as some kind of 'learning', most of the concepts refer to the learning *environment* in which the students get an opportunity to learn new knowledge and skills and not to the students' actual learning process. The teacher provides the learning environment through her/his teaching practice. The concepts reflect specific components and approaches which may be included in the teaching practice. The understanding of certain 'learning' concepts to actually indicate specific components in the learning environment, in contrast to the students' learning, is illustrated in education research literature. In their respective overviews on authentic learning, Herrington and Oliver (2000), Rule (2006), Lombardi (2007) and Herrington and Kervin (2007) separately discuss the learning *environment* which is provided by a teaching practice aiming at including components which represent the concept of authentic learning. Rule (2006) summarizes her overview by stating that literature on authentic learning supports 'authentic learning *environments*' (p. 6, italics added), although it is the concept of authentic learning which is actually phrased in the reviewed literature. Lombardi (2007) concludes that the 'learning *environments* are inherently multidisciplinary' (p. 2, italics added) in her overview on authentic learning. Herrington and Oliver (2000) and also Herrington and Kervin (2007) use authentic learning interchangeably with authentic learning *environments*. In this thesis, it is the learning *environment* corresponding to entrepreneurial learning and authentic learning which is discussed and referred to.

This thesis takes its point of departure in education research indicating an increased student interest in school science and technology from teaching practice approaches which reflect components included in entrepreneurial learning.

As with many of the related concepts, entrepreneurial learning and authentic learning are not exactly defined. The research literature illustrates a wide range of variation in presenting and referring to each respective concept. The interpretations and understandings of the concepts vary from narrow ones, which only include few aspects or components, to broader ones (e.g. Falk-Lundqvist, et al., 2012; Lackeus, 2013; Lombardi, 2007; Stevenson & Lundström, 2002). Lombardi (2007) concludes in her overview of authentic learning that teachers 'offer students authentic learning experiences

ranging from experimentation to real world problem solving' (p. 1). Entrepreneurial learning additionally illustrates a geographical difference in the sense that the broader interpretation is mostly used in Scandinavian contexts within the field of education research. However, on the political arena for education in Europe, it is the broader interpretation which is pointed to (EU, 2006).

The dimensions of confusion discussed above are present to some degree also among practicing teachers (e.g. Berglund & Holmgren, 2007). Part of the confusion among teachers may emerge from the finding that teachers, in general, on briefly being presented to a new concept, often do not perceive it as new, as has been reported e.g. for inquiry learning (e.g. S-TEAM, 2012). On the basis of the strong resemblance between the concepts of entrepreneurial learning and authentic learning, illustrated in Table 1 below, it would be understandable if teachers' perceive that a new concept is not new to them; they may recognize several components from a concept to which they have been introduced before. Also, considering teachers' constant struggles with time in a profession of an ever increasing intensity (e.g. Brynolf et al., 2007; Strömberg 2010), it is not difficult to imagine that the practicing teachers, who may be expected to realize a teaching practice inspired by a new concept, may not have enough time to study or reflect on the core values of the concepts. This thesis will help clarifying some of the complex aspects and relations related to teachers' perceptions and understandings of entrepreneurial learning and the introduction of it into the teaching practice.

In the purpose of presenting a comprehensive overview of the concepts, research studies concerning higher education are also discussed rather than only compulsory and upper secondary school levels. Studies concerning other disciplines than science and technology are included for the same reason. The presentation makes clear that entrepreneurial learning and authentic learning both focus on general student competences rather than competences specific to education level or discipline. Therefore a general approach benefits an understanding of the concepts in line with broad interpretations of the respective learning concepts.

Different writings on entrepreneurial learning and authentic learning point to different aspects as indicators for the concepts. For both of the concepts, I have grouped related aspects into the components listed in Table 1. Additionally, the components have been divided into three higher dimensions for further clarification; the student's process of learning, the authentic context and the authentic assignment.

The overview illustrates the resemblance between entrepreneurial learning and authentic learning, summarized in Table 1. The differences are discussed in the last section of this chapter.

Table 1. Summary of components which may be included in broader interpretations and understandings of entrepreneurial learning, EL, *and* authentic learning, AL.

Dimension 1 - Students' process of learning
Components relating to students' process of learning
<p>Student's pro-activity, inner drive, creativity, initiatives, innovation and inclination to see possibilities and take calculated risks are the motor for the process of learning and stimulated.</p> <p>Builds upon and develops the student's self-confidence and self-efficacy.</p> <p>Stimulates student's ability to plan and manage projects to achieve an objective.</p> <p>Orientation towards the <i>process</i> of finding solutions to problems and assignments.</p> <p>Focus on <i>using</i> content knowledge.</p> <p>Student inquiry and exploration is encouraged; the student is a self-directed learner.</p> <p>Strong element of cooperative learning situations and practice of communicative skills.</p> <p>Student is encouraged to take responsibility for his/her learning and practices self-assessments.</p>
Dimension 2 - Authentic context
Components relating to authentic context
<p>Content and activities are embedded in authentic/real-life contexts which reflect the way knowledge and skills will be used in real life.</p> <p>Collaboration with the surrounding world is beneficial for creating the authentic/real-life context. It provides access to expert performances and allows usage of a variety of resources in the learning process and</p> <p>the authenticity is grounded in relations among actors within a real-life system.</p> <p>The students' work targets an audience outside of the classroom.</p> <p>Contexts are relevant to the student and create sense of meaning and usefulness to learn new knowledge and skills. The relevant contexts may be personal, social, cultural or environmental.</p> <p>Textbooks are complemented by a variety of external sources.</p>
Dimension 3 - Authentic assignment
Components relating to authentic assignment
<p>Assignments and projects are based in the curriculum but flexible enough to resemble real-life situations and commissions.</p> <p>They are interdisciplinary and may be provided through collaborations with the surrounding world.</p> <p>They are open-ended and ill-defined problems open to multiple interpretations and with different possible solutions, which may be complex.</p> <p>Reflection, analysis, critical thinking and ethical considerations are required to solve the problems.</p> <p>Tasks challenge and encourage student's creativity, innovative competence, ability to take initiative, willingness to try own ideas and to recognize possibilities.</p> <p>Personal relevance, hence meaningful, purposeful and valuable, to the student.</p> <p>Result from assignment has a value in itself and not merely for future purposes. The result may be a product.</p> <p>Integrated with assessment in a manner which reflects real world assessment.</p>

It is a broad interpretation and understanding of entrepreneurial learning (and authentic learning in Paper II) which is relevant to this thesis. The CPD course included in this thesis presents a broad understanding of entrepreneurial learning as the CPD message. A broad understanding is also more relevant in relation to the previous, Lpo94, and the current, Lgr11, national curriculum (National Agency for Education, 1994; 2011) for compulsory school in Sweden (e.g. Falk-Lundqvist et al., 2012; Leffler, 2006).

2.1. Entrepreneurial learning

The field of education research and the field of education politics both present descriptions of and issues around entrepreneurial learning.

2.1.1. Entrepreneurial learning in the field of education research

The discussion about entrepreneurial learning is complicated by the political and ideological connotations (e.g. Leffler et al., 2010), the association to business, economy and management in the narrow interpretation of it and geographical differences (e.g. Leffler, 2009). The terminology also adds to the confusion; i.e. entrepreneurial learning (e.g. Leffler, 2006), enterprise learning (e.g. Harte & Stewart, 2012), entrepreneurship education and entrepreneurship (e.g. Leffler, 2009).

Political, ideological and economic connotations

Leffler (2009) noted the ideological and political connotations associated with the concept of entrepreneurial learning in her report on different expressions of entrepreneurship in compulsory school in Sweden. In a discussion on training in entrepreneurship, Johannisson, Amundsson and Kivimäki (2010) state that entrepreneurs have represented capitalism at times, while they today are seen more and more as important contributors to the economic growth. Leffler et al. (2010) add that this is indicated not only in Sweden but also in the rest of the world.

Leffler (2009) furthermore points to the economic connotations:

Entrepreneurship has its roots in the economic sector, but entrepreneurship and enterprise are concepts that are being more frequently discussed even in connection with education in the earlier years of the compulsory school system (p. 104).

In a comparative study on education policy documents in Sweden and South Africa, Leffler et al. (2010) point out that there is a 'global curriculum /.../ developing in which aspects such as entrepreneurship, lifelong learning and sustainable development are common denominators' and that entrepreneurship is 'more and more being brought forward and discussed in educational contexts' (p. 309).

Variation in terminology – geographical differences

The economic connotations to entrepreneurial learning are also illustrated in the research literature in an attempt to discern between the relating concepts enterprise education and entrepreneurship education. Harte and Stewart (2012) state in relation to higher education in UK:

Key differences between enterprise and entrepreneurship education are the clear intended outputs at the end of such curricula for the latter. Enterprise education approaches can be about “taking an enterprising approach to teaching”, or “including challenging concepts within teaching practise to aid and increase problem-solving skills” or to “bring about an awareness of key employment skills beyond university education”. Entrepreneurship education whilst similar in its approach to developing and improving skills has in addition, in many instances, a clear intention on business start-up and the factors to consider in choosing this as a route of employment (p. 332).

Thus, Harte and Stewart’s interpretations bring us to the confusion related to the terminology: There are many research reports on enterprise learning, where this concept is discussed in terms of education for providing skills to start up new businesses and learning for management (e.g. Jones & Iredale, 2006; Mbebeb, 2009; Schelfout et al., 2004). In the Scandinavian context, Leffler (2006) states that the entrepreneurial discourse include some different approaches such as educating *for* entrepreneurship and educating *about* entrepreneurship. The purpose of education *for* entrepreneurship is to ‘stimulate individuals to start up new companies’ while the purpose of educating *about* entrepreneurship is to ‘give the students an understanding for the entrepreneurial process, which they can make use of as co-workers in different companies, organisations and public departments’ (Leffler, 2006, p. 80, author’s translation). Other purposes of education *about* entrepreneurship are to ‘develop the way of learning of young individuals and organizations, usually based on concepts like flexibility and creativity, which are put forward in relation to the rapid social and economic changes which occur in society’ (p. 80, author’s translation). Hence, the education *about* entrepreneurship ‘puts forward the individual’s pro-activity, which in turn includes imagination, creativity, responsibility, decision-making and development of ideas (p. 80, author’s translation).

Narrow and broad interpretations and understandings of entrepreneurial learning

Stevenson and Lundström (2002) take more of a birds-eye view on the concepts by putting the differing variations in terminology together as one entity. They discuss that entrepreneurial learning, enterprise learning and entrepreneurship in education, and other closely related concepts, can be understood in terms of ‘broad and narrow’ interpretations. The broad understanding refers to

general skills and abilities, useful in everyday personal and professional life, which the students are supposed to practice and learn, whereas the narrow understanding is that the students should develop these skills directly in the purpose of starting up or running businesses. Hence, the broad interpretation would represent Leffler's (2006) education *about* entrepreneurship, Harte and Stewart's (2012) enterprise education while the narrow interpretation reflects Leffler's (2006) education *for* entrepreneurship, Harte and Stewart's (2012) entrepreneurship education and also enterprise learning according to Jones and Iredale (2006), Mbebeb (2009) and Schelfout et al., (2004).

Some years back, it was mainly the Scandinavian produced education research reports which discussed skills and competences learned from entrepreneurial learning in the broader interpretation (e.g. Johannisson et al., 2010; Leffler, 2009; Leffler et al., 2010; Otterborg, 2011). In 2009 Leffler states, however, that many European countries seem to have reached a consensus around that entrepreneurship in education should include the broad as well as the narrow interpretation, while there still are many countries in the world where entrepreneurial teaching is strongly linked to enterprise, business and management.

Further non-Scandinavian arguments for recognizing broader aspects than business start-ups in evaluating enterprise education are still being introduced to the field. Based on research findings that graduate entrepreneurs from a university in Wales did not label themselves entrepreneurs and even questioned the term and the relevance of its meaning to them, Edwards and Muir (2012) suggest that

‘.../evaluations of enterprise education need to develop beyond the economist viewpoint of business start-up and business growth and promote the notion that evaluations of enterprise education should encompass pedagogical objectives of enterprise education, enabling students to grow and develop and to shape their own identities in the light of their learning experiences’ (p. 1).

In presenting this conceptual development, Edwards and Muir (2012) also confirm the perception of enterprise learning as mainly connected to business start-ups and growth and argue that enterprise education should ‘embrace (and recognise) the learning development of the whole person, as opposed to economic measures based on quantitative data of number of businesses and number of new jobs created’ (p. 287).

Leffler et al. (2010) conclude that entrepreneurship in the Swedish educational context, in compulsory school, would agree with the broader interpretation and understanding in which entrepreneurship may target social and cultural activities and not only or particularly economic ones.

2.1.2. Entrepreneurial learning in the field of education politics

According to Leffler (2009) the broad interpretation of entrepreneurial learning and students' entrepreneurship within the education system was first introduced by a political organ in an educational monograph on the challenges involved for the educational field in introducing an 'enterprising culture': Organisation for Economic Co-operation and Development, OECD, in 1989. About a decade later, another political perspective, from the European Council (2000) was put forward describing the concept of entrepreneurial learning as a learning environment which stimulates creativity, initiatives, trust in oneself, independence, social competence, one's inner drive, intuition and inclination to take calculated risks. Four years later, entrepreneurial skills were declared as one of the eight 'key competencies for life-long learning' (EU, 2004b 2005) and looked upon as essential for students to learn in preparation for the future in a rapidly changing society. In 2006 EU includes awareness of ethical values into the previous description (2005) of 'sense of initiative and entrepreneurship' and describes it as follows:

...an individual's ability to turn ideas into action. It includes creativity, innovation and risk-taking, as well as the ability to plan and manage projects in order to achieve objectives. This supports individuals, not only in their everyday lives at home and in society, but also in the workplace in being aware of the context of their work and being able to seize opportunities, and is a foundation for more specific skills and knowledge needed by those establishing or contributing to social or commercial activity. This should include awareness of ethical values and promote good governance (p. 11).

In Sweden the concept of entrepreneurial learning has had a development parallel to the one in EU. In year 2000, the Swedish National Board for Industrial and Technical Development, NUTEK, described the entrepreneurial competence as follows:

To be entrepreneurial or pro-active means to make use of possibilities and changes as well as having the capability to follow through activities in the purpose of improving, developing and create values which can be social, personal, cultural or economic. (p. 78).

They additionally pointed out, in agreement with OECD (1989) that entrepreneurship should not be looked upon as a school subject of its own, but rather an approach to learning which includes

different ways of working to allow the students to gain self-confidence, self-awareness, creativity, inner drive and competence to cooperate and communicate.

Leffler (2006) states in her monograph on different discourses on entrepreneurship and enterprise in school that another political perspective on entrepreneurial learning comes from the school context through the previous Swedish National curriculum, Lpo 94, (National Agency for Education, 1994; 2000):

The entrepreneurial school discourse has made use of parts of the goals of the national curricula to lift that these can be compared to entrepreneurship. Thereby, the intentions of the national curricula are in line with the ambitions of entrepreneurship. The work market's needs and insecurity force the school to educate pupils to be able to deal with an uncertain future. (Leffler, 2006, p. 221, author's translation)

In the new curriculum, Lgr11, where the entrepreneurial discourse is more explicit, the broad perspective on entrepreneurship is clearly illustrated:

The school should stimulate pupils' creativity, curiosity and self-confidence, as well as their desire to explore their own ideas and solve problems. Pupils should have the opportunity to take initiatives and responsibility, and develop their ability to work both independently and together with others. The school in doing this should contribute to pupils developing attitudes that promote entrepreneurship (p. 11).

During the progress of this thesis the concept of entrepreneurial learning is more and more frequently replaced by entrepreneurship on the same time as these terms are used interchangeably in the Swedish compulsory school context. The previous Swedish Curriculum for Compulsory School, Lpo94 (National Agency for Education, 1994) did not use the term entrepreneurial learning although it described skills and competences which are included in entrepreneurial learning as 'goals to strive for'. The current Swedish Curriculum for Compulsory School, Lgr11 (National Agency for Education, 2011) is more explicit and states that the school 'should contribute to pupils developing attitudes that promote entrepreneurship'.

Since the political arguments for and descriptions of entrepreneurial learning and entrepreneurship have had a strong impact on policy writings and curricula, the field of education research has responded accordingly. The next section will present some of these responses.

2.1.3. Education research discusses political perspectives on entrepreneurial learning

The political descriptions of an entrepreneur, entrepreneurship and entrepreneurial learning agree with several descriptive efforts from the field of research. Landström (2010) describes the entrepreneur as an individual who is innovative, takes initiatives, dare taking risks, has good self-control, self-esteem and self-confidence. Leffler (2006) states that the individual learns self-esteem and self-confidence 'from his or her own successful and unsuccessful actions' (p. 49) and also emphasizes that entrepreneurial learning has to take place under the guidance of the teacher (p. 97). Johannisson and Madsén (1997) describe the entrepreneurial student as having a combination of the properties and competencies defined by Landström (2010), OECD, (1989) and NUTEK (2000):

... a big trust in one's own capabilities, to be able to seek knowledge and learn new things, to have strong will-power, and be independent, be able to take responsibility, cooperate and make contact with others, be creative, see possibilities and find solutions to problems, to be able to and want to take initiatives and action. (p. 115, author's translation)

As with education *about* entrepreneurship (Leffler, 2006), additional descriptions of entrepreneurship in the school context point to the students' active participation in their own learning (Johannisson & Madsén, 1997; Røe Ødegård, 2000), in which NUTEK (2000) emphasizes student participation in the planning, implementation and evaluation of the teaching. This is in agreement with OECD's argument already from 1989 (OECD, 1989) that the students should feel that they have power of their own learning. Leffler (2009) concludes in her more recent overview on entrepreneurship in schools that 'the discourse on entrepreneurship in schools is based on a strong rhetoric and is composed of topical concepts: responsibility, power of initiative, activity, creativity and cooperation' (p. 109). Johannisson and Madsén (1997) state that pupils are entrepreneurial by nature and that they deserve a learning environment which allows them to grow and develop without any outer limitations. The students need to 'feel free to come up with ideas of their own and develop them into concrete actions' (Leffler, 2009, p. 110) and one major component of entrepreneurial learning is that the student should be able to independently and from inner motivation search for knowledge and learn new things on the basis of the individual ability (Leffler, 2006).

One of the later additions to the definitions of entrepreneurial learning is presented by Otterborg (2011) in her monograph on upper secondary school students' perceptions of what entrepreneurial learning is:

Entrepreneurial learning is by me defined as a way of learning in which the student, in collaboration between school and working life, gets to work with tasks based in reality. In the entrepreneurial way of learning the perception is that knowledge, as students' competencies, capabilities and attitudes, is supposed to develop. The students are expected to develop: to have self-awareness and act independently, break habits and withstand collective actions, take responsibility and to be creative, to be flexible, to see opportunities and make something of them, and to be able to cooperate with others (p. 147, author's translation).

Another recent addition to the description of what is included in an entrepreneurial teaching practice, in the Swedish school context, is a broad interpretation in agreement with Lgr11; it is provided by Falk-Lundqvist et al., (2012) in their handbook on Entrepreneurial pedagogics in school. The authors do not provide a condensed version of a definition of entrepreneurial learning but instead go into detail in and use concrete examples to clarify the different aspects and components. In relation to the overview of and comparison of entrepreneurial and authentic learning in this thesis, it is important to point to the *order* in which different aspects and components included in an entrepreneurial teaching practice are discussed and presented in Falk-Lundqvist et al.'s handbook. Firstly, the entrepreneurial approach in relation to practicing and learning certain skills is described. The authors emphasize that entrepreneurial learning, in line with a broad perspective on entrepreneurial learning, aims at stimulating and supporting the student's general skills and competences which are attributed to entrepreneurs. These skills include creativity, curiosity, ability to cooperate, to take initiatives, to take responsibility – for the project and the own learning process- and to solve, also unforeseen, problems, self-confidence and willingness to take some risks. In these processes the students learn in the same way as entrepreneurs do in an action-based learning which requires 'open-ended questions, acceptance that different solutions and answers may be achieved in different ways' (p. 37, author's translation). After the discussion of these student centred skills and competences, which are based in the student's inner drive and motivation, the importance of the ability to recognize the relations, connections and consequences in an overall meaningful context is lifted, hence the entrepreneurial learning teaching practice aims at providing issues which are relevant and seem meaningful to the students. The authentic context and the authentic assignments resembling real-life problems in real-life situations, which may advantageously be provided through collaboration with the surrounding world, CSS, are means of maintaining student motivation and inner drive.

In Lackéus' (2013) overview on entrepreneurial learning, confirming some of the aforementioned aspects and components, the value of possessing entrepreneurial skills and competences in personal, social, cultural and environmental contexts and not only in economic ones is once again emphasized.

Perspectives on the teacher role – a changed role

Johannisson and Madsén (1997) emphasize that one needs to be flexible and able to break routines to be able to create something new. The ability to break patterns is one of the things which Schumpeter pointed out already in 1934 to be a characteristic competence of an entrepreneur and that his or her strength lies in being able to discover and make use of the possibilities which arise. Leffler (2009) states that a teacher needs to possess entrepreneurial skills to be able to provide entrepreneurial learning environments for the students. The teacher needs to dare to break habits. The teacher needs to have courage to give the students the freedom which an entrepreneurial learning environment requires; hence the teacher needs to dare to let go of different aspects of control (Leffler, 2009). Leffler (2009) further describes the entrepreneurial teacher as a change agent in the school in general and as a guiding mentor to the students in the classroom. It is worth noting that this entrepreneurial teacher has been discussed in earlier research on other related learning concepts. In Young's (1993) presentation of an instructional design for situated learning, he concludes from studies on mathematics teachers that 'teachers who are comfortable with risk taking, and who are willing to turn over some control of the learning environment to students, have succeeded in working along with students as 'experienced novices' (p. 47). Hence, these teachers have dared to let go of some of the control over the learning situation and have dared to expose themselves to learn alongside with the students.

Teachers' attitudes towards entrepreneurial learning

As several researchers in the field of entrepreneurial learning conclude (e.g. Berglund & Holmgren, 2007; Falk-Lundqvist et al., 2012; Svedberg, 2007) the variety of interpretations and alternative interpretations presented within the field is additionally reflected among practicing teachers. This is of interest since this thesis investigates teachers' perceptions in relation to introducing or increasing the degree of entrepreneurial learning in the teaching practice. The political background and the economic associations make the concept even more difficult to come to terms with for practicing teachers. In her monograph on teachers' thoughts on fostering for entrepreneurship Backström–Widjeskog (2008) reports on teacher sceptics towards pedagogical entrepreneurship due to the research being based in the field of economics and due to the association to business start-ups. Berglund and Holmgren (2007) also report on several different teacher perceptions of entrepreneurial learning from a study made in Swedish schools. Some teachers, especially initially when first introduced to the concept, made links to business activities. Berglund and Holmgren

(2007) find that this has created an ideological conflict and thus is an obstacle for introducing entrepreneurship in schools. Johannisson et al. (2010) additionally reflect on teachers' resistance to entrepreneurial learning for reasons of economic associations and ideological convictions: 'Despite the widening and increasingly positive view on entrepreneurship from research and society, schools' suspiciousness of entrepreneurship has remained to this very day.' (p. 174). They add that this scepticism remains in spite of an emphasis on the broad interpretation of entrepreneurial learning. The introduction of entrepreneurial learning into teacher education could support teacher students in revising their understanding, attitudes and beliefs about entrepreneurial learning. However; Johannisson et al. (2010) found, in a study on a project aiming at introducing entrepreneurial learning in teacher education at a Swedish university, that the teacher educators passively resisted entrepreneurship as an (alternative) pedagogical practice. This observation is in agreement with experiences from other Swedish universities (Johannisson et al., 2010).

Furthermore, Leffler (2006) finds from her study on entrepreneurial projects which aimed at long-term educational change and collaborations with the surrounding community that the projects were treated and performed as separate activities and 'not as a part of the ordinary school activities' (p. 105). However, Leffler (2009) also finds that there are teachers who think of entrepreneurship in school as 'placing the education in a context connected to everyday life' (p. 111) and as an issue of 'changing the education towards a more interdisciplinary and exploratory mode of working' (p. 111). Svedberg (2007) observed that entrepreneurship is perceived by teachers partly as an increased degree of collaboration with the community and the local working life. The perception of collaboration with the surrounding community and industry/working life as a prerequisite for entrepreneurial learning may be identified also in the fields of research (Johannisson & Madsén, 1997; Røe Ødegård, 2000) and politics (OECD, 1989; NUTEK, 2000). Other researchers (e.g. Falk-Lundqvist et al., 2012), however, instead regard collaboration between the school and the surrounding world as a tool for providing entrepreneurial learning in a natural manner, since the collaboration may provide the authentic context and the complex, open and authentic, real-life problems for the students to work with. For collaborations to be realized the teacher needs to dare to think in new ways and the students need to be active, motivated and interested in their education for the collaboration to succeed (Leffler, 2009).

This entire overview on entrepreneurial learning makes it easy to agree with Leffler's (2009) conclusion that

Considerable efforts have been made in various research disciplines to appropriate and claim, rather than explain, entrepreneurship, which in turn has resulted in the concept becoming increasingly ill-defined and all-inclusive (p. 104).

As has already been pointed to, this is not unique for entrepreneurial learning. The confusion around the meaning and intentions of entrepreneurial learning may have an influence on the teachers' resistance to integrating entrepreneurial learning in their teaching practice which has been mentioned above. This will be further discussed in Paper III, in which individual teachers' paths of growth inspired by CPD in entrepreneurial learning are investigated.

Teachers in Sweden are required, by the national curriculum, Lgr11 (National Agency for Education, 2011) to provide opportunities for the students in all subjects and at all levels in compulsory school to practice their entrepreneurial skills and to promote entrepreneurship. Few teachers in Sweden have experience from explicit entrepreneurial learning in their teacher education (Johannisson, et al., 2010). Therefore CPD in entrepreneurial learning may be helpful for the teachers. Paper II and III investigates outcome from CPD in entrepreneurial learning in Sweden.

The view on entrepreneurship is both widening and increasingly positive from education research and in society (Johannisson et al., 2010). The interest in entrepreneurial learning from the field of education research may increase the possibilities for entrepreneurship to develop into the stage in which Säljö (2010, p.26) considers it to be 'at best': 'an attempt to restructure some of the normative ideals of education, and to connect the activities in schooling in more explicit manners to knowledge practices elsewhere in society'.

2.2. Authentic learning

Authentic learning is a concept which has always been embedded in the education context. Unlike the more recent concept entrepreneurial learning, authentic learning is defined by several researchers in such a precise manner that it can be presented in list forms. It is informed and inspired by other relating concepts as was addressed in Chapter 1. This is particularly clear in Herrington and Oliver's (2000) proposal of a framework for design of authentic learning instruction, which will be addressed below.

2.2.1. Authentic learning in the field of education research

Authentic learning does not suffer from political, ideological and economic connotations to the same extent as entrepreneurial learning. However, the issue concerning narrow and broad interpretations of the concept is similar.

Narrow and broad interpretations of authentic learning

In reports from the field of research, authentic learning is interpreted and used in a variety of ways (e.g. Bozalek et al., 2013; Grenquist, 2013; Herrington & Kervin, 2007; Herrington & Oliver, 2000; Lombardi, 2007; Rahm et al., 2003, Rowe, Bozalek & Frantz, 2013; Rule, 2006). In their report on the emergent notion of authenticity in a context of high-school science, Rahm et al. (2003) point to the unclear meaning of the term within science education: 'For many, authentic science has become a synonym for science activities that resemble scientists' everyday practice' (p. 737), while 'For others, authentic science embodies participatory models of science education that allows students to work at the elbows of scientists and become members of a research team through work on a real problem that may advance science' (p. 738).

A broad interpretation of authentic learning in various education contexts

In their argument for the situated character of learning, situated cognition, Brown et al. (1989) state that "The breach between learning and use, which is well captured by the folk categories 'know what' and 'know how', may well be a product of the structure and practices of our education system" (p. 32). They define authentic activities in its most simple way as 'ordinary practices of the culture'. Authentic tasks are coherent, meaningful, and purposeful activities that practitioners and experts engage in during real problem-solving situations. Creating authentic learning situations in school science can therefore reduce the gap between science in school and science as it is shaped in its real context outside of the classroom, opening a door to the scientific community. Rahm et al. (2003) further emphasize that the authenticity should be framed in a real-life context:

Authenticity as grounded in the relations among actors within a system, as emergent, and as diverse in meaning is a promising notion that can help us move beyond the mythic notion of authenticity based solely on scientists' science that has come to dominate current school science practices (p. 753).

In a report on an 'authentic classroom' in middle school Nicaise et al. (2000) point to the fact that an authentic school task may well be based in the curriculum but that it 'should be flexible enough to allow the students to pursue personally relevant goals' (p. 80), which, in turn, may make the student motivated to learn for internal reasons rather than external ones such as grades. Based on a qualitative study on 44 different articles discussing authentic learning, Rule (2006) presents a summary of components included in authentic learning. In this summary she emphasizes the meaningfulness of the task. The student perception of meaningfulness may be related to personal aspects for the student; hence this emphasis is in agreement with Nicaise et al.'s findings. Rule (2006) further describes authentic learning as an idea of 'learning in contexts that promote real-life

applications of knowledge' (p. 1) and points to the importance of the task reflecting a situation in real life.

Real-life problems in teaching practice

One way of providing authentic learning environments is to use real-life problems in the teaching practices. In an overview on interpretations and usages of authentic learning, in relation to developing 'enrichment clusters' to the students in middle schools to work with, Renzulli, Gentry and Reis (2004) identified four criteria for real-life problems:

1. A real-life problem has a personal frame of reference, from a student perspective, and must involve an emotional or inner motivation as well as a cognitive interest.
2. It is an open-ended problem for which there are not any prescribed strategies for solution
3. Real-life problems and consecutive solutions motivate changes in attitudes, beliefs and actions.
4. Real-life problems target a real audience and include collaborations beyond the classroom.

This list widens the description of authentic learning by including the open-ended character of the authentic problem. Renzulli et al. (2004) concludes that students in an authentic learning environment are inquirers rather than listeners and that the teacher is a mentor and a resource provider rather than a direct instructor. Perspectives on the teacher role in authentic learning will be summarized below.

Rule (2006) was able to identify four common components as well, despite the discrepancy in concept interpretation. While the aspects described by Renzulli et al. (2004) are focused on the character of the activity, task or problem, Rule's components describe the entire learning environment and situation that the authentic teaching practice provides:

1. The activities involves real-world problem that mimic the work of professionals and the results are presented to an audience beyond the classroom, which in turn makes the problem to something more than just an exercise.
2. The open-ended character of the problems allows for inquiry, creatively and critically, which in turn encourages practice of higher level thinking skills and metacognition, Textbooks may have to be complemented by external resources of facts due to the multi-disciplinary perspectives of real-life problems.
3. The students engage in discourse and social learning in a community of learners.
4. The students are empowered to choose to direct their own learning to a work problem which must have a personal frame of reference and should be open-ended (Renzulli et al., 2004). The teacher instruction thus needs to be personalized and offer several approaches, starting at a

point where the learner is. The empowerment also includes students' decision making as well as self-assessment and reflection.

Other education researchers (e.g. Herrington & Oliver, 2000) have pointed to Information and Communication Technology, ICT, as an excellent tool for providing a greater number of students, mainly at higher education, several components included in authentic learning.

A framework for providing authentic learning environments

Herrington and Oliver (2000) propose a framework for design of authentic learning environments in a report on a development and utilization of an educational multimedia package for students in mathematics. The study includes an analysis of characteristics of a situated learning environment from the literature. From this analysis Herrington and Oliver suggest 'nine situated learning design elements' (p. 25):

1. Provide *authentic contexts* that reflect the way the knowledge will be used in real life (e.g. Brown et al., 1989; Collins, 1988; Resnick, 1987; Young, 1993).
2. Provide *authentic activities* which are complex, ill-defined and of an interdisciplinary character (e.g. Brown et al., 1989; Resnick, 1987; Young, 1993).
3. Provide access to *expert performances* and the modelling of processes (e.g. Collins, 1988, Lave & Wenger, 1991; Resnick 1987).
4. Provide *multiple roles and perspectives* (e.g. Brown et al., 1989; Lave & Wenger, 1991).
5. Support *collaborative construction of knowledge* (e.g. Brown et al., 1989, Resnick, 1987; Young, 1993).
6. Promote *reflection* to enable abstractions to be formed (e.g. Brown et al., 1989; Collins, 1988; Resnick, 1987).
7. Promote *articulation* to enable tacit knowledge to be made explicit (e.g. Collins, 1988).
8. Provide *coaching* and *scaffolding* by the teacher at critical times (e.g. Collins, 1988; Resnick, 1987; Young, 1993).
9. Provide for *authentic assessment* of learning within the tasks (e.g. Young, 1993).

Herrington and Oliver's list of components included in authentic learning is still used as a basis for developing and studying authentic learning environments. Grenquist, (2013) used it in a study on integrating longer-term project-based learning assignments in electrical engineering courses. The semester-long design projects would be more authentic in character than the previous short-lived ones. Grenquist emphasizes that the 'projects are challenging, and present complex questions and problems to the students' and that they 'include authentic assessment, team-based cooperative learning and presentation skills' (p. 3), which is in line with Herrington and Oliver's (2000) list of

components included in authentic learning. He further emphasizes the students' incorporation of *all* knowledge, new and old, which they learn and already possess. Grenquist thereby points to the interdisciplinary character of an authentic learning environment. This is not directly listed or specifically noted in Herrington and Oliver's shortened list, but can be seen as implicitly addressed in the authentic contexts (point 1) and in the authentic tasks (point 2).

Herrington herself continues to define an authentic learning environment as per her and Oliver's definition in 2000. The same components are listed in 2013 on the web-page that complements a guide book on authentic e-learning (Herrington, Reeves & Oliver, 2010). The definition is also used in a South African study on emerging technologies, which Herrington reported on together with Bozalek, Gachago, Alexander, Watters, Wood and Ivala (Bozalek et al., 2013).

Technology and authentic learning

Herrington and Kervin (2007) suggest how the formation of authentic learning environments may be supported by technology. These suggestions require a definition of what an authentic learning environment includes and the list of components presented above is again used as a framework for giving concrete examples of what may be included in authentic learning. One addition in Herrington and Kervin's suggestion is the emphasis on the changed teacher role; putting 'technology into the hands of the students challenge the traditional roles of teachers and students and their associated relationships' (p.233). This situation may be 'associated with the rationale and purpose of an authentic learning experience' since a true authentic learning experience would always be less foreseeable than situations emerging in a learning environment representing direct and teacher-led instruction. This can be recognized from the requirement of the teacher to possess entrepreneurial skills (e.g. Leffler, 2009) to be able to provide an entrepreneurial learning environment for the students, which in turn resembles the requirements for the scaffolding teacher role in situated learning (Young, 1993).

Another example from a point of departure of ICT as a tool for providing an authentic learning environment is Rowe et al.'s (2013) study in a physiotherapy department in South Africa. In this study Google is used to facilitate an authentic learning approach. Although referring to Herrington and Oliver (2000) in relation to the benefits of authentic learning environments the authors do not specify the list of components presented above as a definition. Rowe et al.'s definition does, however, show strong resemblance to Herrington and Oliver's (2000).

As an example from in a non-ICT context, in which Herrington and Oliver's definition of authentic learning is referred to, Hillis (2008) state that the learning approach in authentic learning to some extent resembles the investigative nature in historians' methods for trying to make sense of the past.

Hillis refers to the recognition among history teachers that the most effective learning in history occurs when the students get to problematize the past.

Other descriptions of authentic learning

Herrington and Oliver's (2000) definition of authentic learning, which is a summary from an overview in itself, is also discussed and referred to in another summary of authentic learning in the ICT context. Lombardi (2007) concludes that authentic learning is 'focused on real-world, complex problems and their solutions' and brings forward the multidisciplinary perspective due to tasks being 'similar to some *real world* application or discipline' (p. 2). Lombardi creates a check-list to be used for evaluating whether a learning environment is authentic or not. Her list, which is based on an overview of authentic learning, resembles or equals Herrington and Oliver's (2000) list apart from that the coaching and scaffolding teacher role is not explicitly pointed to by Lombardi. Additional research studies (e.g. Grenqvist, 2013; Hillis, 2008; Rowe et al., 2013; Rule, 2006) are inspired by Herrington and Oliver's description. Hence, it can be concluded that there seems to be some consensus in the field of education research as to what needs to be included in a teaching practice for it to provide the students with an authentic learning environment.

A changed teacher role

The scaffolding character of the teacher role in relation to situated learning is discussed by many authors (e.g. Collins, 1988; Herrington & Oliver, 2000; Resnick, 1987; Young, 1993) Herrington and Oliver (2000) also emphasize the coaching dimension of the teacher role. A few years later Renzulli et al. (2004) conclude, along the same line, that students in an authentic learning environment are inquirers rather than listeners and that the teacher is a mentor rather than a direct instructor. This is further referred to by Rule (2006), in her overview on authentic learning, in which the students are empowered to choose to direct their own learning. The personal relevance for the student is emphasized; hence the teacher instruction needs to be personalized and offer several approaches. Finally, Herrington and Kervin (2007) add another perspective to the teacher role, a perspective which was not discussed in the earlier work by Herrington and Oliver (2000). The traditional roles of teachers and students are challenged as ICT technology is included in the learning environment, partly due to the students' advanced knowledge and skills in ICT, but also due to the importance of the teacher's guidance in securing a rational student usage of the ICT tools, such that the usage serves the purpose of the learning assignment.

As a final note, the less foreseeable character embedded in the teacher's role in an authentic learning environment shows similarities to the reasons for which entrepreneurial skills are required for a teacher to provide an entrepreneurial learning environment (e.g. Leffler, 2009).

Emergent notion of authentic learning

Although this overview result in a concluding summary of components included in authentic learning, the argument by Rahm et al. (2003) on ‘the emergent notion of authenticity’ (p. 740) needs to be noted. They are opposed to ‘the practice of pre-authentication and the practice of locating authenticity within a component of the system, or a simple combination of components’ (p. 740). The emergent notion makes authentic science look different in each separate case depending on components like teachers, students, activities, which interact in a complex manner.

Despite this awareness of the emergent notion of authenticity, there are central aspects and components, among the variety of interpretations and usages, which can be concluded to be coherent and thus are presented in Table 1.

2.2.2. Authentic learning in the field of education politics

Authentic learning has been discussed in the field of education politics. OECD (1993), for example, discusses what they call active and authentic pedagogy in a study on what they refer to as ‘new ways of teaching and learning’. However, the political influences are much weaker than for entrepreneurial learning.

2.3. Similarities and differences

It can be concluded from the presented overviews and Table 1, that it is difficult to distinguish between entrepreneurial learning and authentic learning. Both concepts include components which have been found to have positive impact on students’ interest in learning new skills and competences in science and technology (e.g. Lombardi, 2007; Otterborg, 2011; Sadler, 2009; Schreiner, 2006). I have grouped the components into three higher dimensions, as presented in Table 1; *student’s process of learning*, *authentic context* and *authentic assignment*. It is my conclusion that the distinction between the concepts is related to these dimensions.

Entrance points for entrepreneurial learning and authentic learning

From the overview, I conclude that the distinction or difference between these two concepts mainly lies in the ‘entrance point’ into or the central components with which a description of the respective concept is begun. For entrepreneurial learning this would be the *student’s process of learning* from an inner drive and motivation and the focus on the students’ opportunity to practice entrepreneurial skills and competences. For authentic learning the entrance point would be the *authentic context* in which the authentic assignment is presented. My understanding of the difference between the learning concepts partly emerges from the fact that descriptions of entrepreneurial learning often start with an emphasis on components related to the student’s process of learning, while

descriptions of authentic learning start with an emphasis on the authentic context, in which the authentic assignment is consecutively listed.

An explanation for the appearance of the same components in the two concepts may be the following: In an entrepreneurial learning environment, which takes its point of departure in allowing and encouraging the students' pro-activeness, research evidence indicates that it would be beneficial to work with authentic tasks, in authentic contexts and with issues which relate to the students (e.g. Aikenhead, 2004; Cerini, Murray & Reiss, 2003; Krogh & Thomsen, 2005; Osborne & Collins, 2001; Sadler, 2009; Schreiner, 2006). A serious attempt by the teacher to provide for the students' to learn with the help of their interest and inner drive forces the teacher to provide components in the learning environment which are the same as the ones included in authentic learning. One may say that the 'entrance point' to entrepreneurial learning leads to a learning environment which is very similar to the authentic learning environment. Likewise, definitions and quotes on authentic learning first and foremost bring up the authentic context and assignment (e.g. Herrington & Kervin, 2007; Herrington & Oliver, 2000; Lombardi, 2007; Rowe et al., 2013; Rule, 2006). Consecutively, if the learning environment is strongly focused on providing authentic assignments in authentic contexts, preferably also relating to the students, this is shown to increase the students' interest and motivation to learn (e.g. Aikenhead, 2004; Cerini et al. 2003; Krogh & Thomsen, 2005; Osborne & Collins, 2001; Sadler, 2009; Schreiner, 2006). This, in turn, helps the students to study and learn with the inner drive as a motor.

Whereas descriptions of entrepreneurial make many references to authenticity, the definitions for authentic learning presented in the overview above, do not emphasize certain entrepreneurial skills and competences such as imagination, pro-activity, flexibility and ability to take initiatives or the related components self-confidence, self-esteem and self-efficacy. They may, however be implicitly included in the learning environment, since an authentic assignment and approach is not directed or led by the teacher towards one way of working or only one solution to the problem.

Lastly, the central components and 'entrance points' of the respective concepts are reflected in the sheer name of the concept. Entrepreneurial learning starts in the students' entrepreneurial skills and authentic learning starts in the authenticity.

Another basis for a distinction of the concepts may lie in the descriptions of the (changed) teacher role. The components relating to the respective teacher roles are presented in Table 2. Again, the components are similar and can easily be reformulated to fit descriptions of the teacher role for both concepts. However, a slight distinction is that some descriptions of the teacher role in entrepreneurial learning specifically emphasize the need to allow the students opportunities to

practice their entrepreneurial skills and encourage entrepreneurship in its broad interpretation. The need for the teacher to be entrepreneurial him-/herself for providing entrepreneurial learning is indicated (Leffler, 2009).

Table 2. Summary of components which are related to the teacher’s role in providing an entrepreneurial or an authentic learning environment for the students.

Components related to the teacher’s role in entrepreneurial learning
<p>Comfortable with risk taking in the teaching practice.</p> <p>Dares to break habits and let go of different aspects of control in the learning situation.</p> <p>Courage to give students freedom and willing to turn over some control of the learning environment to the students.</p> <p>Courage to expose him-/herself to learn alongside with the students.</p> <p>Promotes positive attitudes towards student entrepreneurship.</p>
Components related to the teacher’s role in authentic learning
<p>Challenges the traditional student – teacher roles and the associated relationships:</p> <p>Mentor rather than a direct instructor. Needs to provide coaching and scaffolding at critical times.</p> <p>Instruction needs to be personalized and offer several approaches, starting at a point where the learner is.</p> <p>Authentic assessment of learning within the task.</p>

Summarily, Table 3 illustrates the slight differences, the distinctions between the concepts.

Table 3. Distinctions between entrepreneurial learning and authentic learning; the ‘entrance points’ and the teacher’s role.

Distinction	Entrepreneurial Learning	Authentic Learning
<p>Components which are often the first ones mentioned in a description of the concept; i.e. the ‘entrance point’.</p>	<p>Student’s inner drive and motivation to learn.</p> <p>Student’s self-confidence and self-esteem.</p> <p>Student’s creativity, initiative, innovative competence, willingness to try own ideas and ability to recognize possibilities.</p>	<p>Content and activities embedded in an authentic context.</p> <p>Assignments and projects resemble real-life assignments and situations, hence are interdisciplinary in character, ill-defined and open-ended.</p>
<p>The teacher’s role and practice in relation to the learning concept.</p>	<p>The student’s pro-activeness, inner drive and practice of entrepreneurial skills are central and the teacher allows for and encourages this.</p> <p>EL emerges from the teacher’s practice.</p>	<p>The authentic context and the authentic assignments are central and the teacher provides them.</p> <p>AL emerges from the teacher’s practice.</p>

A final note on the similarities for only two of the numerous concepts which are at the beginning of this chapter: On the basis of the strong resemblance between two of the related concept, there is a question as to why different, strongly related concepts appear in the field of education. Rahm et al. (2003) point to authentic learning as term which is currently popular within science education. The concepts may all have been or still are perceived as 'currently popular' if frequently discussed in the field of education research and/or field of politics. All of the new concepts are, however, introduced for the benefit of an increased student interest and learning. Possibly the introduction of a new term is more of an argument for a change of direction in *emphasis* and *focus* in the teaching practice rather than an overall radical change.

From a point of departure of a 'traditional teaching practice' (Watters & Ginns, 2000), which includes direct and teacher-led instruction, entrepreneurial learning and authentic learning may require teacher changes on profound and in-depth levels. The central components, which are the 'entrance points' into the concepts, need to be integrated into the teaching practice and this integration is a process which may and should not be expected to happen in a speedy fashion.

It may be helpful for teachers to get support and inspiration to change the teaching practice. Due to the curricular requirement on teachers in Sweden to include (more) entrepreneurial components in the teaching practice, CPD courses in entrepreneurial learning are provided for compulsory school teachers in in Sweden. During the years of 2007-2010, CPD courses in entrepreneurial learning were offered to teachers on the west coast of Sweden, free of charge. The empirical data in this thesis has been collected from teachers participating in these courses.

3. AIM OF THIS THESIS

The overall aim of this thesis is to investigate compulsory school science and technology teachers' perceptions and change in relation to Continuing Professional Development, CPD, in entrepreneurial learning and to do so from different points of departures and perspectives.

The following is included in the aim:

- To convey teacher's voices, as a group and as individual teachers, in relation to different issues regarding shaping an entrepreneurial learning environment for their students in science and technology education in compulsory school.
- To investigate individual teachers' growth in relation to the CPD included in this work in a theoretical framework.

3.1. Aim of Paper I: Teachers' perceived requirements for collaborating with the surrounding world

The aim of the study is to identify teachers' perceived requirements for including collaborations with the surrounding world as an integrated part of the teaching practice.

The research question is:

What do teachers perceive as requirements for collaborating with the surrounding world as an integrated part of their teaching?

3.2. Aim of Paper II: Authentic and entrepreneurial teaching practice in science and technology – variation and diversity in outcomes from professional development courses for teachers.

This study explores the outcomes from two different efforts to increase teachers' competence in and about authentic science and technology. One focused on entrepreneurial learning approaches, the other on authentic professional science and technology. Both efforts had the same major purpose of generating a positive impact on compulsory and upper secondary school students' interest in school science and technology. The aim of this study is to investigate the overall variation and diversity in the teachers' expressed outcomes. Additionally, the variation and diversity in outcomes will be explored in relation to the different foci of the actions.

The research questions are:

- What outcomes, as expressed by the respondent teachers, can be identified from the two courses?

- What is the contribution to the overall variation and diversity in outcome-types from exploring the different approaches?
- How do the teachers' responses reflect the different approaches?

3.3. Aim of Paper III: Long-term teacher growth from continuing professional development in entrepreneurial learning –a narrative approach.

The aim of the study is to find critical factors which may emerge from the teachers' stories on the outcome from CPD in entrepreneurial learning. Consecutively, the aim is to describe different paths of teacher growth in relation to these factors and in relation to introducing an entrepreneurial learning teaching practice.

The research questions are:

1. What critical factors emerge from the teachers' stories after the CPD in entrepreneurial learning?
2. What paths of growth do the individual teachers illustrate?

4. CONTINUING PROFESSIONAL DEVELOPMENT - THEORETICAL BACKGROUND

Continuing professional development, CPD, is relevant in many professions and not only within the profession of teaching. CPD for teachers is frequently referred to as teacher professional development, TPD. In this thesis CPD refers to continuing professional development for teachers.

4.1. Variation in terminology

Like many other concept related to education, CPD is used for a wide variety of approaches and settings (Day & Sachs, 2010). A list of terms related to CPD may include the following (Bolam & McMahon, 2010):

- teacher development
- in-service education and training (INSET)
- staff development
- career development
- human resource development
- professional development
- continuing education
- lifelong learning

On the job training (Galloway, 2000) and teacher growth (Clarke & Hollingsworth, 2002) can be added to Bolam and McMahon's (2010) list of variation in terminology.

The terms are overlapping and have different meanings for different authors. However, there seems to be an agreement among researchers who provide overviews on CPD research (Day & Sachs, 2010; Galloway, 2000; Muijs & Lindsay, 2008) that it is a wider concept than *in-service learning* and *on the job training* since CPD can encompass a huge variety of settings, both inside and outside of the school. On the other hand, it is more limited than *life-long learning* which entails all forms of learning; CPD is related to a teacher in the teacher's professional context.

There is not only variation in CPD terminology but also variation in definitions of CPD.

4.2. Definitions of CPD

Bolam and McMahon (2010) state that CPD deals with changes, related to the teaching practice, in 1) job skills, knowledge and behaviour, 2) attitudes, beliefs, expectations and concerns, and 3) in grade level, school or district.

CPD related to the school organization would entail staff development, for which a 'typical definition', according to Bolam and McMahon (2010) would be:

Different types of programmes and activity which aim to empower teachers and administrators to develop positive attitudes and beliefs about education and management, become more effective individuals and teams, be competent in teaching students and managing the school process, as well as helping the school adapt to its changing environment. (p. 45)

Day and Sachs (2010) bring forward the different levels of CPD by emphasizing that both the individual teacher and the organization simultaneously must feel a need for a change in teaching practice. If the initiative emerges only from the teacher, it may not be in line with the goals of the school. If the CPD is forced upon the individual teacher, it may cause frustration and lack of motivation. This is of interest in Paper III where some respondents have signed up for the CPD course on their own initiative whereas others have been signed by their school management.

In this thesis, CPD is regarded as a teacher training activity, for in-service teachers, which aims at inspiring and supporting specific teacher change regarding at least one of the aspects included in Shulman's (1987) and Shulman and Shulman's (2004) description of a teacher's professional knowledge. Teachers' professional knowledge will be discussed in the following section.

4.3. Teacher's professional knowledge

CPD may have impact on teachers' practice through inspiring and aiding in the reconstruction of the teachers' required professional knowledge base (e.g. Borko & Putnam, 1995). In 1987, Shulman introduced a *professional knowledge base for teaching*, which includes 7 different aspects of knowledge that teachers need to possess to teach a specific content; content knowledge, pedagogical content knowledge, curriculum knowledge, general pedagogical knowledge, knowledge of learners, of educational contexts as well as of educational purposes and values. In contrast to general pedagogical knowledge, pedagogical content knowledge, PCK, includes knowledge about methods and strategies for an improved student learning and students' alternative conceptions in and around certain content. Since then, PCK has been discussed and redefined in relation to an all-encompassing professional knowledge base for teaching (e.g. van Driel, Verloop & de Vos, 1998). From an investigation of teacher learning, Shulman and Shulman (2004) suggested a refinement of teachers' professional knowledge to additionally take social and collaborative factors into account. Adding the influence of individual and collective reflection on the teachers' transformation of individual experiences into more generalizable conceptions and personal dimensions, they state that:

An accomplished teacher is a member of a professional community who is ready, willing, and able to teach and to learn from his or her teaching experiences. Thus, the elements of the theory are: Ready (possessing vision), Willing (having motivation), Able (both knowing and being able 'to do'), Reflective (learning from experience), and Communal (acting as a member of a professional community). (p. 259)

They describe an able teacher as understanding what must be taught and how to teach it, which is what has been most extensively studied over the past 20 years in examinations of teacher knowledge and understanding; '*understanding the subject matter of the curriculum*' and '*comprehending the pedagogical principles and being capable of designing and implementing instruction consistent with them*' (Shulman & Shulman, 2004, p. 262).

Paper II reports on CPD outcome from two courses which share the aim of inspiring teachers to change their teaching practice to promote students' interest and learning (in science and technology). The courses are designed differently and they also differ in focus in relation to a teacher's professional knowledge (Shulman & Shulman, 2004). In Paper II, *content knowledge* represents subject matter and skills required learning in science and technology; that is '*what must be taught*' (Shulman & Shulman, 2004). *Teaching strategies* represent general and subject specific approaches to and methods for teaching; that is '*how to teach it*' (Shulman & Shulman, 2004).

4.4. Reasons for and purposes of CPD

The need for teachers' continuing professional development is pointed to in Chapter 1 in relation to the teacher as the single most influential actor on the implemented curriculum (e.g. Keys, 2005).

In more general terms, Bolam and McMahon (2010) explain the need for CPD from a point of departure of the rapid changes in our society, which in turn constitutes the context in which school policies and curricula develop:

Macro changes in society and economy over which the governments have limited control –like the growth of information technology, the knowledge economy and globalization, increases in immigration and refugees, as well as natural disasters like HIV/AIDs epidemic, in addition to those introduced by the governments themselves /.../ -all influence the aims and processes of education, schools and schooling and have their impact on CPD (p.35).

Day and Sachs (2010) go even further in saying that 'CPD is no longer an option but an expectation of all professionals' (p. 4). They discuss different functions and purposes of CPD of teachers, such as 1)

to guide teachers to an implemented curriculum which agrees to a larger extent with the intended curriculum, 2) to improve the teacher performance in the purpose of improving the student learning and 3) to contribute to an improvement of the status of the teaching profession. These arguments partly agree with Borko's (2004) foundation for CPD in her overview on professional development. Borko points to educational reform movements around the world and that the outcome of these relies heavily on the teachers, who, in turn may need support and guidance to change their teaching practices to agree with the aims of the reforms.

Furthermore, international education research consistently shows that CPD is crucial for schools to develop successfully and for teachers to grow, stay satisfied and to succeed in their profession (Day, 1999; Hargreaves, 1994). Also, it has been confirmed that there is a greater potential for school and classroom development in schools where teachers are able to reflect, experiment with new ideas and share experiences (Muijs & Reynolds, 2000; McLaughlin & Talbert, 2001). This potential is larger in school cultures where the teachers enjoy appropriate levels of challenge and support from the school management.

CPD may also be required for the purpose of inspiring and supporting teachers to 'come to hold new beliefs' (Borko & Putnam, 1995, p. 60) in domains related to teaching. This is an important aspect of CPD since teachers' beliefs have been found to have influence on the implemented curriculum (e.g. Keys, 2005). Keys further emphasize that teachers cannot simply be told how to change their teaching practice; they must be active agents in the design of the changes. Purposes of CPD include aims to 'help teachers to acquire or develop new ways of thinking about learning, learners, and subject matter, thus constructing a professional knowledge base that will enable them to teach students in more powerful and meaningful ways' (Borko & Putnam, 1995, p. 60). Totterdell et al., (2011) also state that CPD should support teachers' professional growth, leading to sustainable changes in teaching practice.

The international research literature illustrates that CPD may have a positive impact on several aspects of teaching, including the implemented curriculum, the pedagogy, teacher's sense of self-efficacy and how teachers relate to their students (Talbert & McLaughlin, 1994).

4.5. Effectiveness of CPD

Teachers invest time and reflection into a CPD course and some managerial level adds financing to this list of investments. Also, there is a large potential value of CPD, as pointed to in the aforementioned reasons and purposes for CPD. Hence, it can be concluded that measurements on CPD effectiveness may add valuable information for future CPD and investments. Measurements of

CPD efficiency vary from on the spot questionnaires or brief discussions to large scale research projects. Additionally, they vary in method, foci and aims.

Variation in measurements and findings

The variation in measurements is reflected in the currently cumulated pool of research on effectiveness of CPD, in the way that it does not exhibit a clear focus or coherence. The areas of interest and points of departure and approaches vary to a major extent from study to study and findings from studies with a similar area of interest may not agree (Day & Sachs, 2010). The purpose of the following presentation is to illustrate the variation and complexity in trying to find common factors to be included in a general recipe for effective CPD.

Joyce and Showers (1988) demonstrate four components which, need to be included in CPD for it to have impact in the classroom; exploration of theory, demonstration or modelling, practice under simulated conditions and feedback. For a significant impact, coaching in the classroom is also necessary. A later report by Day (1999) confirms and complements these components for effective CPD in identifying inspiration, exposition to new content and ideas, pedagogic discussions, training in new skills, opportunities to experiment, and coaching. Guskey (2000) recognizes additional principles for effective CPD; a clear focus on learning and learners, an emphasis on individual and organizational change, small changes on the way to a major goal, and ongoing professional development. Adey (2004) presents factors for effectiveness in more detail; the CPD course should be based on research findings, use methods for reflection of the ideas being introduced, provide in-school coaching, enjoy school management and organizational support and also encourage teachers' group work and pedagogic discussion. Shulman and Shulman (2004) additionally emphasize the importance of the collaborative initiatives from their study on teacher development within a community of learners. An example of the recognized impact from collegial reflection and discussions around a CPD message is illustrated in the research-based initiative to develop a master's level CPD in England, which is described and analyzed by Totterdell et al. (2011). They emphasize the pedagogic partnership as one of the corner-stones in their framework for CPD, which additionally is based in an understanding of the value of personalized teacher training with individually specified learning outcomes. Anderson (2007) also comes to the conclusion that working together as a teachers' team may be a powerful tool for changes in teaching practice to be realized. This is based on a study, in the context of introducing inquiry learning, which shows that teachers working together to develop instructions had a bigger impact on teachers' beliefs, values and assumptions than only talking about these matters. Here Anderson confirms previous findings from Ford (1992) and Bandura (1977; 1997) who separately report on the importance of the teacher's personal domain for a sustainable teacher change from CPD. They point to the teacher's own motivation to change the teaching practice and

the teacher's own perception of being capable to change for the new task, self-efficacy (Bandura, 1977; 1997).

Desimone, Porter, Garet, Suk Yoon & Birman. (2002) express that a "professional consensus is emerging about particular characteristics of 'high quality' professional development" (p. 82), although there are only indications to back this consensus. Based on an empirically founded hypothesis on key features important for CPD to be effective on a long-term basis, Desimone et al. conducted a three-year-long study on effects from CPD on teachers' practice. The findings indicate that impact is favoured by collective participation and opportunities for the teachers to critically reflect on and discuss their teaching practice in relation to the national curriculum and the aims of the students' education. Another long-term approach was taken by Johnson (2007), who investigated the effects of a two-year-long and collaborative professional development with the purpose of introducing or increasing the degree of inquiry in the teaching practice. The study reveals the importance of a sustained management and collegial support over a longer time, for the CPD effects to remain. Johnson concludes that CPD efforts may be in vain if resources are prioritized away, especially if these priorities result in less time for collaborative reflection, discussions and work. Similarly, from a study performed in a different part of the world and with a different set-up, Tytler (2007) reports that the participating teachers' statements reveal a strong impact from 'the sense of a new way of working with teachers in a team that focused strongly on the development of a shared understanding of teaching and learning principles' (p. 212).

Critical factors for CPD effectiveness

Despite the indications of a lack of general consensus within CPD effectiveness research (Day & Sachs, 2010), it is clear from the findings in the various studies that both external factors, such as the CPD content and design (e.g. Adey, 2004; Joyce & Showers, 1988), school management and organizational support (e.g. Johnson, 2007), the collegial atmosphere, the degree of collegial coherence and the pedagogic discussion (e.g. Shulman & Shulman, 2004) are critical for the effectiveness from the CPD investment. Additional critical factors include personally related aspects such as the teacher's motivation, attitudes, beliefs (e.g. Crawford, 2007) and self-efficacy (Bandura, 1977; 1997). Time to reflect and adjust, is another critical factor (e.g. Johnson, 2007). Even if one and the same factor out of these do not always result in the same outcome from study to study, each factor does have impact; hence it is considered a critical factor in this thesis. A factor which is critical for the effectiveness of CPD may have impact in one way or another; positive or negative. The impact depends on the condition or property of the critical factor in relation to the teacher's professional situation and context.

Complex Conceptualisation of Teacher Professional Learning from CPD

On the basis of the indication of a lack of consensus on general factors having positive impact on CPD effectiveness, (e.g. Day & Sachs, 2010), Opfer and Pedder (2011) present an elaborate overview of the varied findings. This overview is the basis for their proposal of a theory based on interactions between complex systems as a foundation for studying and discussing effective CPD, and to do so with a common understanding within this field of research. They use the term Teacher Professional Learning in their argument for introducing a dynamic understanding of effects of CPD. Their proposal is an attempt to conceptualize the complex process of teacher learning. They conclude that previous reviews in the literature ‘fails to explain how teachers learn from professional development /.../ and the conditions that support and promote this learning’ (p. 376) and further state that the majority of the relevant studies ‘focus on specific activities, processes, or programs in isolation from the complex teaching and learning environments in which teachers live’ (p. 377). This results in non-repeatable studies and contradictory results. The major aim in their suggested conceptualisation is to divert the approach in studies on effective CPD away from cause-and-effect to a focus on trying to understand ‘under what conditions, why, and how teachers learn’ (p. 378). This, in turn, needs to be recognized to vary, in scale and intensity, between individual teachers depending on a complex system of interacting factors, professional and personal. Teacher learning needs to be seen as a complex system which ‘involves processes, mechanisms, actions, and elements and that it is difficult to specify exact outcomes in every instance’ (p. 379). Opfer and Pedder further distinguish between looking at teaching and learning in complex but systematic ways rather than in a complex systems way. The latter recognizes that there are several systems, within the whole complex system, which interact and have impact on each other, in turn in different ways for different individual teachers. The complex systems theory does not provide definite factors for effective CPD in general, but may provide explanations for outcomes. These explanations may be possible to generalize among teachers in similar professional and personal situations. The complex systems theory does not support that CPD which is effective for one teacher, would necessarily work for another teacher at the same school, but rather for another teacher in a similar situation; hence experience a similar influence from the systems which impact the teacher learning.

Opfer and Pedder (2011) identified three overlapping systems involved in teacher professional learning: The activity, the individual teacher and the school.

The Teacher Professional Training Activity: This is the CPD, and it has shown to be more effective when embedded in the teacher’s practice, requires reflection on an individual and a collaborative basis and if the teacher is given time to adjust and absorb the message of the CPD. Another line of research around the activity has focused on how and why collaborative activities and collaborations

are important for teacher learning and change, rather than trying to identify factors important for effective CPD. This research concludes that also for collaborative efforts, the effectiveness depends on the intensity of the collaboration and the individual teachers involved in the teacher training. They refer to Clarke and Hollingsworth's (2002) emphasis of the cyclic nature of the learning and change process for the teacher. Since change needs to happen in several areas of influence for teacher learning, i.e. growth to happen, CPD and evaluation of CPD focusing on only one of the areas might not be effective. Clarke and Hollingsworth's model for effective CPD will be presented below.

The Influences of the Teacher on Professional Learning: A Teacher Level Orientation to the Learning Systems: Teachers have attitudes and beliefs about teaching. These are partly shaped from the teacher's own experiences as a student (Crawford, 2007; Richardson, 2003) but also from other experiences related to teaching and from the personal life. It has been found that a teacher's attitudes and beliefs strongly influence a teacher's practice and vice versa (e.g. Crawford, 2007; van Driel, 2001; Guskey, 1986; Lumpe, Haney & Czerniak, 2000). Furthermore, teachers bring prior knowledge of their subject into their teaching practice (e.g. Windschitl, 2004). The teachers' professional knowledge is an additional factor which is discussed in relation to CPD. Opfer and Pedder (2011) conclude that there seems to be a consensus around teachers' professional knowledge in the literature that 'a distinct rather than a generic body of knowledge is needed' (p. 387). Their point is that a teacher's professional knowledge is influenced in many different ways and also influences other components effecting teacher growth. Research shows that there is an important interaction between the learning activity and the teacher's learning orientation systems: Teachers tend to participate in learning activities which are coherent with their learning systems. Often, a teacher may be influenced or encouraged by the school management to sign up for a certain learning activity, hence the systems of the teacher learning activity and the teacher learning orientation are embedded in the school-level orientation to the learning system:

The Influences of the School on Professional Learning: A School-Level Orientation to the Learning System: It has been found that the school organization and its culture influence teacher growth and practice (e.g. Hollingsworth, 1999; Pedder, 2006). Opfer and Pedder (2011) conclude that the relationship between the individual teacher learning and the organizational learning is not fully understood. The different factors which have influence on teacher and organizational learning act in a reflexive manner and each factor has its counterpart which additionally needs to be attended to, i.e. the school organization needs to be oriented to internal processes on the same time as external developments need to be considered. This is reflected in the needs of the individual teacher, who needs to find a balance between an external focus for inspiration and input and an internal focus for reflection on personal beliefs and practice. Previous research points to both positive and negative

impact from collaborations. One teacher might feel inhibited and constrained from strong collaborative forces while another teacher might thrive from the same influence. However, school-level beliefs about learning have been identified as some of the most important influences from the organizational level. New or inexperienced teachers are especially receptive to the collective beliefs about learning that prevail at the school. Furthermore, the organization's beliefs in its own efficacy have been found to influence the degree of diligence with which teachers pursue the goals. Opfer and Pedder's conclusion is that we cannot understand teacher learning if we investigate the different influences in isolation, they need to be studied as they appear in 'real life', as a complex system of different factors all having influence on each other.

This dynamic model on teacher learning and change leads to a changed focus in the evaluation of CPD, away from an instrumental view on isolated factors effecting the outcome from CPD activities towards a consideration of how the individual teacher's and the school's orientations to learning systems interact to mediate teacher learning and teacher change. The numerous influential factors, acting simultaneously, seem to be too many for researchers to be able to establish causes and effects. However, there are many ways in which to achieve the same learning effects and the best ways differ from teacher to teacher. The most effective way of conducting CPD requires consideration of the participating teachers' attitudes and beliefs and how these interact with elements of the professional context. Opfer and Pedder (2011) conclude that the primary implication from their suggested conceptualization is that more research is needed to 'either verify or falsify' their assumption. Paper III is a response to their appeal, since it investigates individual teachers' paths of growth in relation to factors found to be critical for CPD effectiveness. Paper III explores different conditions in the teachers' professional context in relation to the individual teachers' professional growth.

4.6. Models for effective CPD

There are several models suggesting what needs to be included in CPD and/or how different critical factors interact and have an impact on the outcome of the CPD (e.g. Clarke & Hollingsworth, 2002; Cobb, Wood & Yackel, 1990; Guskey, 1986; Sparks & Loucks-Horsley, 1990; Tillema & Imants, 1995). The two models which will be presented in the following sections are often referred to; Guskey's linear model (1986) and Clarke and Hollingsworth's Interconnected Model (2002). By presenting both models, differences can be pointed to. This may help clarifying the reasons for choosing the Interconnected Model for the theoretical framework in this thesis.

4.6.1. Guskey's model for effective CPD

Guskey presents a model for CPD in 1986, re-presented in 2002, in which he refers to changes corresponding to teacher development. The changes from CPD, which he refers to in terms of staff development, may be identified in three major dimensions: 1) change in the teacher's classroom practice, 2) change in the teachers' beliefs and attitudes, and 3) change in the learning outcomes of students. Aware that the model is neither entirely novel, nor complete, Guskey presents this model in the purpose of pointing to the linear sequence in teachers' professional development. His proposal is based on a study which suggests that change in a teacher's attitudes and beliefs towards the reformed way of teaching, the CPD message, occurs only after the teacher has observed and experienced the benefit of the reformed teaching in the student learning outcome.

The point is that evidence of improvement (positive change) in the learning outcomes of students generally precedes and may be a prerequisite to significant change in the beliefs and attitudes of most teachers (p. 7).

It is worth pointing out that 'evidence of improvement' refers to evidence which the teacher gets from his/her own students, rather than any evidence from research within the field of education. One may say that the teachers would like to 'see for themselves' rather than just rely on research findings or political influences to change their attitudes and beliefs. They want to make a proper field-test. Guskey finds it rather evident that teachers like to repeat teaching practices once they have concluded that they are successful. Guskey defines positive student learning outcome not only as improved academic achievements but also 'the students' attendance, their involvement in class sessions, their motivation for learning, and their attitudes toward school, the class, and themselves' (p. 7).

4.6.2. The Interconnected Model for Teacher Professional Growth

In the Interconnected Model for Teacher Professional Growth presented by Clarke and Hollingsworth in 2002, teacher professional development, here termed teacher growth, is regarded as a form of learning. They state that the term 'teacher change' refers to different types of changes in the literature on CPD, including changes done to teachers, changes performed by teacher, changes as personal development, as local reform, as systemic restructuring as well as change as growth or learning. The interconnection between the different types of changes is acknowledged in the literature, however.

The Interconnected Model describes four different domains included in the teacher's entire (professional) change environment. Change occurs through the mediating processes of reflection and enactment between the domains. The term enactment, related to enacting and enaction, is chosen

rather than merely action. It is my understanding that this is with the purpose of distinguishing the ‘operation’ from single, and more easily observable, actions. An enactment may include one single action but may also include several actions in combination. An enactment may be regarded as a representation in practice of a reformed message aimed for by the CPD, for example, a certain teaching approach. The domains are (Figure 1):

- the personal domain (teacher knowledge, beliefs and attitudes)
- the domain of practice (professional experimentation)
- the domain of consequence (salient outcomes, such as student learning and interest)
- the external domain (sources of information, stimulus or support)

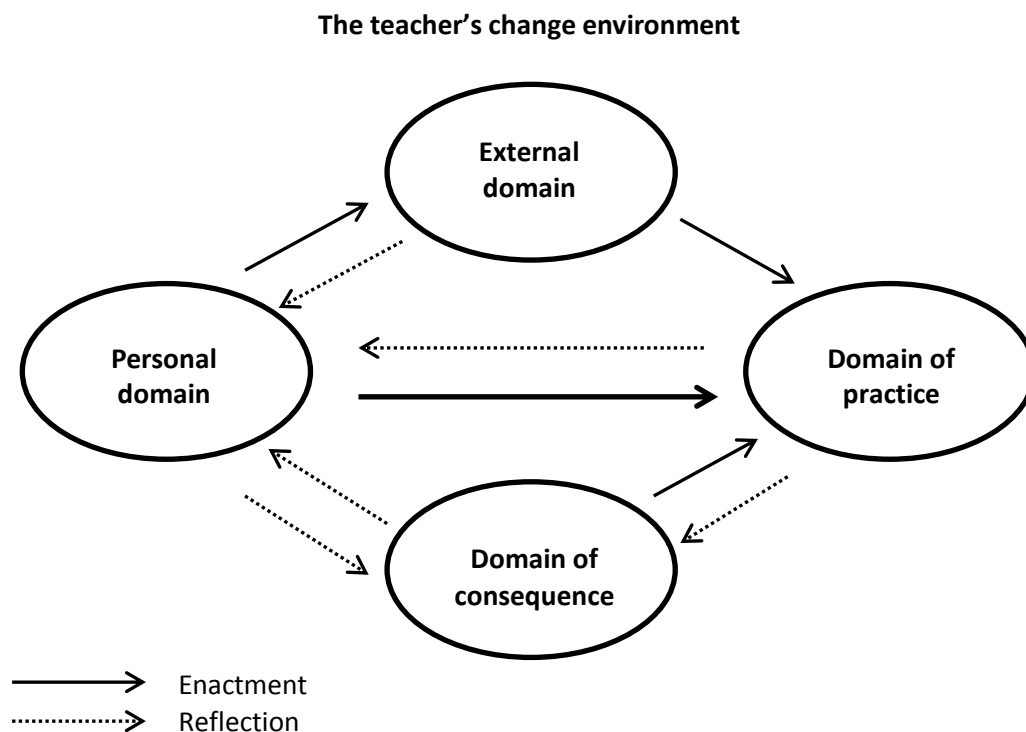


Figure 1. The Interconnected Model for Teacher Professional Growth (after Clarke & Hollingsworth, 2002).

These domains are analogues, however not identical, to the domains in Guskey’s Model (1986), as presented in Table 4. The non-linear nature of The Interconnected Model recognizes the multitude of pathways between the domains that professional growth may take, and the continuing process of learning that teacher growth consists of. The mechanism of the growth is identified as the mediating processes of reflection and enactment between domains.

Table 4. Relation between different components of CPD between the linear model by Guskey (1986) and The Interconnected Model by Clarke and Hollingsworth (2002).

Component of CPD	Guskey, 1986	Clarke and Hollingsworth, 2002
School level	Staff Development	Change in The External Domain
Personal level	Change in Teacher’s Attitudes and Beliefs	Change in The Personal Domain
Teaching practice	Change in Class-Room Practice	Change in The Domain of Practice
Student learning	Change in Student Learning Outcome	Change in The Domain of Consequence

All domains in Clarke and Hollingsworth’s Interconnected Model (2002) are *change* domains; they represent domains in which teacher change may occur in relation to CPD. The external domain is located outside the teacher’s personal world, while the personal domain, the domain of practice and the domain of consequence constitute the individual teacher’s professional world of practice.

When change in one domain leads to change in another domain this is referred to as a ‘change sequence’. Teacher change often involves several movements between the domains within the model. Change which is on-going, rather than one single occasion of experimentation, is termed ‘growth’, rather than development, and it is used for more lasting change. A change sequence which is associated with professional growth is termed ‘growth network’. This network may look very different from teacher to teacher.

The finding that teacher professional growth can occur through a variety of such networks suggests that professional development programs should be deliberately designed to offer participants the opportunity to enact change in a variety of forms and change sequences consistent with individual inclinations. In advocating this more responsive approach to professional development, we align ourselves with contemporary recognition of the need to accommodate a variety of learning styles in our classrooms. (p. 962)

This position on professional development as strongly influenced by the personal domain of change is shared with several others in the field of education research on CPD. For example, Shulman and Shulman (2004) also note ‘the variety of ways in which teachers respond to the process of learning to teach in the manner described’ (p. 257) from the programme which they studied, a programme encouraging teacher learning in a community of teachers. Additionally, Totterdell et al. (2011) describe a study on a British teacher professional development programme which included many

aspects shown in research to be critical for effectiveness. Among these aspects the view on the learning process as an individual process was lifted; each participant had to specify individual desired learning outcomes from the CPD. Both of these examples also point to the influence on the individual learning process from the external domain such as collegial support and collaborative reflection.

Furthermore, Clarke and Hollingsworth (2002) also point to the substantial impact which the teachers' whole change environment can have:

The school context can impinge on a teacher's professional growth at every stage of the professional development process: access to opportunities for professional development; restriction or support for particular types of participation; encouragement or discouragement to experiment with new teaching techniques; and, administrative restrictions or support in the long-term application of new ideas. (p. 962)

The Interconnected Model incorporates previous linear models, and does not regard student learning outcome as the only worthwhile goal of CPD. Clarke and Hollingsworth (2002) further suggest that a more appropriate goal for teacher development programs should be teacher professional growth in contrast to only teacher change, which is the most prevalent goal. The focus on teachers in this thesis agrees well with the recognition of the value of change and growth on teacher level and not only student outcome.

Furthermore, Opfer and Pedder (2011) emphasize that individual teachers' growth vary with circumstances and contexts. This agrees with Clarke and Hollingsworth's (2002) recognition of the individual aspect of teacher professional growth and how differently this may be impacted by various factors from the teacher's entire change environment.

Opfer and Pedder (2011) directly refer to the Interconnected Model for Teacher Professional Growth (Clarke & Hollingsworth, 2002) in their appeal to other researcher to either verify or falsify their proposal of a Complex Conceptualization of the Teacher Learning Process. They state that the Interconnected Model is

...helpful in understanding why the correlational research on features of teacher professional development activity and change has been so disappointing. This work illustrates the cyclic nature of the learning and change process. Change can occur in one area of influence but may not lead to change in another. That is, teachers may change their beliefs but not their practices, may change their practices but not their beliefs, and ultimately may change their practice but not the learning outcomes of

their students. For teacher learning or growth to occur, change must occur in multiple areas of influence. (p. 386)

CPD includes the term 'development' for the changes which occur within the teacher, changes which may have an impact on the teacher's practice. I have chosen to use the term 'teacher growth' in referring to teachers' professional growth, i.e. long-lasting changes which occur within the teacher. The reasons for this are two: Firstly, as to my interpretation, development implies a straightforward direction towards a specified goal, set by the CPD. This is rarely a good description of the process of learning which a teacher goes through in relation to CPD, or in any other context. Secondly, Clarke and Hollingsworth (2002) use the term teacher growth to express lasting teacher changes in their Interconnected Model for Teacher Professional Growth. It is my interpretation that Clarke and Hollingsworth use teacher growth interchangeably with teacher professional growth in the proposition of the Interconnected Model due to the fact that all growth which they describe in relation to the teacher concerns the professional growth; it is presupposed.

Since this thesis is based on teachers' own statements and expressions and since teachers' attitudes and beliefs are known to have strong influence on whether a teacher exhibits professional growth and/or changes his/her teaching practice (e.g. Clarke & Hollingsworth, 2002; Crawford, 2007), it is relevant to discuss factors from the personal domain in more detail.

Teachers' attitudes and beliefs – personal domain

Teachers' attitudes and beliefs are important to consider in CPD efforts since 'attitudes and beliefs play significant roles in shaping teachers' instructional practices' (Jones & Carter, 2007, p. 1067):

...virtually every aspect of teaching is influenced by the complex cobweb of attitudes and beliefs that teachers hold, including knowledge acquisition and interpretation, defining and selecting instructional tasks, interpreting course content, and choices of assessments.

Teachers' belief systems may be difficult to change. In a study on secondary science teachers Luft, Roehrig and Patterson (2003) found that beginning science teachers' beliefs and practices are less static than among experienced teachers; they are rather fluctuating in nature. Their study confirms that there is a relation between teachers' beliefs and teachers' practice. Jones and Carter (2007) add that there could be a time lag between teachers' changes in beliefs and change in teaching practice. This time lag has bearing on the choice of method for evaluation of CPD effectiveness. If the measurement focuses only on student outcome, i.e. domain of consequence, changes in the teacher's personal domain may not be identified, hence the effectiveness may seem lower than what

may be the case. It may be the same scenario if the effectiveness is based on changes in teaching practice. Finally, the time lag points to the benefit of measuring CPD effectiveness on a long-term basis rather than at one isolated occasion. These concerns around the time lag are of interest in Paper II and III. This will be discussed in Chapter 6.

Teachers' beliefs may also be manifested as perceptions of constraints in the form of physical factors, such as lack of time or material. In the context of inquiry teaching Anderson (2002) refers to physical factors as barriers and obstacles which teachers' feel that they need to overcome to reform their teaching practice. Beliefs about physical constraints might discourage the teacher to introduce a certain practice. Strong belief systems resulting in strong teacher identities have been found to lessen the influence of environmental and physical constraints (Jones & Carter, 2007). This is of interest in Paper II, which focuses on teachers' perceived requirements (and barriers) for integrating collaborations with the surrounding world in the teaching practice.

Again within in the context of introducing inquiry teaching, Crawford (1999; 2000) points to the importance of establishing and providing guided reflection on a teacher's beliefs about science teaching. Crawford (2007) concludes from a study on secondary science teachers' beliefs and knowledge in relation to shaping a teaching practice as science inquiry that

...there was evidence that a prospective teacher's set of beliefs about pedagogy, schools, student learning, and the nature of scientific inquiry may have been the overriding factor influencing choice and eventual success in teaching science as inquiry. (p. 635)

It can be concluded that teachers' attitudes and beliefs may influence the teaching practice and CPD outcome. This is of particular interest in this thesis due to the fact that the CPD is directed towards introducing or increasing entrepreneurial learning in the teaching practice. The CPD message itself is subject to resistance and alternative interpretations partly due to the political, ideological and economic connotations associated with the concept (Leffler, 2009; Johannisson et al., 2010), hence a change in the teachers' attitudes and beliefs may involve other issues than for less value-laden CPD messages. One specific type of beliefs is self-efficacy, discussed below.

Self-efficacy – beliefs about ones capability to act

Teachers' beliefs are not only concerned with teaching methods and pedagogy, i. e. 'the mechanics of how things are made to happen' (Bandura, 1997, p. 3). A teacher's beliefs about his/her own 'capability to organize and execute the courses of action required to produce given attainments' (p. 3) are additionally of importance for how the teaching practice gets shaped. These beliefs are

referred to as self-efficacy in Bandura's (1977; 1997) presentation of his theory on people's self-knowledge and the powerful tool that this knowledge provides; a tool which in turn can be used as a tool for teachers' professional growth. There is a mutual dependency between an individual's behavior, B, the external environment, E, and internal personal factors, P, and the ways in which these determinants affect self-efficacy. This model of interdependency resembles the enactment and reflection between the domains of change related to teacher growth in Clarke and Hollingsworth's (2002) model of CPD; E would be the external domain of change, P the personal domain and B the domain of practice. The domain of consequence does not have a strict equivalent in Bandura's model, but may be included in Bandura's external environment, E, in his model for an individual's perception of self-efficacy. However, the personal domain in The Interconnected Model includes a teacher's attitudes and beliefs, among which self-efficacy is a specific form of belief. The internal personal factors in Bandura's model include self-esteem, which is concerned with a person's feeling and perceptions of self-worth. Self-efficacy is concerned with judgments of one's own capability to execute a certain action. The three determinants for self-efficacy vary in strength and reciprocity. They influence a person's perception of self-efficacy for different activities and may vary with circumstances and social contexts.

An example of a relevant action for this study would be to shape a teaching practice which is inspired by entrepreneurial learning. Self-efficacy includes many different kinds of sub-skills required for successfully executing a certain activity. Despite possessing all required sub-skills the execution might not automatically be successful due to certain circumstances and due to emotional and social factors. To achieve a certain activity goal a person needs to possess the required sub-skills and also a belief in being able to use them properly; i.e. the person needs to hold a high and relevant self-efficacy. If a person perceives high self-efficacy for a certain activity but does not possess the sub-skills required for the task, the person might get hurt, physically or mentally. However, people who have the required sub-skills but suffer from low self-efficacy might miss out on opportunities to excel and grow by avoiding rewarding challenges.

People who have strong beliefs in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided. Such an affirmative orientation fosters interest and engrossing involvement in activities. They set themselves challenging goals and maintain strong commitment to them. They invest a high level of effort in what they do and heighten their effort in the face of failures or setbacks. They remain task-focused and think strategically in the face of difficulties (Bandura, 1997, p. 39).

The quote includes qualities and beliefs which would be helpful for teachers who are expected to provide entrepreneurial learning environments (Johannisson & Madsén, 1997; Leffler, 2009).

Additionally, the quote puts forward beliefs which are recognized in an entrepreneur or in a person holding entrepreneurial skills. Hence, the quote also points to some of the qualities and beliefs which the teaching practice should provide for the students to practice on and gain through school education, according to Lgr11 and previously Lpo94 (National Agency for Education, 2011; 1994).

5. THEORETICAL FRAMEWORKS FOR METHODS

In this thesis different frameworks and methods are used for the distinct studies in the purpose of shedding light on the research interest from different angles and perspectives. However,

- they are all based in a qualitative research approach, which in turn provides information for describing details around the complexity involved in the individual teacher's practice and in measuring effectiveness of Continuing Professional Development, CPD.
- they all have a teacher level focus and in this they respect the teachers as a non-homogenous group of professionals consisting of individual teachers, with different personal attitudes, beliefs and approaches towards teaching.

Teachers are often treated and approached as a homogenous group from the point of departure of the teaching practice as a common ground (Goodson & Numan, 2003). This is further reflected in CPD for teachers. A course is designed with a specified aim and for a specified group of teachers. Teachers participating in CPD are treated as a homogenous group on the basis of one or more aspects from the external domain of change (Clarke & Hollingsworth, 2002), such as subject or student age-group taught or the fact that they may be introduced to a new curriculum.

Opfer and Pedder (2011) advice against studying factors, which have been found to influence teacher learning, in isolation from each other. Furthermore, criticism has been raised against treating teachers as a homogenous group when trying to understand teachers' practice (e.g. Goodson, 1991). A qualitative research approach provides opportunities to learn about factors and conditions, in the teachers' professional context, which influence an *individual* teachers' growth.

Since this thesis aims at investigating teachers' perceptions and change in relation to entrepreneurial learning, a qualitative research approach can provide detailed and valuable data. These data are essential in the purpose of conveying individual teachers' voices and to avoid treating the respondent teachers as a homogenous group.

5.1. Teacher's perception and change in focus

Among the several frameworks for studies and evaluations of CPD effectiveness, which have been developed, some are of a normative character in the sense that they propose different degrees of value for different types of outcomes (Muijs & Lindsay, 2008). Guskey (2000; 2002), for example, consider the student learning outcome, to be the most valuable and most important to investigate in CPD effectiveness studies. Other researchers argue for evaluating the outcomes on a teacher level, since the effect on the student learning may be delayed (e.g. Bandura, 1977; 1997; Clarke & Hollingsworth, 2002; Harland & Kinder, 1997; Jones & Carter, 2007). Also according to Guskey's

(1986) model, in which he proposes that teachers have a stronger inclination to change their attitudes towards a new way of teaching *after* they have seen results among their own students, it makes sense to evaluate CPD outcome on the teacher level.

Since this thesis aims at investigating teachers' perceptions in relation to introducing or increasing the degree of entrepreneurial learning in the teaching practice, empirical data consists of the teachers' own statements and expressions.

5.2. The qualitative Research Interview

The qualitative research interview does not aim at quantification (Cohen, Manion & Morrison, 2000). In this thesis the qualitative research interviews have been planned and executed according to Kvale (1997). The open and semi-structured qualitative research interview allows the respondents to focus on aspects which they want to raise within a certain topic on the same time as they may de-emphasize or even leave out other aspects (Kvale, 1997; Kvale & Brinkmann, 2009; Perez Prieto, 2006; Spector-Mersel, 2010). The respondents may choose which version of the topic they want to communicate (Perez Prieto, 2006). This might provide information which the researcher may not have received if the interview or method of data collection had been of a closed nature. However, this gives an empirical foundation for the analyses which 'is neither what *actually* happened, nor how the previous students [here teachers] experienced it but what these previous students [here teachers] tell us about' (Perez Prieto, 2006, p. 11, author's translation). There is a distinction between the actually lived life, the life experiences and the story about the life (Bruner, 1986; Goodson & Numan, 2003, Peacock & Holland, 1993; Strömberg, 2010). Bruner (2004) adds the role of the interpreter, the final reporter, of the told story:

.../a life as led is inseparable from a life as told – or more bluntly, a life is not 'how it was' but how it is interpreted and reinterpreted, told and retold (p. 708).

Additionally, the qualitative research interview is shaped in a special social context, in which the stories told are dependent on what the interviewer wants to know and how the interviewee perceives this, as well as how the communication works between them (Perez Prieto, 2006). There is a mutual exchange which means that knowledge develops during the dialogue (e.g. Kvale, 1997, Kvale & Brinkmann, 2009; Perez Prieto, 2006).

The stories are created for the researcher; they are told to him or her and are influenced by the way the teller has understood the purpose of the study, by his or her aims in telling the story to the researcher and by their interpersonal interaction. When narratives are 'collected', the researcher influences them by her or his presence and by

their 'documentation' which involves selective aspects. But in interviews the researchers' influence is much more prominent, for the data — the narratives — are embedded in the interaction. (Spector-Mersel, 2010; p. 213)

Finally, the conversation or dialogue which the interview is manifested as provides an opportunity to 'catch several people's impressions about a topic and give a picture of a multifaceted and controversial human world' (Kvale, 1997, p. 14, author's translation). This adds a valuable dimension to interviews which are held with more than one teacher from the same teacher team, as is the case for most of the interviews in Paper III.

5.3. CPD effectiveness studies – general level

This thesis focuses on teachers' perceptions and change in relation to CPD. Since teacher change and growth are indications of the effectiveness of CPD, studies on and findings from CPD will be discussed in the following sections.

From previous research on CPD effectiveness it is possible to make conclusions on a more general level about frequent shortcomings as well as recommendations for future studies (e.g. Day & Sachs, 2010; Guskey, 2000). The following sections will provide some examples of both.

5.3.1. Shortcomings in research on CPD effectiveness

Based on an overview of research on CPD, Day and Sachs (2010) conclude that studies on CPD effectiveness frequently can be described by the following points, which they put forward as shortcomings:

1. They rarely focus on longer term or indirect benefits.
2. They rarely differentiate between different kinds of benefits in relation to different purposes.
3. They are often based on individual self-reports which relate to the quality and relevance of the experience and not the outcomes of the CPD.
4. They usually occur summatively, after the learning experience, rather than formatively, so that it can be used to enhance that experience.
5. They rarely attempt to chart benefits to the school or department.

(Based on Day and Sachs's summary on p. 292)

Guskey (2000) presents a similar list of shortcomings in studies or evaluations of CPD:

1. Most evaluations simply summarize quantitative accounts such as activities, number of participants, credits awarded. These are all indicators which do not give any information on the effectiveness of the CPD.
2. If there is a more in-depth evaluation this is most frequently about participant satisfaction, and does not reach into teacher change or growth and even less into student outcome.
3. Evaluations are most often brief, one-time events; hence do not take into consideration that meaningful changes do take time.

Hence, Guskey's as well as Day and Sach's writings both point to the shortcoming of focusing on participant satisfaction rather than outcome. Furthermore, the lack of long-term perspectives is pointed to. This may be problematic on the basis of the observed time-lag from CPD to teacher change and consecutively also to teacher growth and impact on practice (e.g. Jones & Carter, 2007). The manner in which these shortcomings and recommendations are addressed in this thesis will be presented after the following section.

5.3.2. Recommendations for research on CPD effectiveness

In their review on CPD research, Day and Sachs (2010) point to the necessity for any study or evaluation of CPD to take into account both 'indirect and direct impact upon different stakeholders' (p. 292). It also needs to consider the context in which the teachers work. Furthermore, effects of CPD need to be studied or evaluated in different dimensions of a teacher's required knowledge base (Shulman, 1987; Shulman & Shulman, 2004). Day and Sachs further recommend that evaluation practices recognize that outcomes are not only confined to the individual teacher, hence the evaluation should also explore impact on the school and the student and how these levels interact. The different levels were discussed beforehand in Guskey's (2000; 2002) extensive overview on CPD evaluation. He concluded that there are five critical levels on which information needs to be gathered for an effective evaluation:

1. Participants' reactions to the CPD experience.
2. Participants' learning, which most frequently concerns knowledge and skills in relation to the aims of the CPD.
3. Organization support and change.
4. Participants' use of new knowledge and skills, i.e. impact on practice.
5. Student learning outcomes.

Muijs and Lindsay (2008) extended Guskey's five levels by a preceding level which focuses on conditions prior to the CPD, including factors such as motivation for participation.

5.3.3. Implications for this thesis

Several of the aforementioned shortcomings and recommendations have been attended to in this thesis, in the two studies which investigate CPD effectiveness from different perspectives; papers II and III:

- Both studies focus on other outcomes than participant satisfaction from CPD. Although affective impressions are included in these outcomes, they do not make out the focus of the evaluations.
- In both studies, different kinds of benefits from the CPD are differentiated.
- Both studies explore outcomes related to different factors known to have impact on practice.
- Both studies investigate outcome which is related to different levels within the school organization.
- Both studies are framed in a qualitative research approach. This provides for collection of data which may inform on a detailed level.
- Paper III investigates outcome on a long-term basis and uses data from three times of collection over a period of 30 months.

The student level, recommended to be included in CPD effectiveness studies (Day & Sachs, 2010, Guskey, 2000; 2002; Muijs & Lindsay, 2008) is not investigated in this thesis for the aforementioned reasons.

5.4. Framework for evaluating CPD effectiveness

The teacher level focus and the reason for using teachers' own statements as the empirical data, discussed in the sections above, make out the predominant basis for choosing Harland & Kinder's (1997) proposed model for CPD evaluation in Paper II. Further reasons will be discussed below.

5.4.1. Typologies and impact on practice

Harland and Kinder (1997) developed a CPD evaluation model which regards outcome in all of Guskey's (2000; 2002) first four critical levels as valuable. It focuses on evaluating CPD on the level of the teacher and his/her professional context. They had noted that reaction to a CPD event is highly individualized, with different outcomes for different participants. This agrees with findings presented by, for example, Clarke and Hollingsworth (2002), Shulman and Shulman (2004), and Opfer and Pedder (2011). Harland and Kinder (1997) present a typology of nine outcomes, i.e. nine categories. The ninth typology is impact on practice, the ultimate outcome. The other eight typologies may lead to impact on practice.

1. *Material and provisional outcomes*; physical resources such as worksheets, equipment and handbooks. May have a positive influence on a teacher's practice, however usually requires other outcomes such as value congruence. Does not necessarily result in impact on practice, however, lack of outcome may impede impact on practice.
2. *Informational outcomes*; getting information or being briefed on, for example, a new curriculum. This outcome does not include a deeper understanding around the information.
3. *New awareness outcomes*; a shift in understanding of and towards the message of the CPD, such as understanding 1) for a more effective way of teaching or 2) of the content to be taught. New awareness can also include a shift in the understanding of 3) of what aspects within certain content that are important for the students to learn. Does not guarantee impact on practice, since it needs to be accompanied by value congruence as well.
4. *Motivational and attitudinal outcomes*; enhanced enthusiasm and motivation to implement the ideas of the CPD message, inspiration to do so etc. This typology also includes teachers' attitudes towards aspects included in the teaching profession and/or the CPD. Very important for impact on practice but may be short-lived if other outcomes are lacking, such as knowledge and skills outcomes as well as material and provisional outcomes.
5. *Affective outcomes*; an emotional experience of getting inspired by the message of the CPD and/or the deliverance of it. May involve changes of different aspects of the personal domain, for example an increase in self-confidence in teaching according to the CPD message. Affective outcomes are often short-lived but they are important for getting to other outcomes, to get new awareness, for example.
6. *Institutional outcomes*; when the CPD has collective impact on groups of teachers such as collegial coherence in views, attitudes, approaches and their teaching practice as well as organizational changes induced by the CPD.
7. *Knowledge and skills outcomes*; a deeper understanding of content knowledge and/or pedagogics. The knowledge and skills may be of various forms or qualities, i.e. may include a subset of knowledge and skills included in the message of the CPD – a subset of knowledge and skills *outcome-type*.
8. *Value congruence outcomes*; relates to how well the teacher's interpretation and understanding of the CPD message, the new awareness, correlates with the intended message and the course leaders interpretation and understanding of it.
9. *Impact on practice*; the ultimate goal on the teacher level; changes in teacher practice. Impact on practice may be either direct from the CPD message or through the indirect route of the other eight typologies of outcomes. Focus of this outcome is on behaviour rather than on attitudes and beliefs or new awareness.

(Based on Harland and Kinder’s list of typologies on pp. 72-76. The sequence of the typologies in the present listing has been changed in purpose of aligning the sequence with the outcome orders presented in the model.)

In this model the results from a study or evaluation of CPD effectiveness, i.e. the outcome, is entirely based on data consisting of the participants’ own statements. In a comparison between indirect measurements; i.e. from teachers’ own statements, and a direct measurement; i.e. from the researchers’ observations in the teachers’ practice, on outcome from CPD, Harland and Kinder (1997) found that different typologies of outcome, based on the teachers’ perceptions and statements, resulted in different degrees of likelihood for impact on practice. Based on these findings, Harland and Kinder introduced three orders into which the outcome typologies were divided, as seen in Figure 2. The orders suggest a ranking among the eight outcome typologies that are not impact on practice, the ninth typology. The ranking is based on the observed degree of impact on practice.

Impact on practice				
↑	1 st order	Knowledge and Skills		Value Congruence
	2 nd order	Motivational and Attitudinal	Affective	Institutional
	3 rd order	Provisionary and Material	Information	New Awareness
Degree of influence	Order	Outcome typology		

Figure 2. Outcome typology and degree of influence over impact on practice based on the CPD evaluation model presented by Harland and Kinder (1997).

As shown in Figure 2, third-order outcomes have the least degree of influence on *impact on practice*, second-order outcomes have a higher degree of influence and first-order outcomes have the highest degree of influence on *impact on practice*. According to Harland and Kinder (1997) all outcome orders, are valuable and needed to maximize the chances of teacher change and growth leading to impact on practice. They also point out that some degree of *impact on practice* can occur even if not all outcome typologies are represented. However, the more outcomes and the higher the order of outcome, the higher is the probability for *impact on practice*.

5.4.2. Different outcome types and a teacher’s professional knowledge

In relation to the outcome typology *knowledge and skills*, Harland and Kinder (1997) emphasize that the quality of the outcome may be of different types within the typology. The typology includes different *outcome types*. This can be understood on the basis of Shulman’s early writings on a

teacher's professional knowledge base (1987) and the 'teacher's ability and understanding' which is discussed in Shulman's later writings (Shulman & Shulman, 2004). A teacher's ability and understanding includes knowledge about what to teach and how to teach it. *Knowledge and skills* include both content knowledge and teaching strategies.

Additionally, the typologies in Harland and Kinder's model (1997) point to the importance of the dimensions which Shulman and Shulman added in 2004 to be required for a teacher to grow into an accomplished teacher; readiness, willingness and reflection – individually and in the community of teachers. Readiness and willingness is reflected in *motivational and attitudinal* outcome. The typologies *new awareness, value congruence* and *institutional* outcome may be indicators of individual and collaborative reflection. Furthermore, Harland and Kinder's typologies give examples of what may be included in the different change domains in Clarke and Hollingsworth's Interconnected Model for Teacher Professional Growth (2002), apart from the domain of student learning. The typologies *provisionary and material, information* and *institutional* outcome are examples of what may be included in the external domain of change. the personal domain of change include aspects related to the typologies *new awareness, motivational and attitudinal, affective, value congruence* and *knowledge and skills* outcome.

5.4.3. Individual outcome routes

In an evaluation of the effects from CPD, using their proposed model, Harland and Kinder (1997) found that the 'participants have unique 'outcome routes' following an in-service experience and rarely achieve exactly the same permutation of outcomes as their colleagues' (p. 77). These findings are in agreement with the above presented findings of Shulman and Shulman (2004) and are also supported by Opfer and Pedder's (2011) conceptualization of teacher professional learning.

Also, Harland and Kinder (1997) emphasize that the model is not to be understood as implying a linear progression among the nine outcome typologies. If that were the case, the outcome routes would not differ among teachers. The model only suggests what outcomes, as expressed by the teachers, which seem to introduce more or less likelihood to have an impact on the practice in the class-room. Furthermore, teachers who fulfil several outcome typologies already before CPD are more likely to change their teaching practice within a shorter-term perspective.

5.4.4. Rationale for choice of CPD evaluation model

Since this thesis focuses on teachers' perceptions and change in relation to CPD, Harland and Kinder's (1997) model for evaluation of CPD is an appropriate tool for analysis. The model recognizes that different orders of outcome, corresponding to Guskey's four out of the five critical levels (2000; 2002), are valuable and not only Guskey's fifth level, the student outcome. Furthermore, while

focusing on the teacher, the model still recognizes outcomes which are outside of the teacher confinement. This is in agreement with Guskey's (2000; 2002) as well as Day and Sachs' (2010) arguments of exploring the impact also on the school level. Additionally, the empirical data in this thesis consists of the teachers' own statements about CPD outcome.

Additionally, Harland and Kinder's (1997) focus is on 'planned change and not adventitious or unplanned changes, important though these may be' (p.71). The CPD initiatives investigated in this thesis included planned changes for the teaching practice towards including more entrepreneurial learning. Furthermore, Harland and Kinder state that their evaluation model is relevant to both voluntary and imposed forms of CPD activity. This is of importance in this thesis since it includes both forms.

Furthermore, Harland and Kinder (1997) raise a concern about the policy-makers and practitioners' eagerness to find evidence for what works as effective CPD. The individual outcome routes, already discussed, are one of the accounts for pointing to cautiousness. Other accounts are pointed to by the questions of 'effective at what?' and 'under what conditions?' (p. 81). *What* the CPD is effective at points to the different outcome typologies and the different outcome types within the typologies. *Under what conditions* the CPD is effective includes many aspects from the external and the personal domain of change (Clarke & Hollingsworth, 2002), such as whether a whole teacher team takes part in the CPD and what attitudes the individual teacher has towards the CPD. Opfer and Pedder (2011) also argue for a shift in CPD research to focus on trying to understand 'under what conditions /.../ teachers learn' (p. 378). In Paper II, different outcome types within the typologies are discussed, i.e. 'effective at what'. In Paper III individual teachers' different paths of growth are described. These different paths of growth provide information on 'under what conditions' the CPD has been effective (or not) for the individual teacher respondents.

Harland and Kinder (1997) express resistance to build theory around effectiveness of CPD based on high levels of generality, since this does not define influencing factors well enough to assist practitioners, planners and policy-makers. This position against general success factors for effective CPD agrees well with Opfer and Pedder's (2011) position on CPD evaluations and Clarke and Hollingsworth's (2002) Interconnected Model for Teacher Professional Growth, in which the cyclic and dynamic interrelations and interactions between the different domains of change are emphasized.

5.5. Narratives

The benefits from using the qualitative research interview are well aligned with Goodson's (1991) argument for using narratives as a means of making justice to empirical data from individual teacher respondents. Narratives are used in Paper III, which investigates and describes teachers' different paths of growth in relation to CPD in entrepreneurial learning.

The teaching profession is subject to an ever increasing intensity due to, for example, higher demands on documentation and student goal fulfilment as well as expectations to take active part in school development (Goodson & Numan, 2003; Strömberg, 2010). Narratives may clarify qualitative aspects of school and teacher development in times of changes, aspects which might not get visible in quantitative or in merely summarizing/categorizing qualitative approaches (Goodson & Numan, 2003; Tripp, 1994). Narrative is a tool for giving the teacher a voice (e.g. Goodson & Numan, 2003; Perez Prieto, 2006; Spector-Mersel, 2020). Strömberg (2010) explains that narratives may

./.../ raise specific dimensions and aspects of teachers' lives and work, with their foundation in the teachers' own experience [and as such they may] complement and/or contrast against pictures created from other sometimes concurrent perspectives, such as other actors in school, policy documents or political documents on education' (p. 24, author's translation).

Narratives include different forms of story-telling which makes the subjects visible and put the human-beings, their experiences and views in focus (Pérez Prieto, 2006). Goodson and Numan (2003) also conclude that stories are 'one individual's personal representations of something which has been experienced, something which the person wants to convey, communicate to others' (p 97, author's translation). Spector-Mersel (2010) further explains the respondent's stories:

Those stories were not previously there; they were created for him or her [the researcher], in his or her presence and under his or her direct and indirect influence. This influence is unavoidable even when the researcher invites the interviewee openly to tell a story with no apparent direction or intervention, for his or her external characteristics and visible social ascriptions (age, sex, ethnicity) inevitably influence the narrator's selection. The very fact that the story is being told in a research setting also bears an influence. When stories are collected through observation researchers still influence them, by their mere presence. Thus, often the data of narrative research is not 'clean', in the sense that it is exclusively the narrators' creation. Rather, it is the co-construction of two (or more) persons. (p.216)

Regarding the terminology, Goodson and Numan (2003) reflect on the usage of the term 'narrative' in the context of research, rather than 'story', as possibly being a desire to present a story in a form which will be perceived as more formal.

5.5.1. Analysis of narratives and narrative analysis

Polkinghorne (1995) distinguishes between analysis of narratives and narrative analysis; 'analysis of narratives moves from stories to common elements, and narrative analysis moves from elements to stories' (p. 12). The former means that the respondents' stories are the sources of data collection.

The analysis of narratives, i.e. the respondents' told stories, starts already during the interview (e.g. Heyman & Perez Prieto, 1998; Kvale, 1997) and continues at the desk. Themes around which the respondents choose to talk in relation to the interviewer's questions emerge during the telling of the stories (Kvale, 1997; Löfdahl & Perez Prieto, 2009; Perez Prieto, 2006). The themes may result in critical factors which are common to the different teachers' stories and relevant to the research question. The first part of Paper III represents an analysis of narratives, in which the narratives are the teachers' told stories in each interview. The second part of Paper III is a narrative analysis, where the researcher merges data into a written story, a narrative. It is the construction of the narrative which constitutes the analysis. The narrative does not represent the teachers' spontaneous stories (Kvale, 1997; Löfdahl & Perez Prieto, 2009). The written narrative has a plot which constitutes the criteria for which themes to include in the story. The plot connects the themes, which make out the foundation for the structure of the narrative (e.g. Bamberg, 2012; Bjurulf, 2008; Polkinghorne, 1995). In Paper III, the themes, which emerge from the teachers' stories, are considered to be critical for the teachers in relation to their change and growth; hence they are referred to as critical factors. The narratives are structured around the critical factors. The teachers' paths of growth make out the plots in Paper III.

5.5.2. The researcher – the interpreter - validation

During the writing process of a narrative the narrator, i.e. the interpreter of the told story, should not try to hide his/her own voice, but also not let 'text become /.../ sublimated to that voice' (Packwood & Sikes, 2006, p. 338). Furthermore, the writing process needs to be guided by awareness about not presenting the accounts as factual (Packwood & Sikes, 2006). In the narrative analysis in Paper III, the ambition has been to portray the teachers' paths of growth in a manner which makes clear that they are presenting the teachers' perceptions and are evaluations of the effectiveness of the CPD and not of the individual teachers. The narratives are written with empathy for the teacher's situation in an ever increasing professional intensity (Goodson & Numan, 2003; Strömberg, 2010), a situation for which my understanding is facilitated by my role as a practicing teacher.

Narrative as a research method does not have an exact 'book of rules' (Heyman & Perez Prieto, 1998). Instead, the researcher has a right as well as an obligation to design a method which best responds to the aim of the research. The major objective is rather to clearly specify the procedure. The interviewer and interviewee's mutual influence on the data from a qualitative research interview (e.g. Kvale, 1997; Kvale & Brinkmann, 2009) needs to be considered. Furthermore, the story told by the respondent is interpreted by the researcher, who also chooses what data to include and not include in relation to the research question (e.g. Hellsten, 1998). The researcher's background and own experiences related to the research topic may be integrated into the interpretation.

...the narrative paradigm emphasizes that the researcher reads the stories through a prism of values, images, stereotypes, inclinations and personality traits. Thus, the research report is always a partial version of the reality. Just like the participants, the researcher tells stories. The researcher's narrative is not more correct or true than the participants' or alternative interpretive narratives. (Spector-Mersel, 2010, p.217)

My dual role as researcher and a practicing teacher, who moreover includes entrepreneurial learning in the teaching practice, most likely brings my own experiences and my own understanding of the definition of entrepreneurial learning used in this thesis into the interpretation of the teachers' told stories. My dual role may colour the narratives differently than if I had only been a researcher. Due to my situated learning (e.g. Collins, 1988), I may include more of my own understandings into the narrative analysis than would a researcher who is not also a practicing teacher. This will be further discussed in Chapter 6. However, the issues around the narrator's voice in the narratives, whether the narrator is a practicing teacher or not, may be alleviated through respondent validation. This has been done in Paper III.

5.5.3. Life-histories and life-stories

Goodson (1991) argues for life-*histories* rather than life-*stories* as the preferred narrative approach, since teachers' autobiographies, personal and professional social contexts, and the political context have been shown to have a strong influence on a teacher's practice, apart from the formal teacher education and in-service practice (e.g. Goodson, 1991; Crawford, 2007). Packwood and Sikes (2006) further argue that 'it is essential to situate deconstructions and voices within their social, political, economic, and moral contexts' (p. 336). However, the political context in Paper III is limited to and represented by the aim of the CPD course, which is to support and inspire teachers to provide a learning environment which allows the students to practice entrepreneurial skills, in turn in agreement with the previous and current curriculum in Sweden, Lpo94 and Lgr11 (National Agency for Education, 1994; 2011). Also, it is beyond the scope of this thesis to find reasons outside of the

professional context for the respondent teachers' contingent variation in growth in relation to the CPD intervention, hence political and social contexts outside of the teachers' professional domains have not been included in Paper III. Thus, life-stories rather than life-histories (Goodson, 1991) are chosen as a means of narrative. However, Goodson (1991; Goodson & Numan, 2003) recommend against only describing aspects within the domains which Clarke and Hollingsworth (2002) refer to as the teacher's personal domain and domain of practice in the purpose of describing teacher growth. Adding to this the aforementioned shortcomings and recommendations in research on CPD effectiveness (Day & Sachs, 2010; Guskey, 2000; 2002) the teacher's external domain of change have been included in the life-stories in Paper III. Perez Prieto (2006) makes another distinction between different types of stories. He distinguishes between 'complete' and 'topical' life-histories, where 'complete' life-histories may be in line with the stories for which Goodson advocates. 'Topical' life-histories 'focus a limited period and limited aspects in the lives of the respondents' (p. 15). The external and the personal domain of change and the domain of practice in Clarke and Hollingsworth's model for effective CPD are influenced by aspects from the non-professional context. However, in Paper III, only aspects clearly embedded in the professional domains will be investigated and reported on. The focus is on the respondent in his/her *position* as a teacher and not on the respondent as an individual (Heyman & Perez Prieto, 1998, Strömberg, 2010); hence the stories presented may be best described as 'topical'.

As with many other established concepts, narratives have different meanings to different researchers (Goodman & Numan, 2003). In Paper III, narrative is used for a story, written by me, the researcher after having interpreted the story told by the respondent teacher in an interview situation. The data is the teacher's expressions of his/her interpretation of 'the lived life' (Bruner, 1986) in relation to perceived outcome from the CPD message to include (more) entrepreneurial learning in the teaching practice.

5.6. Overview of theoretical perspectives in method, analysis and presentation of results.

Table 5 presents a short overview of how the different theoretical perspectives are used in the separate studies. Table 5 may also be helpful while reading the next chapter, which presents aspects that are common for all the methods and how these are used or visible in the separate studies.

Table 5. A summary of frameworks and methods for collection of data, analysis and presentation of results in the separate studies.

Paper	Collection of data	Analysis	Form of presentation of results	Group or individual level
I	<p>Paper questionnaire to individual teachers.</p> <p>Direct and open questions on perceived requirements.</p> <p>Data may be traced back to individual respondents.</p>	<p>Categorization without pre-defined categories.</p>	<p>Table of categories of requirements, including sub-categories.</p> <p>Quotes to exemplify and validate.</p>	<p>Analysis and presentation on group level.</p>
II	<p>Qualitative research interviews in groups.</p> <p>Open questions.</p> <p>Data may be traced back to individual respondents.</p>	<p>CPD evaluation model presented by Harland & Kinder (1997).</p> <p>Related to Shulman & Shulman's (2004) professional knowledge base for teachers.</p>	<p>Tables of quotes representing the outcome typologies.</p> <p>Tables based on outcome order.</p>	<p>Analysis and presentation on group level.</p>
III	<p>Qualitative research interviews in groups and individually.</p> <p>Open questions.</p> <p>Data collected at 3 points of time over a time period of 30 months.</p> <p>Data may be traced back to individual respondents.</p>	<p>Analysis of narratives: Categorization without pre-defined categories.</p> <p>Critical factors emerged from themes in respondents' stories.</p> <p>Narrative analysis: Stories structured around critical factors.</p> <p>Related to Clarke & Hollingsworth's (2002) model for effective CPD.</p>	<p>Table of critical factors, including aspects and sub-aspects.</p> <p>Narratives for each individual teacher.</p>	<p>Analysis of narratives on group level.</p> <p>Narrative analysis on individual level.</p>

6. METHOD

This thesis entails three distinct studies. Different methods and theories have been used in the purpose of illuminating the aim of the thesis from different perspectives. The different frameworks may also validate the findings from the separate studies. A summary of methods for collection of data, analysis and presentation of results used in the separate studies has been presented in Table 5 at the end of Chapter 5. More detailed descriptions of the methods are presented in the separate Papers on the studies.

Before discussing the differences in methods and theories, the common bases will be presented in short; my dual role as a researcher and a teacher, the qualitative research approach and the teacher level focus. Additionally, the CPD initiative which gave access to all the respondents who have contributed to this thesis will be presented. Thereafter, the differences in the selection of respondents and collection of data and also in the analyses will be pointed to.

6.1. My dual role as researcher and a teacher

During the time which I have worked with this thesis, I have held a dual role as a PhD student and as a teacher in science and technology, teaching students at the age of 12-16 years. This may cause concerns around analyses and interpretation of data. However, it may also benefit the thesis. In the analyses of the data I have been guided by the added understanding of the professional context which I have gained from my experience in practice. My own situated learning (e.g. Collins, 1988), from working with the two curricula which have been current during the time of the study may have contributed to a better understanding of issues related to specific parts of the teacher responsibility, in its own and also in relation to the practicing as a teacher. Additionally, my authentic experiences have guided my understanding of the teachers' whole professional context and situation. This, in turn, may have been helpful in formulating follow-up questions during the interviews and in trying to understand the respondents' replies from a perspective of a practicing teacher. The dual role may have enabled me to pick up on nuances in the replies, nuances which I then have been able to address for further clarification. However, my situated learning may also have inhibited me from identifying aspects and dimensions which a more neutral researcher may be able to identify. A researcher who is less involved in the actual teaching practice may be able to identify issues and interdependencies which are more general and possibly relate to CPD within other work practices as well. Still, in my dual role, I have made great effort to convey the respondent teachers' voices, whether in group or individually, more than my own voice. My simultaneous position as a teacher may have been helpful in my ambition of presenting the researcher's findings with understanding and empathy for the teachers' situation in a profession exposed to an increasing intensity.

The longitudinal study (Paper III) was enabled through my part-time position as a PhD student. It adds value simply by being longitudinal in a field a predominantly short-term studies. The longitudinal approach has allowed time for the mediating processes of enactment and reflection to act between the domains of change (Clarke & Hollingsworth, 2002). The data collection over a longer period of time allows for a delay from CPD to teacher change and consecutively also to teacher growth and impact on practice as observed by e.g. Jones and Carter (2007). The longitudinal approach has also allowed more time for other processes in the teachers' professional and social context to happen. This may make it more difficult for the respondents to pinpoint their perceptions of their change and growth in relation to the CPD itself. Teachers may change and grow from other influences in their professional context.

6.2. The qualitative research approach

All separate studies in this thesis are framed within qualitative research. The open-ended questions give room for the respondents to discuss issues which they themselves want to put forward in relation to the topic questions. The qualitative research approach additionally provides for responses on a detailed level; often with concrete examples from the respondents' own professional context. The qualitative approach is a valid approach in a response to Opfer and Pedder's (2011) appeal to study CPD effectiveness on an individual level rather than on a general level and to describe conditions under which teacher growth happens. The qualitative data additionally provide information on mediating processes, the interaction, between the domains of change (Clarke & Hollingsworth, 2002) which concern the teacher; the external domain, the personal domain and the domain of practice. It opens up for illustrating the teachers' individual outcome routes (Harland & Kinder, 1997) and the teachers' different responses to the CPD (Shulman & Shulman, 2004).

The research plan for this thesis as well as collection and analysis of data is done predominantly by me. Analysis of data in Paper I is additionally performed by my supervisors for reliability reasons. Collection and analysis of data for the Norwegian respondents in Paper II is done by the co-author of that article.

6.3. The teacher level focus

Although the work in this thesis is directed towards contributing to an increased student interest and learning in science and technology, this thesis focuses on the teacher. The reasons for this include the large impact which the teacher has been found to have on students' interest and learning (e.g. Hattie, 2009) and the observed time lag between teachers' changes in beliefs and consecutive changes in teaching practice (e.g. Jones & Carter, 2007). Additionally, keeping the teacher level focus

in all the separate studies provides information from different perspectives around teacher change in relation to CPD.

6.4. Selection of respondents

Through an EU-funded project in a region on the west coast of Sweden, free academic CPD courses and inspirational days in entrepreneurial learning could be offered from 2007 – 2010. Teachers at all levels, school leaders, career counselors and teacher assistants active in school were invited to register and participate in the courses or inspiration days.

The aim of the course was to inspire and support teachers and whole school organizations to provide entrepreneurial learning environments for the students. The CPD message; i.e. entrepreneurial learning, was not defined in exact terms. However, it can be described as an essence of the components listed in Table 1 in Chapter 2. The CPD course included several of the factors which have been found to have positive impact on the effectiveness of CPD on a general level:

- Exposition to new content and ideas (Day, 1999) and exploration of theory (Joyce & Showers, 1988) which described teacher approaches for providing more entrepreneurial learning environments.
- Focus on learning and learners (Guskey, 2000); the learning and motivation of the teachers as well as the teachers' students were in focus during the course. Several of the activities required the participating teachers to reflect on their personal and external domains and the domain of practice; their teaching practice.
- Demonstration (Joyce & Showers, 1988), for example from inspirational lectures on concrete examples of how to provide an entrepreneurial learning environment.
- Pedagogic discussions (Adey, 2004; Anderson, 2007; Day, 1999; Desimone et al., 2002; Shulman & Shulman, 2004; Totterdell et al., 2011; Tytler, 2007) during CPD and through examination assignment. The examination project was to plan and execute an entrepreneurial learning project in practice, which in turn provided training in new skills (Day, 1999).
- Feedback and coaching in the classroom (Joyce & Showers, 1988) was encouraged among the colleagues, however not offered as an activity included in the CPD.
- Emphasis on both individual and organizational change (Guskey, 2000).
- Encouragement to proceed with small changes on the way to a major goal (Guskey, 2000).
- Ongoing professional development in the sense that the five course days were spread over at least six month (Guskey, 2000; Johnson, 2007).
- Reflection of the ideas being introduced (Adey, 2004) was done through a variety of mandatory assignments, such as role-play, during the course days.

- School management and organizational support (Adey, 2004).

The CPD course furthermore included the characteristics needed for effectiveness according to Opfer and Pedder's (2011) conclusion regarding the The Teacher Professional Training Activity; it was embedded in the teacher's practice, required reflection, individually and collaboratively, and the teacher was given time to adjust and absorb the message of the CPD. It can be concluded that the CPD course included several of the factors considered to be important for effective CPD on a general level.

Some school managements registered the entire school staff, either to a whole course or to one inspirational day, in which case the CPD was arranged to suit a larger group of participants. All the Swedish respondents, but one, were selected among the participants in the academic CPD courses; one of the respondents participated in an inspirational day. The respondents from Norway, which have contributed to Paper II, were selected as described in the Paper II.

Most of the respondents who contributed to Paper I had registered for the CPD intervention on their own initiative. They had a positive attitude towards changing the teaching practice and approach to the students towards including more components from entrepreneurial learning. Thus, these respondents may have introduced a positive bias to the results. Since the aim in Paper I was to identify as many categories as possible, without any quantitative claims, the positive bias may in fact have contributed to more comprehensive results than otherwise.

The results from Paper I influenced the choice of respondents for Paper II and III. The teachers' perceived requirements identified in Paper I include the *school management*, *colleagues* and *CPD* as directions of concern. The respondents in Paper II and III appeared to have these three directions of concern addressed in a positive manner; they appeared to enjoy support from the school management, be part of coherent teacher teams and they had all participated in CPD. This conscious choice in the selection of respondents for Paper II and III made possible an investigation of paths of growth for teachers for whom some of the identified requirements seemed to be fulfilled to some extent. Three of the respondents who contributed to Paper II and III had been registered to the CPD course by their school management, one had volunteered for the CPD course and one participated in the inspirational day on the school management's initiative.

The respondents, who contributed to Paper I, are different from the respondents in Paper II and III. The respondents in Paper I include all categories of teachers in compulsory school, whereas the respondents in Paper II (Swedish) include five lower secondary school teachers in science and technology and one social science teacher, who works in close collaboration with a science and

technology teacher. The respondents in Paper III include four of the same science and technology teachers and the same social science teacher as in Paper II.

6.5 Collection of data

In all three studies the data is collected within the framework of qualitative research. In Paper I the data was collected using a paper questionnaire with open questions directly related to what they perceive as requirements and barriers for integrating collaborations with the surrounding world in the teaching practice. In Paper II and III data was collected in qualitative research interviews. The initial topic questions related to the organization and to their processes of planning the teaching practice. Other questions, still open, were more specifically directed towards their perceived outcome from the CPD in entrepreneurial learning and their attitudes and approaches towards integrating collaborations with the surrounding world in the teaching practice.

Data for Paper I and from the final interview in Paper III (except for two of the respondents, as per their wish) is collected from individual teachers. Data for Paper II and the first two interviews for Paper III are collected from group interviews. All data can be traced back to individual respondents.

Before agreeing to participate in the respective studies, the respondents were informed about the aim of the study, their right to choose whether to continue to participate or to withdraw during the time of the study. They were also informed about their legal right to withdraw, at any time, all collected data from being presented. They gave a written consent, in coherence with the rules of ethics at the University of Gothenburg, to collection and storage of data under the specified conditions.

6.6. Analysis of data

The categories of the teachers' perceived requirements in Paper I and the critical factors in Paper III were identified from the empirical data without any pre-defined categories. This was done with the intention of not restricting the analysis, in turn in the purpose of increasing the likelihood of identifying the diverse and varied issues which the respondents chose to point to. Also in Paper II, outcome was initially coded for without any pre-defined categories. Only thereafter, the outcome statements were categorized according to the typologies in the CPD evaluation model presented by Harland and Kinder (1997).

For reasons of reliability the empirical data in Paper I was categorized independently by me, the researcher, and my supervisors. The terminology of the categories and sub-categories was then agreed upon in collaboration. The empirical data in Paper II was categorized independently by the co-author of the article and me at two separate times with a time lapse of at least six months. The

results from the two analyses were cross-checked and compared by both of us in collaboration. The comparison was concluded with a discussion in which we reached an agreement, regarding all the outcome statements, on the interpretation of the outcome typologies.

Paper I and II are reported on a group level. The purpose of these studies is to identify as many different aspects as possible, in relation to the different research questions in the separate studies. Paper III is reported on an individual level, since it aims at describing individual teachers' professional growth and to learn about the interactions between factors known to have impact on CPD effectiveness.

6.7. Validation of narratives

The narratives presented in the manuscript for Paper III were sent to the respective respondents for validation together with a letter in which the aims and an overview of the research was again presented to them. The letter emphasized that the study does not investigate their teaching practices per se, but rather what they perceive as their outcome from the CPD course. The letter also included a statement which opened up for them to choose not to comment on the narrative, but that I desired an acknowledgement about whether they had read the narrative or not. All respondents replied and gave their consent to publishing.

7. RESULTS

This chapter shortly presents the results from each separate Paper, gathered under the common aim of investigating compulsory school science and technology teachers' perceptions and change in relation to CPD in entrepreneurial learning.

7.1. Paper I: Teachers' perceived requirements for collaborating with the surrounding world.

The research question was:

What do teachers perceive as requirements for collaborating with the surrounding world as an integrated part of their teaching?

Teachers do perceive requirements for collaborating with the surrounding world as an integrated part of the teaching practice. The analysis of the questionnaire replies was performed without any pre-defined categories. The directions of the teachers' concern fall into 13 main categories of requirements. Most of the main categories additionally include sub-categories. The *school management*, *time* and *personal character traits and disposition*, are the main categories represented by the largest number of statements, closely followed by *colleagues*. Other directions of concern, as perceived by the teachers', are the *surrounding world*, *economy*, *professional development*, *curriculum and grading system*, *localities*, *students'* as well as *parents'* attitudes and beliefs and the *union*. The individual teacher has a low degree of influence, within a reasonably short time, over most of the main categories, and only a high degree of influence on sub-categories within the *personal character traits and disposition*, on *professional development*, the *local curriculum* and certain aspects of *time*.

Directions of concern which have not previously been identified in relation to teachers' collaboration with the surrounding world are *economy*, *the local curriculum*, *localities*, *teachers' union* as well as *time* to reflect on and adjust to a new teaching practice.

The teachers' replies provide detailed information about the main categories and the sub-categories. They point to issues which may be valuable to address in school development and in CPD which includes the aim of inspiring and supporting teachers to integrate collaborations with the surrounding world in the teaching practice, at all or to a higher degree. The findings may additionally be of assistance in compulsory school teachers' responsibility to help the students to make well-informed choices of future education and careers.

7.2. Paper II: Expanding teachers' competences in authentic and entrepreneurial teaching issues in science and technology - an investigation of two approaches.

The research questions were:

- What outcomes, as expressed by the respondent teachers, can be identified from the two courses?
- What is the contribution to the overall variation and diversity in outcome-types from exploring the different approaches?
- How do the teachers' responses reflect the different approaches?

Both CPD courses show outcome in all of Harland and Kinder's (1997) typologies except for *institutional outcome*, which is not represented among the respondents from the Norwegian course. The two CPD courses do, however, result in different outcome-types within the typologies. The Swedish respondents express outcome types which relate to general aspects of teaching strategies, whereas the Norwegian outcome types are represented by more specific and content-related activities and material integrated in the teaching practice. Thus, the variation and diversity in outcome types reflects the different foci, in relation to a teacher's professional knowledge, of the two courses. Furthermore, *motivational and attitudinal outcome* statements from the Swedish respondents are more oriented towards the teachers' practice and the student learning than they are from the Norwegian respondents, whose increased motivation and positive attitudes are mainly related to their own learning of new knowledge and skills. The Paper illustrates that transfer of teaching strategies, from a self-experienced learning in an authentic setting, to the teacher's own practice does not automatically occur, even though the experience results in strong *affective* as well as *motivational and attitude* outcomes.

7.3. Paper III: Long-term teacher growth from CPD on entrepreneurial learning – a narrative approach

The research questions were:

1. What critical factors emerge from the teachers' stories after the CPD in entrepreneurial learning?
2. What paths of growth do the individual teachers illustrate?

The five respondent teachers included in this Paper on teacher growth in relation to CPD in entrepreneurial learning illustrate five different paths of growth. Factors previously found to have impact on teacher growth from CPD are confirmed: *school management, colleagues, personally related factors* and *time*. However, these factors may have positive or negative impact; hence they are considered to be critical factors for an individual teacher's path of growth. Teachers' professional growth from CPD about entrepreneurial learning varies to a large degree even if the teachers seem to share aspects from the external domain of change. The teachers' personal domain of change and the degree of the collegial coherence is found to have large impact on the teachers' professional growth. In this Paper, the degree of collegial coherence is found to be more critical to an individual teacher's growth than support from the school management. The collegial coherence can compensate for lack of support on an organizational level; however lack of collegial coherence is not compensated by moral support from the school management. Furthermore, the strong influence of teachers' perceptions of the CPD message is confirmed. Moreover, the findings point to additional concerns in relation to entrepreneurial learning, due to the concept's political, ideological and economic connotations. Additionally, the impact of the teacher's willingness to participate in CPD and the sense of meaningfulness in participation is illustrated. The findings suggest that the focus on trying to identify general factors critical for effective CPD should be exchanged for a focus on the individual teacher, the teacher's personal domain and professional context.

8. DISCUSSION and IMPLICATIONS

The three studies in this thesis investigate teachers' perceptions and change in relation to CPD in entrepreneurial learning. However, on the basis of the general character of skills and competences included in entrepreneurial learning, the findings may be used to guide teacher change and school development on a more general level, as well. The purpose of this discussion is to reflect on findings from this entire work. Additionally, implications for the field of education practice and suggestions for future research will be presented.

8.1. Teachers' perceptions

The first part of this discussion discusses findings from this thesis on teachers' perceptions in relation to CPD in entrepreneurial learning. Findings related to the other part of the aim, to investigate teachers' change in relation to CPD in entrepreneurial learning, will be discussed in section 8.2.

8.1.1. Requirements and critical factors

Teachers do perceive requirements for integrating collaboration with the surrounding world in their teaching practice. Previous studies which discuss schools' collaborations with the surrounding world have done so in relation to authentic learning environments (e.g. Aikenhead, 2004) and have explored the project, the student outcome or consequences for the teacher role (e.g. Bencze & Hodson, 1999; Braund & Reiss, 2006; Doppelt, 2005). They have not directly investigated the teachers' perceptions of requirements for collaboration with the surrounding world. The direct focus in Paper I may explain the identification of issues that have not been found in earlier works; *economy, localities, the local curriculum, teachers' unions* as well as *time to reflect and adjust to a different teaching approach*. In addition, the direct focus on requirements (and barriers) for integrating collaborations in the teaching practice have provided detailed information about issues which teachers may need to have addressed for them to change their teaching practice. The categories of requirements which the teachers seem to perceive as the most influential; the *school management, personal character traits and disposition, time* and *colleagues*, agree with the critical factors emerging from the stories which other teachers tell while describing their teacher change in relation to CPD in entrepreneurial learning in Paper III.

Hence, the factors that seem most critical to address for teacher change, as perceived by teachers themselves, agree with factors previously found to have impact on CPD effectiveness on a general level; school management and organizational support (e.g. Johnson, 2007) as well as the collegial coherence and the pedagogic discussion (e.g. Adey, 2004; Anderson, 2007; Shulman & Shulman, 2004). The majority of the teachers' perceived requirements are general in character, even though the research question related to integrating collaborations with the surrounding world in the

teaching practice. it thus seems reasonable to presume that the teachers' perceived requirements are important to address also in CPD in general.

8.1.2. The Interconnected Model for Teacher Professional Growth

The categories of the teachers' perceptions of requirements and the factors perceived by the teachers to be critical for teacher change are included in the personal and the external domains of change in the Interconnected Model for Teacher Professional Growth by Clarke and Hollingsworth (2002); school management and colleagues are part of the external domain of change and personal character traits and disposition as well as personally related factors are part of the personal domain of change. Clarke and Hollingsworth found that teacher growth is more likely to happen when change happens in more than one domain, thus the findings provide information about issues, in the personal and external domains of change, which teachers perceive a need to have addressed in CPD. Time may be included in both of these domains but may also represent the mediating processes of reflection and enactment between the domains.

8.1.3. Interdependency between requirements

The interrelation between the domains in the Interconnected Model is reflected in the interdependency between the categories of teachers' perceived requirements. This is clearly illustrated by how the teachers discuss *time*. *Time* can refer to hours and minutes, as in time, allocated by *the school management*, to plan together with *colleagues*. The teachers' approach to the organization of his/her working hours depends on *personal character traits and disposition*. *Time* is also needed to reflect on and adjust to a new way of teaching, which may be inspired by some form of *professional development*. The narratives illustrate that the interdependency, which is embedded in teachers' perceptions about requirements, may actually get manifested in teachers' change processes, as discussed below.

8.2. Teacher change and growth

The narratives in Paper III illustrate that the personal domain of change has large impact on an individual teacher's growth. The different paths of growth describe how the teachers' perceived critical factors from Paper III and the requirements from Paper I may influence teacher change. Additionally, the narratives illustrate circumstances under which teacher change may or may not occur. Teacher change is an indicator of CPD effectiveness, which thereby also will be discussed. The findings from Paper II provide information on different types of teacher change which may represent outcome in evaluations of CPD effectiveness

8.2.1. The personal domain of change and teacher growth

Paper III points to different aspects, within the personal domain of change, which seem to have impact on teacher growth. One of those aspects is the teacher's attitude towards the CPD itself. Ulla and Allan express disappointment due to the fact that all teachers were registered to the course by the school management without any prior discussion with the teacher teams. Allan and Ulla expressed resistance mainly due to a sense of not having been able to complete previous school development initiatives. Allan additionally seems to resist the concept entrepreneurial learning. Opfer and Pedder (2011) conclude that teachers, when given a choice, tend to participate in training activities which are aligned with their own orientation towards the learning systems. Additionally, Day and Sachs (2010) point to the benefit of having a situation in which both the individual teacher and the organization simultaneously feel the need for a change in teaching practice. Since this was not the situation for Allan, this may have had a negative influence on his growth, which indeed was not as distinct as some other respondents' growth. The teachers' alignment with the CPD message may be particularly important in relation to entrepreneurial learning, due to the political, ideological and economic connotations associated with it (Johannisson et al., 2010; Leffler, 2009).

8.2.2. The external domain of change and CPD effectiveness

The narratives in Paper III are presented on an individual level, hence they provide information on circumstances under which teacher change and growth may be supported and realized in relation to factors from the external domain. The *school management* is expected by the teachers to provide moral and organizational support. Support from the *colleagues* is additionally perceived as critical. The indication from the perceived requirements is that school management support is more critical than collegial support. However, the narratives indicate that the degree of coherence among the colleagues in the teacher team is more critical for teacher growth than school management support. Furthermore, the narratives indicate that organizational support from the school management is more critical than moral support. The teachers' paths of growth described in Paper III indicate that lack of organizational support may be compensated by a high degree of coherence in the teacher team, whereas a low degree of coherence in the teacher team was not found to be compensated by school management's moral support.

Ulla is positive towards changes in agreement with the CPD message and also enjoys the school management's moral support. Still, she seems to be somewhat inhibited in her growth due to a sense of lack of collegial coherence and support. As her professional context is changed to include colleagues which have all volunteered to be part of a school development team, Ulla starts taking active part in inspiring and supporting the colleagues in her new teacher team. The new pace in her teacher growth becomes one of the sources and reasons for her step to become a school leader at

the same school. This example illustrates the indication of the collegial support to be more critical for teacher growth than school management support. Another example is from the same school and presumably the same school management support. Gilbert works in a coherent teacher team supportive of changes. Although Gilbert senses a lack of organizational support, he exhibits teacher growth to an extent that he can point to concrete examples of changes which he has introduced into his teaching practice. Berit and Veronica, who enjoy similar support from another school management, exhibit different paths of growth, which they, themselves, interpret as related to the degree of collegial support. Berit, who is in a more coherent teacher team, positive towards change in line with the CPD message, continues to exhibit growth during the time of the study. Veronica has a feeling of getting her wings clipped in her teacher team, which is not in agreement with her own desires for changes on an organizational level. These examples describe circumstances under which teacher growth occur to varied extents and how teachers may respond differently to external factors in the professional context. Opfer and Pedder (2011) and Clarke and Hollingsworth (2002) lift the importance of investigating circumstances, individual responses and interactions between domains of change rather than searching for general factors having positive impact on CPD effectiveness. The narratives on the five teachers' different paths of growth provide information according to those desires.

8.2.3. CPD effectiveness

The work in this thesis illuminates, from different perspectives, factors that influence the results from studies on CPD effectiveness.

'At what' is the CPD effective?

The findings from Paper II reveal that CPD which may be regarded as having potential to be effective, based on using Harland and Kinder's (1997) model for CPD evaluation, may not be effective at what it is expected to be effective at. Both courses were found to result in outcome in all typologies included in the model, except for lack of *institutional outcome* from one of the courses. The results show, however, that the outcome types vary within the typologies for the two courses. The outcome types reflect the different foci, in relation to a teacher's professional knowledge base (Shulman, 1987) and a teacher's ability (Shulman & Shulman, 2004), of the courses; what much be taught; i.e. the content knowledge and skills in one course and how to teach it; i.e. teaching strategies in the other course.

A longitudinal perspective on CPD effectiveness

The longitudinal perspective in Paper III make clear that conclusions concerning CPD effectiveness may vary with time lapsed after course finish. Gilbert, who exhibits teacher growth in the final interview, did not indicate teacher change at the initial interview. Veronica, who indicated teacher

change and expected growth in the initial interview, turned out to express inhibitions to change and growth at the end of the study.

Many studies on CPD effectiveness include measurements from only one or a few occasions during short period of time. This may be due to issues on cost-effectiveness, time limitations in research projects and to the difficulty of having the same respondents available and willing over a long period of time. Due to my dual role as a teacher and a researcher I had the opportunity to collect data over a longer period of time.

8.3. Group level - individual level

The overall aim of this thesis includes an aim to convey teacher's voices, both as a group and as individual teachers, in relation to different issues regarding the shaping of an entrepreneurial learning environment for their students in science and technology. The empirical data for Paper I and Paper II is analyzed and reported on at a group level. The purpose of the group level approach was to increase the likelihood of identifying as many categories and as a large a variation and diversity as possible. The empirical data for the critical factors for teacher change and growth in Paper III are also analyzed and reported on a group level, whereas the narratives are analyzed and presented on at an individual level. The group level investigations provide information about issues which teachers may have to deal with on an individual level. The requirements and the critical factors are, indeed, discussed in the teachers' individual narratives. They are, however, discussed in different ways, with different attitudes and in relation to different circumstances for each individual teacher. The circumstances under which these different responses occur and the forms in which they are expressed provide information which, in turn, may be valuable for CPD initiatives on a group level.

8.4. Entrepreneurial learning

The concepts entrepreneurial learning and authentic learning are used and perceived in many different ways, as reviewed in Chapter 2, which also presents a comparative analysis of the two concepts. The separate overviews help clarifying these concepts, which may both be interpreted in narrow as well as broad perspectives (e.g. Stevenson & Lundström, 2002; Rahm et al., 2003). The broad interpretations and understandings of the concepts exhibit many similarities and Chapter 2 presents several components which may be included in both approaches. The listing of the components is a contribution in itself, representing summarized descriptions based on several previous efforts to describe and define these concepts.

The similarity between entrepreneurial learning and authentic learning (and also with many other concepts, as summarized in Chapter 2) leads to the question of why new concepts are introduced to

the field of education. It may seem that it is the terminology rather than the approach which is new, as expressed by two of the respondents in Paper III, as well as in earlier work on inquiry learning (S-TEAM, 2012). One possible explanation may be that a new terminology is introduced to emphasize a slightly different focus. In the context of authentic learning, Rahm et al. (2003) point to the concept as currently being popular within science education at that time. This 'current popularity' may be manifested in the field of education research and practice, however also in the field of education politics. A current popularity in the field of education politics may result in increased possibilities to get funding for research as well as development projects. However, the introduction of concepts that are not perceived by the teachers to be new may be counterproductive. Teachers' perception of not being introduced to new educational approaches or strategies may cause frustration among teachers and additional lack of trust in research findings and initiatives. In this way, it may also work against desires of bridging the gap between the field of education research and practice. This desire is the basis for the existence of the program at the research school in which I have worked with this thesis; CUL Research School, Centre for Educational Sciences and Teacher Research at University of Gothenburg.

8.5. Implications

The findings from this thesis have implications for different levels within the field of education practice and for education research.

8.5.1. Implications for CPD and research on CPD effectiveness

CPD often includes desires for specific changes in teaching practices. Since it is the teacher who shapes the teaching practice, it is important to listen to what teachers have to say in relation to teacher change. Here are some issues which the respondent teachers in this thesis seem to want to convey.

Teachers' perceptions in relation to changes in teaching practice

The teachers' perceptions of requirements (and barriers) for integrating collaborations with the surrounding world illustrate issues that are important to address in future CPD and future research on CPD in entrepreneurial learning. So do the factors which the teachers perceive to be critical for teacher change and growth. The general character of the requirements and the critical factors indicate that the findings may guide CPD and research efforts also in relation to other aims for changes in teaching practices. On the basis of the strong influence from teachers' attitudes and beliefs on the teaching practice and on CPD outcome (e.g. Crawford, 2007) the issues which the teachers have pointed to in *personal character traits and disposition* and in *personally related factors* may be particularly important to address in the context of CPD. The influence of the personal domain

may be even stronger in relation to entrepreneurial learning, due to the political and economic connotations (e.g. Leffler, 2009) associated with the concept and the occurrence of both narrow and broad interpretations (e.g. Stevenson & Lundström, 2002) of it.

Further research is needed to learn more about how the teachers' perceived requirements (and the implied barriers) may be addressed effectively in practice and to what extent this would have an effect on the teaching practice.

What is the CPD expected to be effective at?

Furthermore, the aim of the CPD; i.e. the change message is important to clarify in order to achieve a higher degree of CPD effectiveness. What is the CPD expected to be effective at? This is also important as a foundation for a valid measurement of CPD effectiveness. The results from Paper II indicate that CPD including both concrete examples of content as well as teaching practices may be needed in order to achieve teaching outcomes which represents impact on practice from both of these aspects of a teacher's professional knowledge. Further research is needed to confirm these indications. Would the outcomes from the course with a focus on general teaching strategies, inspired by entrepreneurial learning, have been represented by more concrete, rather than general, examples if the course more explicitly had discussed the teaching strategies in relation to the content knowledge relevant for the teachers? Likewise, would the outcomes from the course which focused on content knowledge in an authentic setting have been more directed towards changes in teaching practice if the teacher activities had included discussions and reflections on the teachers' own experience from learning new knowledge and skills on a rocket range?

The personal domain, time and CPD effectiveness

The longitudinal approach in Paper III indicates the value of measuring teacher growth and CPD effectiveness over a longer period of time. The individual paths of growth illustrate that an initial significant teacher change may not necessarily result in significant teacher growth at a later point of time.

Additionally, the longitudinal approach in Paper III indicates the strong impact of the personal domain on CPD outcome; teachers who are at the same school, have the same school leader and are part of the same teacher team, exhibit different paths of growth. These findings are aligned with Opfer and Pedder's (2011) conclusion that CPD which is effective for one teacher, does not necessarily work for another teacher at the same school. The findings suggest that professional development initiatives should consider the individual teacher's situation and context in the purpose of an increased degree of impact on the individual teacher's change, growth and impact on practice.

Along the same line, measurements on CPD effectiveness may be more valid if they consider individual teachers' personal domain at the initiation of the CPD and measure the teacher change in relation to this reference point. If teacher change is studied in relation to a goal which is set up at a group or general level teacher growth, which may have been significant for one individual teacher, but less significant in relation to the group level goal, may not be visible in the measurement. This is pointed to also by Harland and Kinder (1997) who find that teachers who fulfil several outcome typologies already before CPD are more likely to change their teaching practice to approach the ultimate group level goal, within a shorter-term.

8.5.2. Implications for the school organization

The respondent teachers talk about organizational issues on different levels, such as the teacher teams and the school schedule. These are issues which are perceived to be the school management's responsibility according to the teacher's requirements from Paper I and the critical factors from Paper III.

Teacher teams

The indication of the strong influence from the degree of collegial coherence on teacher growth may be valuable to address on an organizational level in school development efforts, whether or not in connection with formal CPD. What competences and other personally related factors should be considered in arranging the teacher teams? Which is the most effective balance of these competences and personally related factors within a teacher team to achieve an effective school development? Additionally, the composition of the teacher teams, in relation to coherence around the change message, may be valuable to consider and possibly rearrange. Further research is needed to guide school managements on how to arrange the teacher teams in ways which favour the desired changes to a larger degree.

Organizational changes

Additionally, the school management may want to consider other organizational changes which agree with the message of the school development and/or CPD. The findings indicate teacher frustration over, for example, a school schedule which makes it complicated to provide an interdisciplinary teaching practice.

Career counsellors

The teachers and the career counsellors in Sweden have a joint responsibility to help the students make well-informed decisions about future education and career (Lgr11). Thus, the information about teachers' perceived requirements for integrating collaborations with the surrounding world in

the teaching practice may also be of guidance for career counsellors who aim to establish collaboration with the teachers in the teaching practice.

8.5.3. Implications for the introduction of future research findings

Efforts to introduce new educational concepts may encounter teacher resistance. The longitudinal study shows examples of teachers' wary of too frequent introductions of new methods and responsibilities. Additionally, there are examples of teachers viewing the new concept just as a new name on teaching strategies which they already use. The analysis of two related educational concepts in Chapter 2 shows, indeed, a strong resemblance between the concepts and the differences are hard to discern. The processes of introducing new concepts into the field of education and the reasons behind these introductions need to be further investigated as do the recipient teachers' reactions and responses. A better understanding of these processes and the teachers' responses to new concepts may guide the introduction of future research findings which may have positive impact on students' interest and learning and this may contribute to teachers more easily accepting the new findings and incorporating them into their teaching practice.

8.5.4. Suggestions for extension of research

As this thesis focuses on teachers, questions about students' responses and outcome from working with school assignments in entrepreneurial learning environments have not been investigated, but would, of course, be valuable as an extension of this work. Since entrepreneurial learning includes many different and varied components presented in writings on the concept, it would be helpful if these studies focused on only a few and well specified components at a time. With the help of research findings from specific entrepreneurial learning studies on student level effects, the benefits as well as the issues involved in entrepreneurial learning may be addressed in powerful ways in the fields of education practice, education research and education politics.

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