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Teacher Training in Finland

A Case Study

A dissertation submitted in partial satisfaction of the
requirements for the degree Doctor of Philosophy
in Education

by

Susan Maria Wiksten

2018

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ABSTRACT OF THE DISSERTATION

Teacher Training in Finland

A Case Study

by

Susan Maria Wiksten

Doctor of Philosophy in Education

University of California, Los Angeles

Professor Carlos Alberto Torres, Chair

This Ph.D. dissertation is a qualitative case study of a local discourse about teacher preparation in Finland. I have used structuration theory to analyze thirteen semi-structured, open-ended interviews. Participants were faculty and students in a graduate-level program preparing science teachers for upper secondary schools. Findings are presented as synthetic overviews of respondent articulations on six interview themes: (1) goals of teacher preparation, (2) the role of collaborative practices in teacher preparation, (3) the role of research in teacher preparation, (4) the role of critical thinking in teacher preparation, (5) different forms of knowledge and skills in teacher preparation, (6) the good teacher. The research contributes to research on pre-service teacher training. Notably, by articulating how context-specific culture and social norms contribute to a local variant of teacher preparation. Two characteristics of the discourse are

identified as: (a) an emphasis on the role of theory for sound decisions in teaching practices, (b)
a focus on the development of abstract thought in students.

The dissertation of Susan Maria Wiksten is approved.

Joshua Dienstag

Megan Franke

John Rogers

Carlos Alberto Torres, Committee Chair

University of California, Los Angeles

2018

To the children who, like my mother,
are survivors of violent political conflicts.

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VITA

Susan Wiksten is a Dean's Scholar at the UCLA Graduate School of Education. Since 2007, she has worked with administration, credential evaluation and research in education in Denmark, France and the U.S. She obtained an M.A. in Comparative Education from Université Paris Descartes (La Sorbonne), France in 2013. She holds a prior M.A. in the Humanities from Åbo Akademi University in Turku, Finland.

In recent work, she has provided research assistance to the World Council of Comparative Education Societies (WCCES), the UNESCO Chair in Global Learning and Global Citizenship Education at UCLA as well as the UCLA International Institute. At UCLA, she has held administrative and graduate student research positions as well as Reader and Teaching Assistant positions at the Graduate School of Education and Information Studies, the Division of Social Sciences and Comparative Education, the Department of Humanities and the International Institute. Her service as co-chair of the Teacher Education and the Teaching Profession Special Interest Group of the Comparative International Education Society (CIES) and her contributions as speaker and organizer for the Paulo Freire Institute at UCLA reflect her dedication to supporting the promotion of participatory practices in education.

1. Introduction

When I conducted interviews and participant observations in Finland in September 2016, I used the local commuter transports daily. Often, I would take a local train that took me in twenty minutes from a suburb to a downtown area. The downtown area, was a fifteen-minute walk from the campus of the research university where I conducted several of the interviews on which I report in this Ph.D. dissertation. For interviews at one of the two normal schools and a newer campus in a suburban area, I would take the local busses instead.

On several occasions, I noticed schoolchildren travelling with me. The large majority of students in K-12 education at the research site traveled to school using the same public commuter traffic as I did. Most of the routes that I travelled in 2016, were familiar to me from my adolescence as I have lived, studied and worked for many years in the setting that now presented itself as the site of my field-research. The environment was familiar and yet different, as I had not lived here for some fifteen years. I noticed new train lines and structures had been added over the years. Some of the older structures I recognized were showing signs of aging.

This was a familiar environment that I was comfortable in moving about. However, now as also before, the local commute was not comfortable on every single occasion. In the following, I describe an incident that caught my attention on September 5th, 2016. The incident provides an example of the various concerns and anxieties associated to commuter traffic at the field research site.

Loud and angry shouting could be heard soon after the train had parted from the station. The angry shouting came from the next train compartment, so I could not see the person who was shouting. The voice sounded like the voice of a woman. The train was full of commuters and many around me reacted to the shouting by turning around to see if they could see what was going on. Some stood up to have a better look. My first thought was that perhaps there was a fight of some sort. However, it sounded like there was only one person producing the outbursts of loud anger. This observation did not ease my concern, or that of the other passengers, and I looked around to see if someone was going to

intervene. People around me seemed apprehensive, some throwing occasional glances in the direction of the shouting.

I thought about the number of stops the train was going to make before arriving at the main railway station downtown. I listened by each stop the train made, whether the shouter was going to leave. Also, I thought about trying to get hold of the train conductor, a person that usually walks through the train in the train cars designated for purchasing a ticket. I could not see a conductor nor did I know of any other way to call for help. Calling an emergency number passed my mind but was not something I could at the moment do. I did not have a mobile phone on me. I had seen unstable persons in the public transport before, I figured this was a case of that.

As passengers left the train at the main railway station, a lady whom I had noticed peering to the back of the train was leaving at the same time as me. As she looked anxiously towards the angry shouting that had not ceased, I said to her “It must be someone who is mentally ill”. She answered to me that she had at first thought that there was some violence going on and that this was scary. We continued to discuss as we stepped out of the train in the flow of passengers. Neither of us knew what to do in such a situation. I mentioned I had thought about alerting the conductor but did not know how to do that. By now, we were out on the train platform and we could see the conductor. He had stepped out of the train as well and was walking ahead in front of us. We could recognize him by an outfit that included a striped shirt and grey pants, a casual looking uniform. The lady I had talked with said “Oh, but there he is, let me just try and ask him”. She increased her pace and easily caught up with the conductor who was not far ahead. She addressed the conductor and he started talking to us as she asked about what to do in these kinds of situations. He said that he figured the train was so close to its final destination that it was not worthwhile throwing the woman off the train. He told us that he had come across another one who was lying on the tracks drunk and the police had just said to let her go home and sober up.

The conductor did not seem bothered about our questions, he kept reasoning by his decision to let the bothersome woman stay on the train. He explained that he did keep an eye on the feed from the cameras to see what was going on in the train cars. He told us there were two red panic buttons in the train car for passengers and that we could use those for alerting the conductor. We explained that we had not known of this. By now, we had walked up to the main railway station and I said goodbye to both of my new acquaintances as I continued on my way to the university.

*In the moment, I was struck by the communality of the discussion. The conductor was not condescending, nor did he make any references to regulations, nor did he in other ways try to distance himself from the concerned ladies posing questions about his work. He did not seem to consider our questions bothersome, despite the apparent difficulty of the topic. Instead, he was ready to share his experiences and to talk **with** us rather than just talking **to** us.*

(Wiksten, Research Journal September 6th 2016)

By providing the above excerpt from my research journal, I would like to introduce my reader to the context of the site of my field research. Providing such an excerpt gives as unfair of an account

of a Finnish city as a movie by Aki Kaurismäki does (2017; 2006; 2002; 1996). While movies by Kaurismäki are insightful and humoristic, they are also hated by many Finns because of the limited and ugly descriptions of Finnish society that Kaurismäki provides. Similarly as Charles Dickens and Hans Christian Andersen, Kaurismäki has provided a critique of the society of his time, veiled as fiction narratives. Those who do appreciate movies by Kaurismäki, do so in my view because they understand that he does not intend to depict Finnish society in full. Any form of description of a society is limited. Trying to propose that one could capture what characterizes a given society or context by any single narrative or description is a vain effort. Yet, that is part of the reason for why Kaurismäki's work has been disliked. He does not provide a complete image of Finnish society.

But then, what would a complete image entail? There are facts such as compiled in the World Factbook, where we find that the size of the geographical territory of Finland is comparable to the state of Montana in the U.S., the political regime of Finland is a parliamentary republic and the size of the population in Finland is approximately 5.5 million (Central Intelligence Agency, 2018). The composition of geography, economy, the demographics and the role of historical minorities are factual components that go into what characterizes Finland as a cultural context. However, as demonstrated by the mixed responses to the work of Kaurismäki, there is also an imagined component of Finnish society that is constructed, negotiated and contested over time (cf. Anderson, 2006).

The research I report on in this dissertation has an elusive quality. I do not pretend to give a full account of a culture of teacher preparation in Finland. However, I will attempt to outline characteristics of a discourse on teacher preparation that I have encountered in a set of interviews, at a specific location and a specific time. The quality of the findings presented is not that of

generalizable laws of nature, but the findings help to shed light on the meaning of teacher preparation in a specific culture.

This dissertation reports on a qualitative case study conducted in 2016-2017. The topic of the case study is a local discourse about teacher preparation in Finland. I have used structuration theory to analyze thirteen semi-structured, open-ended interviews. Structuration theory is a sociological theory (Giddens, 1986). Participants were faculty and students in a graduate-level program preparing science teachers for upper secondary schools. The findings include articulations on the goals of teacher preparation, the role and purpose of pertinent research and the role of critical thinking in subject-matter specialized teacher preparation.

My research contributes to research on teacher preparation. Notably, by articulating how context-specific culture and social norms contribute to a local model in which the forms of knowledge and skill-sets of teachers are understood as complex, interlinked and framed by societal discourses.

The goal of my research was to support a deeper understanding of the characteristics of a local discourse and to illustrate how teacher preparation is reasoned about in the case of a research university in Finland. The research was motivated by recent reviews of research on teacher education (Cochran-Smith et al., 2014, 2015) and critical responses to the ways in which international surveys contribute to the construction of global norms in education. That is, a form of globalization that is taking place in education (Sellar & Lingard, 2014; Andrews et. al., 2014). These and other contributions have underscored the importance of a better understanding of the context of teacher preparation and different cultures of teacher preparation.

A program that proclaims itself as the largest and most diverse unit of teacher preparation in Finland is interesting as a research setting for two reasons: (1) according to PISA (OECD, 2016b),

Finland has been described as an education policy regime and cultural context that has managed to support comparatively equitable student outcomes over time (Sahlberg, 2011), (2) I have worked for more than fifteen years with the translation of Finnish cultural and societal concepts and terminology into Swedish, French and English (cf. Wiksten, 2013). While the first point provides an explanation for why there has been some interest in Finnish teacher preparation practices, the latter point provides an underlying motivation for conducting a qualitative case study on a local discourse on education in Finland. A pilot and the case-study on which this dissertation reports were conducted with approval of the Institutional Review Board of the University of California, Los Angeles and with the consent of participants as well as the research university at which the interviews were undertaken. The research question was: *What can the interviews conducted tell us regarding the characteristics of a local culture of teacher education?*

This dissertation is organized as follows. The following chapter (chapter 2), provides a literature review. Chapter three presents a theoretical framework and methodology. Chapter four elaborates on research procedures. Chapter five presents the research findings by six themes and by topics signaled by research participants. The six research themes were: (1) goals of teacher preparation, (2) collaborative practices, (3) research, (4) critical thinking, (5) different forms of knowledge and skills, (6) the good teacher. A respondent narrative is compared in chapter five with a narrative from the Finnish oral tradition. Chapter five concludes by explaining the findings in light of structuration theory. The concluding chapter six, provides a synthesis of research findings. I propose two features distinguish the variant of teacher preparation I have encountered in the discourse that I have documented. (1) An emphasis on the role of theory for sound decisions in teaching practices. (2) The construction of the learning subject, i.e. the student, as an abstract thinker. Finally, in chapter seven, I discuss an agenda for future research. I propose that

Comparative International Education can contribute to teacher preparation by providing additional perspectives.

2. Literature Review

2.1. Paradigms or cultures of teacher preparation?

What does it mean to talk or write about a paradigm of teacher education or a culture of teacher education? Many scholars have proposed that teacher education cannot properly be conceptualized as a paradigm (Schuller, 2007; Lokhoff et al. (Eds.), 2010). The reason for this is that education as a field of research is not considered to be part of *scientific* research proper. In other words, education as a field of research is not one of the *hard sciences*, among which e.g. physics, chemistry and mathematics are considered. This observation made by Schuller and Lokhoff et al. is a recognition of the fact that research questions in education will often fall in the domain of the social sciences. The distinction between the natural sciences in modern academia and the social sciences is sometimes referred to as the distinction between *hard* and *soft* sciences.

The fact that education belongs in the research domain of the social sciences does not per se make it contradictory to refer to education as a paradigm. The social sciences hold several well established discourses and an established paradigm of research and analysis of education and other societal institutions (Coleman, 1994; Bourdieu & Passeron, 1970; Foucault, 1995). Yet, it seems that education comes across, even within the social sciences, as a particularly non-paradigmatic field of research. Can the history of research in education shed some light on why this is so?

Shulman notes that no distinction between knowing about a subject matter and knowing about how to teach said subject matter was made in the early European universities (Shulman, 1986, p.6-7). Teaching faculty at universities were organized as guilds (ibid). A purpose of guilds was to protect a craft-based livelihood by limiting access to a profession for non-guild members. Since the establishment of the early European universities in Paris and Bologna, a degree of reticence to share knowledge about practices of teaching was the norm. To readily share information regarding

instruction practices was against the best interest of subject matter specialists in academia. A simple reason for this was that the instructor's livelihood depended on such knowledge.

As noted by Cochran-Smith, it is only more recently that a public interest to conduct research on teacher education in a transparent manner can be observed (Cochran-Smith & Fries, 2008). Cochran-Smith and Fries explicitly refer to teacher education as a field of research in which Cochran-Smith and Fries observe what they propose are shifts in paradigms. Over the course of the 20th century, Cochran-Smith and Fries propose that there has been a shift from a focus on (1.) curriculum, (2.) training, (3.) learning, to more recently a focus on (4.) policy (ibid. pp. 1053 - 1058). In proposing that teacher education is a field that can be seen to be guided by a paradigm, indeed several paradigms, the work of Cochran-Smith and Fries presents the field of research on teacher preparation not only as a sub-species of the social sciences but indeed a field of research in its own right.

Similarly, the efforts of Cochran-Smith and Villegas to review the entire field of research on teacher education, can be understood as an effort to outline a current paradigm of teacher education (Cochran-Smith & Villegas, 2014; Cochran-Smith et al., 2015). A striking feature of the research paradigm outlined in the two articles by Cochran-Smith and Villegas is an articulated political intention. Cochran-Smith and Villegas propose a social justice agenda for research on teacher education (Cochran-Smith & Villegas, 2014; Cochran-Smith et al., 2015). A question of interest is to what extent such a claim is generalizable? To what extent is it safe to assume that what Cochran-Smith and Villegas choose as an important agenda, no doubt a valuable and worthy agenda, to what extent can the same agenda be understood as driving other researchers in teacher education?

Further questions could be asked regarding the proposed paradigms in teacher education. The claim that the research themes identified by Cochran-Smith and Fries are paradigms can be questioned using Kuhn's somewhat narrower definition of a paradigm (Kuhn, 1962). Kuhn explains paradigms as sets of shared references among scholars. I propose following Kuhn's definition of a paradigm, that education can be identified as a field of research that is in a "pre-paradigm phase" (Kuhn, 1962). A phase in which there does not, as of yet, exist a sufficient amount of shared or agreed upon references to comfortably refer to a paradigm that would be specific to education or the specific field of education that deals with the preparation of teachers (Kuhn, 1962; Bird, 2013).¹

My position to the question of whether research on teacher education is governed by paradigms is that it certainly is. However, I would like to distance myself somewhat from the research themes listed as paradigms by Cochran-Smith & Fries and propose, partly in line with Kuhn, that the more interesting paradigms for research on teacher education are those that relate to how we may understand the role of teacher education and research on teacher education in relation to modernity and stances critical to modernity. The interesting paradigms to consider are in my view the distinctions that have underpinned different views of the humans subjected to the practices of teacher preparation and education more broadly. I have already touched upon one such distinction which is made by the differentiation of *natural sciences* and *social sciences*.

A somewhat crude metaphor that illustrates a distinction of learning subjects is demonstrated by contrasting the Pavlov dog experiments and what is embedded in historically established concepts such as the German term *Bildung*. The former presents us with a learning subject that learns by

¹ Dr. Carlos Alberto Torres has proposed a definition for a paradigm as a 'logic in use'. The latter is compatible with the definition proposed by Kuhn if we recognize that the logic in use is not an individual logic but is a shared logic among adherents to the paradigm in question.

instinctive animal responses, the latter presents us with a learning subject who learns through enculturation. The latter approach to education is in an English language context illustrated by the ethos and practices of the Liberal Arts tradition of education (cf. Geiger, 2016, 2015). A characteristic difference in how the two approaches view learning subjects is that the former model of conditioned learning does not focus on metacognitive developments that are difficult to measure in single instances, such as the development of abstract thought. The model of enculturation instead, focuses comparatively more on the development of metacognitive thought, e.g. in the form of literary analysis (cf. Vygotsky, 1978).

A practical example of a metacognitive development is learning study skills. The Pavlovian approach to understanding learning as a conditioned phenomenon excludes discussions on study skills. The Liberal Arts tradition in contrast specifically requires the learner to reflect in a conscious way upon strategies and contradictions that are understood as part and parcel of human learning. The difference is that while the dog may go through a strategic effort or a conflict of interest, we do not request the dog to consciously reflect on the strategies or conflicts of interest that it finds itself in. The dog does not in its conditioned learning become, in Freirean terms, conscientized, it does not become critically aware (Freire, 1970).

The different paradigms of learners as either *conditioned* or *enculturated* is elaborated by Vygotsky in his review of developments in the field of research on cognition in the 1920s/1930s (Vygotsky, 1978). This is a time in history where Vygotsky identifies a paradigmatic division taking place. A divergence in which his own research as well as later adaptations by Bronfenbrenner come to represent a paradigm of the learner as a socio-cultural abstract thinker while the other camp to which he assigns Pavlov, for Vygotsky represented a paradigm characterized by the decision to bracket what is most characteristic to human learning, i.e. the

advancement of abstract thinking. Vygotsky explains that Pavlov decided to focus on a form of cognition that brackets abstract thought, in order to achieve easily measurable experimental results with physical response learning in controlled environments (as with laboratory rats) (Vygotsky, 1978).

Another distinction between paradigms that is relevant for the case study at hand is the distinction between practical reason and theoretical reason. A practice such as teacher preparation can “*intuitively be seen to belong first and foremost to the domain of practical reason*” as was noted by one of my research participants (Erik, interview September 19th, 2016). Erik, a Professor of subject matter specialized teacher preparation, continued by explaining why in his view teacher preparation needs to build on advanced theoretical understanding. Not a form of theory that remains on an abstract level, but advanced theoretical understandings that are relevant for practices of teaching. I will discuss this, and other articulations made by my research participants more extensively in the chapter on research findings. I provide the isolated example of a minute part of a conversation here as an example of how the paradigmatic divide between theoretical reason and practical reason is present in the research materials of this case study.

In identifying the divide between the paradigms of practical reason and theoretical reason as a key for understanding teacher education, I take another step in line with propositions made by Kuhn (1962). Namely, I propose that the paradigms that drive our understanding of a practice such as teacher preparation are situated within a broader history of science. To identify paradigms is following Kuhn a task of historiography. It is an effort to trace outlines of movements in the history of science (Kuhn, 1962). In proposing that the history of science is important for how we understand a field of practice such as teacher preparation is a give-away of my own scholarly background and interest in continental European discourse traditions in philosophy. As pointed

out by Korsgaard, the interest to *big questions* associated with continental philosophy was for a time period not accepted within the analytic branch of philosophy (Schaubroeck, 2008).

Many scholars e.g. in the U.S., viewed for some time that inquiry focusing on the functions of practical reason was the more appropriate route for advancing relevant scholarship (ibid.). On this background and supported also by the drive for technical specialization in modern research, many researchers in education have been comfortable and have felt justified in bracketing theoretical reasoning as non-essential for the field of education.

A post-WWII focus on the micro-level research of societal institutions has been supported also by a broader shift in western thought referred to by Arendt as the end of metaphysical thought (Arendt, 1977). A shift that can be described as a reaction against modernity and a renaissance of critical thought under the umbrella concept of post-modernity (Kellner, 1995).

The field of research in education holds today in its' fold researchers who take many different positions to the above-mentioned paradigms. Some hold on to modernist frameworks and bracket out critical insights from the conceptual framework on which their research builds (see e.g. the work of Meyer that has been compiled by Krücken & Drori, 2009), others focus on building on the critical traditions and do so often with focus on the micro-level of societal institutions (e.g. racial micro-aggressions). Others call for taking critical advances seriously while re-incorporating efforts to understand the big questions of context and culture (Mundy, 2016). The latter stance can be seen as an effort to balance the fragmentation and the narrow scope of micro-level analyses ushered into academia by technical specialization in modern approaches and by the rejection of shared references as a form of top-down violence in post-modern theories (cf. Hall, 2006). As always, some of the more fruitful scholarly efforts that manage to advance our understanding tend to contrast with and react against what previously has represented mainstream research.

As I see it, the effort of scholars such as Cochran-Smith, to eke out a new discourse on paradigms in research on teacher preparation, represents a bold effort to bring back theoretical reasoning to a field that for many has represented a domain of practical reason only. Recent policy statements as observed in the themes of the annual conferences of professional associations vested in advancing educational research in the U.S. such as the American Educational Research Association (AERA) and the Comparative International Education Society (CIES) similarly show a re-engagement of theoretical reasoning. Notably, by efforts to support the development of an understanding of the history of the field of research in education and by trying to re-invigorate research under labels such as *humanism* (AERA, 2016; CIES, 2015; CIES, 2014). While technical specialization in research, in particular the use of mathematical modelling and new technologies and soft-wares remain highly valued practices as such, we can thereby observe also a push-back from scholarly communities. A push-back in the form of a call for contextual and cultural relevance.

The theoretical discourses that play a particularly significant role as a foundation for this push-back are critical theories. However, critical theories as such do not represent a homogenous continuum but are varied in articulations and focus. While early social critique of institutions in industrialized nations was structural in nature and adhered to concepts of modernity (e.g. (Marx & Engels, 1906), such explanations were subsequently challenged by post-structural approaches that were in turn supported by concepts that reflect a reaction against modernity (e.g. Derrida, 2008). Notably, by underscoring the political nature of shared references.

Another stance that has emerged as a critical explanation of the dynamics of societal institutions is an approach that recognizes both the existence of structures and linguistic limitations as well as the possibility of strategic action within such parameters (Giddens, 1986). Following the structuration theory presented by Giddens, we may understand learning subjects or persons not as

captives of modern structures, nor as individuals lost in the fragmented world of post-modernity but rather as knowledgeable actors making strategic decisions within a context that is structurally and politically limited (Giddens, 1986). Structural and political limitations include material conditions as well as intersectional positionality that is determined by factors such as race, gender, age, ethnicity, community of faith, tribe and nationality. A related explanation in the field of economics is provided by the capabilities discourse which similarly as structuration theory views the individual actor as knowledgeable with regard to individually meaningful and valuable goals (Wells, 2016; Sen, 1999).

2.2. Social norms and culture.

Having outlined in the above some of the meaningful uses of the concept *paradigm* I will now briefly identify some of the dimensions of the complex and large concept of *culture*. As noted by Latour, human everyday practices color actions, functions and decisions that are made even in environments that are thought of as entirely controlled, such as a science laboratory (Latour, 1979). Latour explains what is perceived as normal, such as the idea that hierarchal organizational structures are efficient, as a norm that is constructed by practices in the everyday. In this view, culture and social norms are understood as synonyms for a continuous effort to maintain shared references.

Social norms and culture are not in this approach understood as essential to a group of people. The difference between this approach taken by Latour and for example that by Huntington is interesting because it poses a question on culture vs. a presumed essence of a population, in a similar way as the proverbial question regarding whether the egg or the chicken came first (Huntington, 1997). More precisely, the question regarding whether an existing culture determines the decisions of groups of people, or whether the decisions of a group of people determine a culture

associated to that group. While Latour proposes the latter, Huntington represents a group of scholars who maintain that culture determines the future of groups of people in a manner akin to a force of nature (Huntington, 1997). Another example of the same stance is provided by Putnam and colleagues in a comparative research study of governance in Italy (Putnam et al., 1994). Putnam and colleagues propose that a history of corruption will hinder the development of good governance practices in Italy (Putnam et al., 1994).

The work of Huntington and Putnam illustrates some of the problems associated to macro-level theories of culture. Historical determinism as such is nothing new, a highly influential variant of historical determinism was presented by Hegel in the 1800s (Hegel, 1807). The problem I propose is that macro cultural theories are susceptible to circular logic and unethical stances. An example that illustrates this is research in eugenics, a pseudo-science driven by a racial agenda. Eugenics is one example of how the rigorous use of systematic methods and advanced techniques is not sufficient to justify a field of research as a science. Eugenics represents a belief in superior categories of essential features in groups of people. A belief based on social norms and a rejection of cultural difference.

The unethical part driving determinist agendas is associated with the unwillingness to allow for the representation of different stances. In a sense, to affirm a political position by denying the position of differing stances. Hall has explained efforts to cut out the representation of differences in societal positions as ideology-driven research. With ideology, Hall refers to the unadjusted and scheme-like application of ideas to cover a wide range of societal institutional behavior (Hall quoted by Rojek in Hammer & Kellner (eds.), 2009, p. 52). Ideology and policy recommendations that advocate idealized institutions is here understood as not only an imposition of meanings that cut over dialogue and negotiation (*ibid.*) but also a disregard of empirical evidence (*cf.* Ostrom,

1990, p. 8, p.22). In brief, abstract theories that do not connect to the actual circumstances experienced by actors in the field are weak because such theories build on assumptions.

The mainstream discourse par excellence that has held its credibility in the face of postmodern societal critiques such as that of Hall, is anthropological research (Delamont, 2012). Anthropological studies have sought to develop techniques for a systematic study of human practices in educational contexts (Mundy et al., 2010). It is notably in anthropological and social research that the research methods for rigorous case studies have been developed (Erickson, 1986). In this case study I build in part on the classroom observation techniques outlined by Erickson (ibid.). A mainstream of research on society and cultural analysis has since the mid 20th century increasingly focused on the micro social level of analysis in part due to some of the problems associated with macro theories noted above.

While different and broader conceptualizations are possible to make using a multi-signifier such as *culture*, my dissertation builds on a take in which my analysis focuses on the part of culture that is encompassed by the narrower term *social norms*. I use a lens from the social sciences for narrowing down my focus on social norms.

The social sciences lens I have chosen to use is Giddens's structuration theory (Giddens, 1986). The structuration theory approach developed by Giddens is compatible with the use of anthropological methods and encourages the development of vertical analyses. That is, the consideration of micro-level evidence for understanding dynamics across different social levels from the micro level of the classroom to the macro level of a policy regime.

I recognize, following critiques of culture (Hall, S., 1977; Freire, 1970; Bernstein, 1975; Bourdieu & Passeron, 1970) that education is inextricable from agendas of interest. Accordingly, that efforts to bracket out societal negotiation and the political dimension of education are

fundamentally problematic. Therefore, it remains necessary to recognize the interaction and construction of social norms and policy dynamics across social levels.

Let's consider for example the formally recognized policy context in which schools function. Policy negotiations occur on several levels and at several sites including the federal, state, accreditation agency, higher education, school district and school levels. Shared references for goal-oriented learning are negotiated also on the micro-level in individual classrooms. On each level, from the individual classroom to the state level, decisions and autonomy of individual actors is constrained by negotiated and shared references. As proposed by Giddens, the actors on each level from the classroom to the legislator contribute to the interpretation by which educational goals are implemented in the form of organizational practices and educational practices (cf. Giddens, 1986). If we accept the proposal of Giddens according to which all participants in a situation of social interaction are knowledgeable contributors to how that interaction is made sense of, we will also recognize that important negotiations take place on every level of policy implementation.

Using the social structuration theory proposed by Giddens, I have focused in my research on the normative dimensions of locally relevant construction of meanings. That is, social norms expressed in the form of goals and expectations to teacher preparation.

2.3. A local discourse.

Discourse, similarly as the broad concepts culture and paradigm, is a multi-signifier that is used for denoting practices of articulation in various fields of practice and inquiry. For the purposes of this case study, a helpful overview of discourse analysis in a context of education is provided by Kumaravadivelu (Kumaravadivelu, 1999; see also van Dijk, 1997). One way to define a discourse is to say that a discourse, similarly as the concept of paradigm and social norms, refers to shared

references that draw on partly overlapping world-views. Another way of using the term discourse is to refer to the ways in which researchers in mathematics or e.g. researchers in special education will often choose to approach and describe established topics and issues in their respective fields of research.

The uses of the term discourse and discourse analysis that interests me, are the ways that the term discourse is used to describe the reasoning and practices of how professionally relevant topics are discussed by professional communities. I use discourse to denote the ways in which a professional community frames its *modus operandi*. How teachers in a specific time and place spoke about teacher preparation. I do not distinguish what teacher students in this case study have said, as a separate discourse from what faculty said. Nor do I distinguish what faculty at the Department of Mathematics and Statistics said as a separate discourse of what faculty at the Faculty of the Department said. This does not mean that such a distinction is not possible to make. Another researcher could have chosen to study the same group of speakers as representatives of differently outlined discourses. The reason that I have decided to bring together what was said by these thirteen speakers is that all of the individuals I have interviewed share the following characteristic. Each of the individuals interviewed contribute to the everyday interaction and practices at a teacher preparation program that prepares subject matter teachers in mathematics, some as teacher students (5) and some as faculty (8).

In this case study specifically, I use the term *local discourse* to denote the ways in which thirteen research participants spoke about teacher preparation. My conceptualization of a local discourse includes the terminology that research participants used, the references they made, the examples they provided and the emphases they made. Also, the reasoning they used for the purposes, practices and meaning of teacher preparation. I have analyzed a discourse as outlined by the micro-

cosmos or micro-society that I have observed in the strand of mathematics teacher preparation at a Finnish research university. It is good to recognize that the discourse I have documented is constructed and limited by the case study that I have constructed. This is why I refer to the discourse I have documented as a *local discourse* as it represents only a sample of thirteen speakers triangulated with participatory observations at lectures and seminars at one teacher preparation program.

Drawing on the concepts of paradigm and social norm, I define a local discourse of teacher preparation by three features. A local discourse of teacher preparation consists of (1) practitioners that share a language (in this case Finnish), (2) shared references regarding the purpose, aims and nature of education (e.g. the recognition that teaching practices are guided while not dictated by a shared national curriculum), (3) shared assumptions that draw on a shared socio-historical and regional context.

I do not intend the term *local discourse* as a denial of a diversity of world-views, reference frameworks and life experiences among the thirteen interviewed and the auxiliary of observed research participants. For example, I have in this case study paid close attention to documenting patterns that relate to positional differences. Chapter five on research findings describes such patterns that I have identified in interview responses. The research participants were all individuals with different life experiences, showing diversity in age, gender and ethnic backgrounds (Table 1.). Accordingly, it would be wrong to describe the discourse I have documented as one stance.

My goal has been to identify similarities, differences and patterns in how teacher preparation was reasoned about in a set of interviews. It is these characteristics and the themes that I have reduced from what my research participants have shared with me, that I refer to as a local discourse. As discussed earlier, behavior in social contexts, including interview responses, are not

based on natural laws and do not lead to results that can be generalized for populations or political units. Accordingly, it is not safe to assume that the local discourse I have documented can be equated with something that all teacher students, teacher educators and faculty working with teacher preparation in Finland design as important. It is what thirteen research participants in September 2016 came to think of when they answered a set of semi-structured open-ended questions. However, it is my understanding that the research participants in their professional roles and in their roles as teacher students provided serious, genuine and thoughtful responses to questions on what it meant, in their view, to become a mathematics teacher.

2.4. Historical context.

Lauloi vanha Väinämöinen:
järvet läikkyi, maa järisi,
vuoret vaskiset vapisi,
paaet vahvat paukahteli,
kalliot kaheksi lenti,
kivet rannoilla rakoili.

[...]

Itsen lauloi Joukahaisen:
lauloi suohon suonivöistä,
niittyhyn nivuslihoista,
kankahasen kainaloista.

(Lönnrot 1849, *Kalevala*, song 3, verses 295-230, 327-330)

Old Väinämöinen sang:
lakes splashed, earth rumbled,
copper mountains shook,
stone ledges popped,
bedrock broke apart,
stones on the shores cracked.

[...]

Joukahainen himself:
by the song was sunk to his veins into the
swamp,
to his groin into the meadow
to his armpits into the heath.

(Translation by author, *Kalevala*, song 3, verses 295-230, 327-330)

The above excerpt from the Finnish epic *Kalevala* describes what happened when the young man Joukahainen challenged the tribal elder Väinämöinen. Väinämöinen is one of the main characters among several heroes described in the Finnish oral tradition. The latter is described as knowledgeable, experienced and a possessor of remarkable lyrical skills. After having declined several attempts of the younger man to challenge him to duels of various kinds, Väinämöinen finally gets upset and shows off by singing the young man into the swamp.

I happened to sit at a dinner in 2012 in Paris next to someone who has worked for a long time in a leading role with the Education Directorate of the Organization of Economic Development and Cooperation (OECD). That is, the Directorate that runs the PISA studies among other international surveys. I asked him how he envisioned what a traditional hero in Finland might be like. The answer I received was something along the lines of *hard working* and my dinner companion was surprised to hear a brief account of the virtues of Väinämöinen. I described Väinämöinen as an old man with knowledge, experience and the ability to construct persuading narratives. We noted that a parallel could be drawn to the contemporary work of the Education Directorate at OECD. Both the idea of Väinämöinen and the OECD build fundamentally on political influence. While the anecdote can be disregarded as an incidental funny and unexpected observation, it also illustrates a habitual intellectual disregard of tribal cultures.

Giddens distinguishes between tribal societal organizations and two types of states. In one type of state, tribes remain important while the state is a kind of super-structure. In the second type, the state is a central and pervasive form of social organization. The former state is described as one in which “*modes of symbolic co-ordination, based in written texts, make their appearance.*” (Giddens, 1986, pp. 181-182). A concrete example of such symbolic co-ordination is the written form of Finnish vernacular language introduced by Michael Agricola in a 1530 translation of the New Testament (Marjomaa, 2000).

Swedish crusades introduced Christianity to Finland in the 12th century. The oral form of symbolic co-ordination of the Finnish tribal society from the era predating Christianity, remained an important component of Finnish cultural practices and a prominent component of the myths associated to the Finnish nation-state in the Christian and modern era. An example of this is the 1835 published and 1849 revised publication of the Finnish epic *Kalevala* (Lönnrot, 2009). While

the *Kalevala* was recognized as a collection of songs for which many decisions regarding editing and structure were made by Lönnrot, the material nevertheless draws on the oral tradition of the pre-Christian tribal societies in Finland (Lönnrot, 1995, introduction).

Using the typology of Giddens, I distinguish the pre-Christian Finnish tribal society as an oral culture whereas a shift to a form of society that exhibits an external state structure in which tribal practices remain important takes place in Finland during the period of Swedish rule from the 12th to 19th centuries. The superimposition of the state as a distinct entity separate from everyday society is in the case of Finland accentuated by linguistic and ethnic differences. The group of Finno-ugric tribes of which the Finns are a branch represents a family of languages and cosmologies distinct from the Germanic family of languages to which Swedish belongs (cf. yearbooks of the Kalevala association e.g. Laaksonen & Mettomäki, 1996; cf. Kamppinen, 2014)

It is in my view interesting to note that the shift from tribal society to the first form of state society identified by Giddens, coincides in the case of Finland with the introduction of Christianity and a form of rule that exhibits colonial features. The shift from tribal to state society was politically and economically motivated by the consolidation of power and by the regional expansion strategies of the Swedish empire. An empire that culminated in geographical extension in the 17th and 18th centuries. A common complaint among priests in Finland throughout the 600 years of Swedish rule was that the Finns continued practicing traditional rites associated to animism and traditions of the Finnish tribal societies (cf. Oinas, 1981). One such tradition is sauna-bathing.

Uno Cygnaeus made the first proposal for a common school in Finland in the 19th century partly motivated by the very dilemma that he, his father and grandfather had faced as priests in Finland (Lönnbeck, 1910, pp. 4-7). Namely, that the large majority of Finns were in Cyganeus' view being

confirmed as members of the protestant church without actually understanding the religious doctrines or the religious texts (Lönbeck, 1910, pp. 26-29). The common school was for Cygnaeus to address this dilemma as well as contribute to the economic, health-related and cultural development of the population at large.

The state as a central and pervasive organizational form coincides in the case of Finland with the time period represented by Finnish independence that ensued the first World War and the establishment of a modern Finnish nation state from 1917 on. The comparatively brief period of autonomy under Russian rule in the 19th century coincided with the hey-day of national romanticism in Europe and a popular Finnish rejection of the Russian Czar empire as a culturally foreign superstructure. Again, differences in Finnish society vis-à-vis a distinct language that is not part of the Slavic family of languages to which Russian belongs, religious differences and other cultural differences contributed to accentuating the colonial features of the Russian period. Notable organizational remnants or influences from the Swedish era include the early Finnish constitution and from the Russian era the practice of recognizing several languages as part of official government administration. Both Finnish and Swedish are formally recognized official languages in Finland today.

While I find the typology of societal organizational types proposed by Giddens helpful, I find a weakness in his explanation in the ambiguity presented by statements such as “*the early capitalist world economy was a transitory one in history, lasting no longer than two centuries or so*” (Giddens, pp. 184, 185). In my view, the *world* would in this quote from Giddens be better articulated as the term *Europe* or the term *West* that Giddens uses elsewhere. I propose that Giddens perspective is Eurocentric. The proposed typology is in my view more useful if its’ application is not limited to a perceived mainstream history of European development. The

descriptive value of the typology could e.g. allow for an interesting discussion on the circumstances in which a number of societies developed in the period after the Cold War, including Brazil, Russia, India and China.

Giddens makes several articulations that support the possible use of his typology for such purposes in that he explicitly distances the proposed typology from a one-to-one representation of specific historical events, chronology, determinist or essentialist statements (Giddens, 184). To sum up, I find the use of Giddens typology more interesting and helpful if we ignore his statement that some of the types of societies described are “*perhaps forever disappearing*” (p. 185) which contradicts his earlier qualification “*without, of course, disappearing altogether*” (p. 184).

While a centralized form of governance and many features that can be seen to accord with the second type of pervasive state emerge in the 20th century in an industrialized nation-state-like Finnish society, it is clear that the history of tensions between traditional tribal society and the instauration of foreign rule provide a backdrop that remains important for understanding political factions and historical minorities in the context of Finland.

While the Finnish tribal society in many ways no longer exists, it remains an important component of the imagined nation state (Anderson, 2006). References to Finnish tribes (people from Savo, the Carelians, the Häme etc.) remain common references in local discourses in relation to provincial identity and provide a contrast to the idealization of homogeneity and the production of national romantic propositions.

The prevalence of tribal references provide a contrast also to the Weberian explanation of a capitalist protestant society (Weber, 1934). The latter is evident in that the tribes were all associated to livelihoods and associated customs, most commonly revolving around agrarian practices. Practices that represented, as expressed by the frustration of Cygnaeus, a competing

world-view reproduced alongside and in tension with protestant ideology. Following Giddens, I propose that the form of Protestantism that was practiced in Finland in the 18th and 19th centuries until the recent secularization of Finnish society in the late 20th century, represented a local variant of Protestantism. A variant that is not well represented by the analyses of Weber, which focus on the ways in which Calvinism and specific continental European variants of Protestantism interacted with social values pertaining to livelihoods (Weber, 1934). The context Weber considered in continental Europe was rather different from the Finnish context in which the state and church represented foreign elites and various tribal adherences represented and continue to represent local identities.

Giddens refers to power as the “*means of getting things done*” (Giddens, p. 175). Colonial settings have historically expressed a problem of legitimation notably when contrasted with the ideal of one language corresponding to a nation-state identity. When the elite does not speak nor understand the language of the majority of the population, the means of getting things done and political legitimacy are undermined. Pre-independence Finnish society fits in this sense very well to the first type of comparatively weak states described by Giddens, as state prevalence in the everyday lives of the population and extensive surveillance was rudimentary to barely extant compared to the modern context.

The establishment of a Finnish common school has historically been a component of Finnish nation-state building and was from the very early proposal of Cygnaeus a Finnish language project. The Finnish common school was at the outset a national romantic project as well as an effort driven by an Enlightenment agenda. The preparation of teachers was understood by Cygnaeus to be a crucial aspect for the success of the common school (Lönnbeck, 1910).

Something that was unusual for the 19th century was that Cygnaeus insisted on teacher preparation that was not gender segregated and that was carried out in the vernacular language (Lönnbeck, 1910, p.6). On both of these points he met important political resistance from the government and elites in Finland in the 19th century. An exception was the Russian Czar who following Enlightenment ideals provided political support for the common school program for the 19th century Finland. Finland was at this time an autonomous Duchy of the Russian empire.

Cygnaeus agenda for supporting the development of the vernacular language, a school that was not gender-segregated and his rejection of corporal punishment in schools garnered an important popular following in Finland. The funeral of Cygnaeus was a national event that gathered large crowds of people (Lönnbeck, 1910).

3. Theoretical Framework and Research Methodology

This chapter outlines the methodology for a case study focusing on a local discourse about teacher education in Finland. The methodology draws on complementary theories from sociology, psychology, anthropology and guidelines for case studies in education (Giddens, 1986; Erickson, 1986; Anderson-Levitt, 2002; Merriam, 2009). The primary method used was semi-structured, open ended, audio-recorded interviews. The analysis of the interviews was supported with a set of secondary materials. Secondary materials served the purpose of triangulating the interpretation of articulations made by research participants (Merriam, 2009, p. 215-216; Arksey & Knight, 1999, p.22).

Secondary materials and methods consisted of participatory observations carried out in lectures, seminars and faculty meetings (cf. *observer as participant* as defined by Merriam, 2009, p. 124). Field notes and a research journal have contributed to reflections on the research process, research context and researcher positionality. The journal and notes have helped to develop in-depth descriptions of the context of research (cf. *thick descriptions* as defined by Merriam, 2009, p. 43).

Verbal answers in interviews were complemented with a drawing by each of the thirteen interview participants (Appendix III). The drawings describe teachers' knowledge and skills areas that were perceived as important by research participants. The drawings served a support for triangulation as well as a support for open-ended reflection and conversations with research participants.

This chapter is structured as follows. I start by contextualizing structuration theory in a landscape of qualitative research in education. Second, I describe how structuration theory informs the methodology and analysis in this case study. Third, I provide an overview of my approach to interviewing and analysis. Finally, I provide notes on internal validity and ethical considerations.

3.1. A qualitative approach for studying social norms.

This case study is qualitatively focused. Qualitative theories highlight the communication dependent, temporal and process-like dimensions of values and identity formation (cf. McLeod, J. and Thomson, R. (Eds.), 2009). For the conceptual framework of this study, my primary reference is Giddens's structuration theory (Giddens, 1986). Structuration theory provides a frame for analyzing societies and practices in social institutions such as a teacher education program. Structuration theory explains human societies in a manner that is compatible with theories for describing cultural characteristics and social norms in education. Notably, theories in the fields of anthropology, psychology, sociology and qualitative research in education (cf. Kendall, 2007).

Social and developmental psychology explain cognitive development and dynamics associated to learning social norms (Barret 2007 p. 1). National identity is in this approach defined as an ethno-symbolic definition of culture that represents a community of people who share and reproduce symbolic systems such as a shared language, traditions, ideology and a shared world view (Barrett, 2007, p.5). With national enculturation, Barret refers to the combined effect of development and cultural learning by which individuals form identities as members of nation- and state-groups (ibid. p.16).

In the field of political sciences, Anderson has in turn proposed a conceptual construct for understanding collective and individual meaning making about national identity as "imagined communities". By his theory of imagined communities, Anderson defines nations anthropologically as imagined political communities that are inherently sovereign and limited (Anderson, 2006, p.6)

Informed by the above theoretical framework, I found it important to use the themes I articulated in the interview guide in an open-ended manner in order to explore: (a) respondents'

lived experiences and motivations, (b) world-views and value based frameworks engaged for making sense of lived experiences and (c) intersectional positionality (gender, race, ethnicity, age and primary language).

Methods chosen for this study were guided also by a pragmatic stance (Howe, 2003). I have chosen interview methodologies “not by the a priori epistemological standards, but by the epistemological standard of their fruitfulness in use.” (Howe, 2003, p. 144). Different forms of knowledge are in this approach understood as human constructions. The interpretative take on methodology that Howe proposes is not relativist. Instead, the methodology underscores the following idea: *Knowledge can be constructed in ways that are guided by values such as justice and impartiality*. I agree with Howe in his proposition that research in education ought to be conceived and conducted in an effort to live up to what a genuine form of democracy requires (ibid.)

A methodological approach that similarly builds on efforts to construct research on values of justice and impartiality is participatory action research (PAR) (Merriam 2009, p. 36; cf. Pain, Finn, Bouveng, & Ngobe, 2013). PAR builds on critical traditions in research on education that have advanced the use of systematic methods for stronger standards of objectivity in two ways: (1) by locating knowledge in a socially and historically constructed context, (2) by actively engaging alternative perspectives to knowledge claims. In particular, knowledge claims by individuals who by their socially constructed roles traditionally have represented passive study objects (cf. Harding, 2004, p.128). The latter is one of the reasons that I have chosen to include students among the respondents. While guided by similar values, my methodology falls more in line with established qualitative approaches than PAR. However, I have sought in my research similarly as PAR to (1) locate knowledge in a socially and historically constructed context and (2) to actively engage

alternative perspectives to knowledge claims. Notably, by having pro-actively sought participant and peer feedback throughout the study.

3.2. Methodological implications of using structuration theory as lens.

A reason for why structuration theory is compatible with the qualitative theories and methodological approaches that I have reviewed above is that structuration theory provides a framework that is not limited to macro level analyses or micro level analyses. Structuration theory lends itself well for a variety of inquiries in the social world, including vertical and horizontal comparisons. A key feature of the theory is that the meaning of social practices is understood as something that forms through an interaction of structures and actors.

“[...] there is no such entity as a distinctive type of ‘structural explanation’ in the social sciences, all explanations will involve at least implicit reference both to the purposive, reasoning behavior of agents and to its intersection with constraining and enabling features of the social and material contexts of that behavior.”

(Giddens, 1986, p.179)

The above quote illustrates how Giddens contrasts his theoretical and methodological approach with the structurally oriented tradition of research in sociology that builds on the work of scholars such as Durkheim (1919). Giddens rejects the idea that social phenomena are governed by rules akin to natural laws (Giddens, p. 179). Accordingly, Giddens distances himself from methods that seek to articulate general rules that govern social systems.

Giddens calls for a different methodological approach that is sensitive to “ [...] *multiple meanings that constraint must be recognized as having in social analysis*” (Giddens, p. 179). This is in my understanding the reason for why Giddens suggests that anthropological methods are fully compatible with the purposes and theory of sociological research as both sociologists and anthropologists are fundamentally working with describing human practices.

Giddens rejects the determinism and essentialism of structural sociology. Using this approach to inform a methodology of research is to propose that it is futile to search for generalizable causal relations operating independently from human behavior and practices (Giddens, pp. xix, xx.). Following Giddens, I propose that for explaining how social systems and social institutions function it is necessary to examine the strategies chosen by individual actors and by groups of people.

While social phenomena constrain human actions, options and strategies and may seem as facts, Giddens points out that such reified facts nevertheless are produced and reproduced by human agency (Giddens p. 180). Strategies are in this approach limited by what individual actors and groups of people know and by the options present in specific circumstances. Circumstances in turn, are variable in time and space (Giddens, p. 173).

I propose accordingly that a pertinent methodological approach is the identification and description of varieties of social phenomena. Using teacher preparation as an example, it is in this vein pertinent to conduct research that does not from the outset assume teacher preparation is a practice that is fundamentally identical or same across contexts and time. Accordingly, I propose that an approach that is likely to bear meaningful outcomes will seek to outline and characterize varieties of teacher preparation.

3.3. Research site and research participants.

The site of this case study was a historically established, well-respected and comparatively large university from which leading figures of education in Finland have graduated. While the program proclaims itself the largest and most diverse in Finland, there is no indication that it represents an outlier. Instead, the site can be described as a model university in the Finnish context. During my field research, I happened to run into a peer from my M.A. studies from many years ago at another

Finnish university. I asked her why she was applying for the academic rank of docent at the research site and not at our alma mater to which she remains associated as a researcher. She responded that it would look better on her CV. This is an example of the normative frameworks specific for the Finnish context and the background on which I describe the site as prestigious, a leading university and a model university in the Finnish context.²

The physical research sites of this case study consisted of locales associated to a specific strand of subject matter specialized teacher preparation. The Faculty of Education prepares teachers for a variety of subject matters, as well as teachers for elementary schools. Subject matter specialized teacher preparation was in this context identified as one program with a variety of strands. I have in this case study focused on the strand of mathematics teacher preparation. The research site for this case study was a research university and the different departments that contribute at said university to the preparation of teachers. This includes the Faculty of Education and the Department of Mathematics and Statistics and one of the field practice schools associated to the research university.

The participatory observations I carried out included a mathematics lesson at one of the field practice schools, also referred to as a *normal school*. This was in connection to an introduction to the field practice schools organized for teacher students in the beginning of Fall term 2016. At the normal school, I observed in total two mathematics lessons, one faculty seminar and carried out one interview. Another twelve interviews and nine hours of observations were carried out at the Faculty of Education and at the Department of Mathematics and Statistics.

² While this roundabout positioning of the university at which I conducted the field research seems evasive, it is necessary for this case study. I am obliged by UCLA Institutional Review Board recommendations to not name the university.

The preparation of teachers for high-schools, is structured in Finland in a manner in which each teacher-student prepares to become a teacher in two subject-matters. In addition to studying to become Mathematics teachers, two of the students interviewed in this case study were specializing in Physics, one in Chemistry, one in Buddhism and one of the students had not decided on a second subject of specialization by the time of the interviews. The faculty, instructors and administrators interviewed were involved in the preparation of subject-matter specialized teachers, however, not only in the area of Mathematics. For example, one of the lecturers taught Mathematics Didactics but also the Didactics of Information Technologies. On this background, I find the term *science teacher preparation* as appropriate for describing the program I have studied in this case. However, the terms *mathematics teacher preparation* or *subject-matter specialized teacher preparation* are equally relevant.

Participants were faculty, students, administrators and instructors in a graduate-level program preparing subject-matter specialized teachers for upper secondary schools. Participants were recruited using a combination of snowball technique (e-mail correspondence, faculty referrals) and a call for student volunteers at a Mathematics Didactics lecture. My initial contact to the Faculty of Education was to the director of the program that prepares subject-matter specialized teachers.

As I was in my initial research question interested in inquiring into the relationship of subject-matter expertise and teacher preparation, I decided to interview students and faculty involved in the preparation of subject-matter specialized teachers. Narrowing down on a specific subject-matter was in the pilot-study arbitrary in the sense that my choice to interview a group of students was guided by the scheduling of classes at the Graduate School of Education where the pilot study was conducted in 2015. Having tested my interview instruments with instructors and faculty preparing mathematics teachers and students preparing to become mathematics teachers, I decided

for the sake of consistency in the 2016 case-study, to interview a group involved in a comparable qualification.

Proposing that the choice of subject-matter specialization was to some extent arbitrary for the purposes of this case-study is a contentious point to make. The reason for why it can be seen problematic is that researchers in a subject-matter specialization in the field of education often have a background in the subject-matter themselves. Usually, the researchers of mathematics education tend to be prior mathematics teachers. Researchers in special education are often professionals who have worked as special educators. Having a background in Comparative Education and the Humanities and having worked professionally with credential evaluation, I am in a conventional sense an outsider-observer of teacher preparation. The agenda that motivated my research was not, as often is the case in the field of education, to study and evaluate an individual program for the purpose of promoting it as an example of what works, or for the practical purpose of trying to improve said program. Instead, I was interested in trying to outline some of the characteristics of context-specific social norms and local culture without which a translation and understanding of the goals and practices manifested in the thirteen interviews analyzed in this case study would not make sense. I was motivated by an interest to contribute to basic research that is informed by a sociological approach to understanding how institutions function and the local practices that manifest constraints and resources available to local actors (cf. Giddens, 1986).

3.4. Preparation of secondary school teachers in Finland.

Subject matter specialized teacher preparation in Finland in practice, is the preparation of secondary school teachers. In this section, I provide a synthetic description of the graduate level degree program in which I have carried out interviews and participant observations. The purpose of this section is to provide context. Notably for understanding at which point in their studies

students were located. All of the students I interviewed had at the time of the interview finished their undergraduate studies and were undertaking graduate level studies.

Over the course of the past two decades, higher education programs have been re-structured in Finland in order to follow Europe-wide guidelines promoted by the Bologna process (EUR Lex, 2015). This means in practice that prior five-year degrees have been divided into a three plus two structure in which three years of undergraduate studies lead to a Bachelor's degree. Subsequent graduate studies for two years lead to a Master's degree (Eurydice, 2017).

Subject matter specialized teacher preparation in Finland was a five-year degree prior to the Bologna reforms. The length of required studies does not seem to have changed much over time. Completion of the three initial years of subject matter teacher preparation does not meet the requirement for obtaining teacher qualification in Finland. The teacher preparation program is designed so that students need to complete graduate level studies in order to be qualified to work as teachers. In Finland, teacher certification is provided by the universities upon completion of graduate level studies in Education.

An alternate route is to apply for qualifying graduate studies in education after having completed another relevant degree. Two of the students I interviewed in this case had followed the latter route (one student held a prior graduate level degree in Physics and another student held a graduate level degree in Chemistry).

A comparatively larger part of the students studied mathematics and education in parallel. This means that students had applied to university directly to the five-year strand designed for teacher students. In the first three years, teacher students in the mathematics strand had studied together with students admitted to the Department of Mathematics and Statistics. Students were required to complete an undergraduate thesis in mathematics. While a few teacher preparation courses were

provided as part of the undergraduate studies, a larger number (equivalent to one full year of studies) was provided as part of the graduate level studies (cf. Eurydice, 2018).

Students undertook field-practice during graduate studies and were required to complete a graduate thesis in either education or mathematics. Faculty interviewed in this case study explained that a comparatively larger part of teacher students chose a topic that related directly or indirectly to teaching mathematics.

3.5. Interviews and analysis.

The methods deployed in this case study focused on exploring expectations and values that guide meaning-making processes in a local discourse about teacher preparation. I have carried out interviews and participant observations that were informed by ethnographic theory (Erickson 1986; Anderson-Levitt, 2002) and guidelines for qualitative interviewing and interviewing in the social sciences (Olson, 2011; Arksey & Knight, 1999). The interview guide constructed using the above framework, principles and guidelines is presented in Appendix I. The use of open ended interviews has served the purpose of providing rich and grounded empirical evidence on respondent understanding and opinions about teacher preparation. The research site and participants were purposively selected. Further details regarding the research procedures, participants and site are provided in chapters four and five. The research instruments of this study were semi structured open ended interviews with students and faculty. The primary measure used in this study are narratives of professional expertise and descriptions of purpose. I have in addition to direct answers to question taken care to document descriptions offered by participants, such as e.g. anecdotal stories. Stories proposed by research participants have been used for shedding light on the meaning making processes of the respondents (cf. Seidman 2005 p.7).

In analyzing interviews, I have used a combination of grounded and top down coding. Top down coding drew on sociological theory (Giddens 1986). Coding has supported the development of overviews of types of articulations and synthetic descriptions of discourse characteristics. Further details on the types and groups of articulations identified are provided in chapter five on findings. In the analysis of field-notes and interview notes, I have deployed reflexive approaches (cf. Merriam, 2009, p. 219).

3.6. Notes on internal validity and ethical considerations.

In qualitative approaches the researcher provides by her or his interpretation a lens by which evidence based grounded first-hand exposure to the field and the study participants can be provided. A primary goal in this case study was to shed light on meaning making processes. In particular understandings and opinions that were observed in the field. Due to the important role that the principal investigator plays in a case study, there is a risk that interpretation may become distorted. To counter this, I have (a) audio recorded interviews, (b) written interview syntheses (c) maintained a research journal (d) written extensive field notes in connection to each interview and participant observation and (e) maintained a database with information regarding interview length, date, attendants (f) maintained a digital archive of syntheses, transcripts, recordings, documents and finally (g) maintained a paper archive of notes, memos, jottings, drawings and sketches from the site. The extensive documentation of my research materials has allowed me to not depend on memory when synthesizing study materials.

The extensive journaling, which included a reflexive research journal as well as audio recordings of impressions in the field has served to counteract possible biases caused by researcher positionality. I have reviewed the documented materials at the time of synthesizing study findings as a way to critically assess the development of my own thought processes, in particular with

regard to positionality. I have used member-checks in order to strengthen internal validity of the study. Also, I have encouraged respondents to correct information and to elaborate on the appropriateness of the questions both at the time of the interview and again in connection to member-checking of written interview syntheses.

When conducting research in an institutional context there is a risk that study participants may think that there is an obligation to participate. I have made it clear in a written information sheet that was handed to respondents that their participation or abstaining from participation will not affect their grades or evaluation in their studies or work. Also, that respondents were free to withdraw from the study at any time they wished to do so. I have repeated these points orally when introducing myself and the study at the research site.

Breach of anonymity is the primary risks associated to having participated in this study, a risk of disclosure of personal identity, views and expectations. Participants were informed orally about all of the associated risks and what their rights as participants are. Names of participants have not been disseminated nor has such information be stored together with research notes and files. While pictures and audio-recordings were taken as part of the data collection, such materials were primarily collected to support analysis and synthesis and were not intended for dissemination.

To conclude, I have in this chapter proposed that qualitative methods provide the most appropriate framework for investigating characteristics of a local discourse about teacher preparation. The advantage of conducting a qualitative case study is the wide array of dimensions of the social world that the approach allows to investigate. These are dimensions that describe understandings, experiences, imaginations and the ways that discourses and relationships work as well as the significance of the meanings they generate. Instead of being inconvenienced by complexity in efforts to find a general picture or average, qualitative studies allow to celebrate the

multidimensionality, richness and depth of practices such as teacher preparation. To that end, I report in the following on articulations about science teacher preparation as observed in a program that prepared subject-matter specialized teachers, notably teachers in the Mathematics strand, at a research university in Finland.

4. Description of Research Procedures

4.1. Planning the research.

The research activities undertaken for this case study were initially planned in 2015-2016 when I tested interview and participant observation guides at the University of California in Los Angeles. At this early stage of planning the research, I wanted to conduct a comparative study of two teacher preparation programs, one in the U.S. and one in Finland. However, following the recommendation of my dissertation committee in July 2016 to focus on an individual case-study, I shifted the focus of the dissertation to the interviews that I conducted in Finland in September 2016.

Nevertheless, the feedback that I received in testing interview guides and participant observation guides in the pilot study in 2015 was helpful for identifying potentially meaningful themes in teacher preparation practices and theory. One such theme was the duality of subject matter content specific knowledge and knowledge and skills pertaining to the practice of teaching and classroom management, another theme was that of social justice. Indeed, duality came across as an understatement in the expectations articulated both by students, instructors and faculty. As a practice-oriented field to which many expectations are directed, it seemed that some of the instructors I had interviewed in the pilot study were working hard at staving off and thereby protecting teacher students from what was perceived as unreasonable expectations. However, what exactly was perceived as unreasonable seemed to vary from one faculty member to another. Some expressed that teacher students should not be required to write scholarly papers or conduct research, whereas others indicated that teacher students should not be expected to be able to fully map all of the different areas of knowledge by which education is assessed. Through my research I have come to understand these varying stances as indicative of a social sciences field in which actors are continuously finding their way and re-orienting themselves in a web of changing social

networks, expectations and agendas. This is not to say that I perceive any of what I have observed from a relativist perspective, but I do find it valuable and helpful to view the varying stances as a reality and necessity of a field of work that is undergirded by political agendas and social norms. Agendas and norms, that are to some extent reproduced over time while also subject to change (cf. McLeod, J. and Thomson, R. (Eds.), 2009).

In the six months before my field-research in Finland, I conducted reviews on the initial themes that emerged from the 2015 pilot study. I undertook a comparative reading of how seven different Graduate Schools of Education articulated the theme of *social justice* in publicly available program descriptions. I conducted also a close reading of a teacher preparation manual used at the field-research site, in order to identify characteristics of how social justice as a theme was, or was not, a part of the curriculum. The outcomes of these preparatory case studies were indicative and guided an initial selection of research themes. However, as my reading of program descriptions and manuals was not conclusive, I determined that an open-ended approach would allow to identify further locally relevant themes on site. Initial interview themes included the role of research in teacher preparation, the role of collaboration, forms of knowledge and skills that are important for a teacher to master and the concept of knowledge production.

The field research in Finland in 2016 allowed me to discern which of the initial themes I had proposed were meaningful for research participants and which were not. One of the themes that did not resonate with respondents in the U.S. and did not seem to resonate much in Finland either was the concept of knowledge production. This is a theme that I, despite my own initial interest in the theme, have subsequently abandoned as a marginally relevant theme. Other themes that have moved into the center-stage, i.e. themes that my research participants showed an interest to discuss, were in particular those regarding the role of research in teacher preparation and the role of critical

thinking as well as the relationship of content specific knowledge (i.e. mathematics and physics) to knowledge regarding practices and theories of teaching and learning (i.e. theories of learning, classroom management etc.).

Similarities between the program that served as pilot site and the program that served as field-research site included the following. (1) Both sites prepared upper secondary school mathematics teachers. (2) Both sites articulated a social justice agenda in their program descriptions. (3) Both sites were viewed as leaders in the development of education in the contexts they serve. (4) Both of the programs were situated at public research universities.

My initial contact to the field research site was in February 2016 by e-mail to the faculty member in charge of subject matter specialized teacher preparation and subsequently on his recommendation to a Professor of Mathematics Education at the Graduate School of Education and a Professor in Mathematics at the Department of Mathematics and Statistics. Each of these faculty members kindly assisted with identifying potential instructors, administrators and student groups for interviews and observations. Despite my efforts to plan such interviews as far as possible ahead of travel, such planning did not bear much in the way of concrete outcomes. All of the meaningful contacts and interviews that I was able to carry out were conducted at the research site in September 2016 in connection to participant observations at lectures, section meetings, faculty meetings and seminars.

4.2. Research procedures.

Structuration theory is used as a framework for outlining and analyzing a discourse about teacher preparation (Giddens 1986). Following structuration theory, individuals are understood to make strategic decisions in everyday situations by building on prior experience and what they know about structural constraints and resources. That is “[...] *everything which actors know or believe*

about the circumstances of their action [...], including tacit as well as discursively available knowledge” (Giddens 1986 p.375). In this vein, agency in socially situated practices, such as classroom instruction, is connected to social structures by a reciprocal relationship (cf. Spillane, 2005; Burrige et. al. 2010). Social and institutional structures are understood both as a medium and outcome of human activity. From this perspective, student outcomes are not only a consequence of specific interventions but also social interactions in the classroom in which both students and instructors contribute.

The case study was conducted in Finland in 2016 and comprised of thirteen semi-structured open-ended audio-recorded interviews. Participatory observations (twelve hours of documented lectures, seminars and meetings) were used to triangulate the articulations that arose from the interviews. I requested and encouraged research participants to comment on the relevance of interview questions, provide feedback to interview syntheses and to elaborate on themes that research participants found to be interesting or relevant.

Each interview synthesis was constructed following a systematic procedure in which I reviewed notes, recordings as well as transcribed and translated parts of the interviews. Syntheses provide background information, respondent narratives and articulations structured by themes (*goals of teacher preparation, critical thinking, the role of research, collaborative practices, the good teacher, knowledge areas of a teacher*). Each synthesis includes transcript segments that illustrate respondents reasoning on themes. Syntheses (7-9 pages each) were sent by e-mail for member-checking.

All of the thirteen respondents had by October 2017 acknowledged receipt of the interview synthesis and had provided feedback regarding accuracy. Overall, feedback from respondents showed that syntheses were perceived by participants as accurate descriptions of the interviews.

Four respondents requested changes such as removal of two sentences or the use of a different word. Subsequently, I have compiled documents that bring together respondents' stances by themes (e.g. critical thinking, research, collaborative practices etc.)

The preparation of mathematics teachers is interesting as it brings together two fields of research that are in conventional academic discourses identified as very different, namely the *hard* natural sciences and the *soft* social sciences. It is also a subject matter the teaching of which in schools is conventionally perceived to reflect social norms by a privileged participation along intersectional lines of social position that often are defined by race, ethnicity, socio-economic status and gender.

I decided to not use pre-determined racial and gender categories, opting instead for participant self-identification in order to construct demographic profiles that made sense to my research participants as individuals. Six participants identified as Finnish, four identified as either ethnic minority or immigrant background and four identified themselves by specific values or professional categories (see Table 1.). The age of participants ranged from 22 years to 64 years. Seven respondents gender-identified as men while six respondents identified as women.

The preparation of teachers for high-schools, is structured in Finland in a manner in which each teacher-student prepares to become a teacher in two subject-matters. In addition to studying to become mathematics teachers, two of the students interviewed in this case study were specializing in Physics, one in Chemistry, one in Buddhism and one of the students had not decided on a second subject of specialization by the time of the interviews. All of the students interviewed were undertaking graduate level studies at the time of the interviews.

4.3. Catalogue of research activities and materials.

All of the on-site data collection took place during four weeks in September 2016. The materials collected consist of field-notes, jottings, sketches of room-plans and lecture halls, photos and

research journal entries primarily relating to participant observations and interviews. I conducted thirteen semi-structured open-ended audio-recorded interviews ranging from 28 minutes to 1 hour and 30 minutes. I wrote jottings and field-notes for each interview within 24 hours of the interview. In addition to encouraging respondents to talk about what was in their view important or relevant, I used specific questions addressing the following themes:

1. The role of research in teacher preparation.
2. The role of collaborative practices.
3. The role of critical thinking
4. Knowledge production
5. The goals of teacher preparation
6. The knowledge areas and the skills of a teacher
7. How teachers contribute to the development of education
8. The good teacher

The interview guide (Appendix 1) provides the questions and themes in further detail. Field-notes ranged from half a page to two pages in length. Each respondent was assigned at first a code and subsequently a pseudonym. The names of respondents are maintained as a hand-written paper document in a locked office separately from my digital catalogue that serves as the data-base of my research materials. The system I used for identifying respondents consisted of a two to three-digit letter code with no association to the real name of the person interviewed. The pseudonyms used are common Finnish or ethnic minority names that accord with the gender of the individual. I have encouraged research participants to propose different pseudonyms in connection to member checking. While minor changes to interview syntheses were requested by research participants, however, none of the research participants showed an interest to change pseudonym.

4.4. Consolidation of interviews and member checking.

Each of the interviews conducted in Finland was synthesized into an account of the interview. These syntheses range from seven to nine pages in length. I followed a seven-step method for constructing the syntheses.

(1) First, I read through the field notes and jottings from the interview.

(2) Second, I listened through the audio-file of the interview.

(3) Third, I transcribed selected parts of the interviews. The interview transcripts range from eight to twelve pages in length for each interview.

(4) I have structured each synthesis into an initial part identifying time, place, location of interview and demographic information on the interview subject. The introductory part includes background information such as the organizational position of the interviewee (e.g. student, faculty or administrator). Additionally, the introduction provides an overview of some of the key points from the interview such as interviewee self-identification, prior work-life experience in the field of education and voluntary narratives shared by the respondent. The latter were helpful for identifying topics proposed by research participants. With topics raised by research participants, I refer to themes or issues that I had not articulated in the initial interview guides, such as the *role of humor* and the *responsibility of a scientist*.

(5) The second part of each synthesis brings together respondent answers on the following themes: (a) critical thinking, (b) the role of collaborative practices, (c) the role of research, (d) goals of teacher education. The third and last part of each synthesis brings together respondent answers on the following themes: (e) the good teacher, (f) the forms of knowledge and skills of a teacher.

(6) From each transcript, I selected parts that I incorporated into the synthesis as illustrations of the ways in which the respondent reasoned about the above themes. The interviews were conducted in Finnish and the transcripts were written in Finnish. I have translated selected segments from the transcripts into English. Each of the 7-9 page syntheses were written in English. This required me to translate a number of concepts and terminology into English. For a number of locally specific concepts and terminology I have included the Finnish original in brackets. For each of the transcript examples provided in the syntheses, I have included the original transcription segment in Finnish.

(7) I have sent each of the syntheses for member-checking. Four respondents requested minor changes. I have adjusted the syntheses as requested by research participants. Changes consisted of: (1) a proposal for the use of a different word in translating from Finnish to English (education instead of pedagogy), (2) note on inconsistency in use of language, (3) correction of title used and (4) the removal of two sentences that referred to prior experiences in education from another context (competitive examination in another country). All of the research participants have responded to my request to review interview syntheses and to provide feedback (13/13). The feedback obtained by member-checking interview syntheses indicated that respondents in this case study recognized the interview syntheses as accurate descriptions of the interviews conducted.

4.5. Anonymizing and presentation of data.

In collecting data, I constructed field-notes and interview notes using a two to three letter code for each participant. Tables listing interview schedules were constructed using the same codes. I have constructed pseudonyms for each of the research participants and I have provided research participants the opportunity to change the pseudonym. I keep the real names of the research

participants in a hand-written letter size document that is kept in a locked office separately from the digital recordings and a digital inventory of research materials.

The following chapter on findings provides an overview of articulations by six themes (goals of teacher preparation, collaborative practices, critical thinking, the role of research, the knowledge and skills areas of a teacher, the good teacher). All of the names used, except the name of the principal investigator and interviewer (Susan Wiksten), are pseudonyms. An overview of a few statements on each theme by each of the participants is provided as a table in Appendix II (Tables 1 - 6). The stances reported are primarily respondent views on the preparation and professional role of teachers. My understanding of the information that I have been provided is that no sensitive or problematic personal information was shared, nor have I suppressed any information that I have received. I have removed two sentences from one of the interview syntheses on the request of one of the respondents. However, the information removed was of marginal importance for the study as it pertained to examination practices in another country where the respondent had studied before. I have sought to provide an impartial, balanced and objective overview and analysis of the interviews that I have conducted.

5. Findings

This section presents research findings. First, I provide overviews and excerpts from interviews that illustrate the following six themes (1) goals of teacher preparation, (2) the role of collaborative practices in teacher preparation, (3) the role of research in teacher preparation, (4) the role of critical thinking in teacher preparation, (5) the knowledge areas of a teacher and (6) articulations of what it means to be a good teacher. The seventh section of this chapter compares one of the narratives that emerged from the interviews (narrative on the responsibilities of a scientist, see beginning of section 5.6.) with a narrative from the Finnish oral tradition (Lönnrot, 1995). The eighth and final section discusses how the findings relate to the analytical framework.

5.1. Goals of teacher preparation.

“[...] one cannot depart as a teacher from the stance that “I will teach this, and this has to be learnt, because it’s important, it’s something everyone should know”. Instead, there has to be the capacity to pose questions such as “how could this benefit my students, oh, why should they maybe be interested in this topic, or why might they be interested?” And for that reason, it is important as a teacher to have the ability to think about the prior contact that students have with the subject matter, for example: “what do students already know about [the subject matter]”?, “what perceptions do they have about [the subject matter]”?, “what misconceptions may they have”?, “what attitudes do they have”?

And for that reason, a teacher has to, or in my view one of the goals of the subject matter specialized teacher preparation is to get students in subject matter teacher preparation to become interested also for example in youth research. Because youth research is a field of study that informs us about the positionality of youth, their attitudes, thinking and values, all that the students bring with them into the classroom. That’s the ground they [students] stand on when they approach mathematics or biology or history. That’s something that I think my own teacher students don’t always expect. Instead, it’s easy for them to expect that we’ll be studying techniques for teaching and student assessment, and we do, but there’s a lot more to it. [...]

(Erik, interview September 19th, 2016)

The above quote from the director of subject matter specialized teacher preparation at the Faculty of Education illustrates a theme that was taken up by several faculty members I interviewed. Namely, that challenging students to think was understood as one of the important goals of teacher preparation.

In the following, I report on articulations on this and other themes associated with the goals of science teacher preparation. As mentioned before, the interviews were conducted in a graduate-level program that prepares subject-matter specialized teachers at a research university in Finland. Participants were faculty, instructors and students from two university departments (the Faculty of Education and the Department of Mathematics and Statistics) and one field-practice school.

The research question of the case study was: *What can the interviews conducted tell us regarding the characteristics of a local culture of teacher education?* Here, I focus on a narrower sub-question: *How did respondents articulate the goals of teacher preparation?*

In compiling different research participant articulations on goals, I noticed at first that the total number of goals articulated exceeded the number of research participants. Each of the participants identified a variety of different goals. I observed that types of goals articulated corresponded to the organizational position of the respondent. For example, the goals articulated by teacher students displayed inter-group similarities when contrasted with the goals articulated by faculty and instructors. Students' goals were oriented towards what students perceived they needed to learn in order to become professional teachers. In contrast, faculty articulated a number of goals that reflected needs to adapt program goals to expectations that derive from the organizational context. That is, organizational expectations specific to the university or field practice school in which faculty worked, as well as the broader education policy context. The positionality of being a student as compared to having a role in teaching teacher students was thereby expressed in the somewhat different goals articulated.

Meanwhile, goals articulated across the thirteen interviews showed overlap that was not limited to such positionality as being a student or faculty member. I have not observed gender or age specific patterns in the articulations of goals. From the more than fifty different articulations of goals documented in the interview syntheses, I have constructed eight categories that illustrate the types of goals that were expressed.

The categories I have identified provide a reduced description of the goals that were articulated by research participants in the interviews. The categories are helpful in identifying cross-cutting themes and types of goals and expectations. Eight overlapping categories or themes for goals and expectations to science teacher preparation in this case were: (1) learning to work with diverse groups of learners, (2) social interaction skills, collaboration and leadership, (3) formal recognition, theory, getting challenged to think, (4) changing goals, resisting the change of goals,

(5) continued learning, (6) tools for teaching, (7) how to communicate subject matter content, (8) learning subject matter content.

I propose that a grouping into three over-arching types of goals can be made from the goals identified here. I have named the first group *Social interaction*, it incorporates goals that relate to social interaction, diversity and leadership skills (themes 1 and 2 in the above). I have named the second group *Continuous change*, it incorporates goals that relate to formal recognition, continued learning and theory (themes 3-5 in the above). I have named the third group *Learning how to teach math*, it incorporates goals that relate to subject matter specific content such as math and tools for teaching subject matter specific content (themes 6-8 in the above).

The construction of thematic categories and groupings into types of goals is not arbitrary. I have used goals that participants articulated with similar or comparable articulations and intentions for the construction of the thematic categories. For example, the category *tools for teaching* derives from references to teaching techniques and methods among several research participants. The category *tools for teaching* covers conversations on teaching methods broadly and does not discern between conversations regarding teaching techniques that are achievable using traditional technologies (paper and pen) and conversations regarding goals that are achievable using newer technologies (computer software applications).

The grouping into types proposed here draw on structuration theory as I have purposively grouped conversations on goals that at first may seem controversial, such as *theory* and *challenging established thinking* with goals regarding *changing goals* and *resisting the change of goals*. Giddens explains factors that contribute to social tensions as logically connected. An example of this are factors driving change in an organization and factors resisting change. Giddens refers to such factors as a *duality* (Giddens, 1986, p.192).

A metaphor can help to illustrate how tensions, despite negative colloquial connotations associated to a term such as tension, are not necessarily logically opposed to purposive function. Let's consider a sail or a piece of paper, both can be maintained in an upright position to serve a purpose, either to propel a boat or to serve as a folded sign for a speaker. Neither will be able to serve that purpose without tension. In the case of the folded paper the duality is formed by the rigid physical structure and gravity, a soft tissue paper would not work well as a sign. In the case of the sail, the tension is created by the duality of wind and sail.

In line with structuration theory, I assert that a stronger analysis of organizational characteristics and characteristics specific for a local discourse can be achieved if dualities are observed. For example, by contextualizing and reading goals for curricular change with articulations of goals to resist curricular change. Other explanatory models could of course be used for constructing different groupings and categories.

The remainder of this section is organized as follows. The first part presents research materials and findings focusing on respondent articulations of: (a) goals of teacher preparation, (b) goals that are specific for the preparation of science teachers, (c) concrete examples of goals that pertain to classroom teaching. The Second part of this section discusses findings using a structuration theory perspective.

5.1.1. Articulations and examples of the goals of teacher preparation.

Thirteen semi-structured, open-ended, audio-recorded interviews averaging 59 minutes in length form the core of the research materials. I have formulated three assertions regarding characteristics of the discourse on teacher preparation observed:

- (1) *Faculty and students articulated different goals.* Faculty, instructors and administrators

expressed goals that pertain to: (a) subject matter specific content and (b) changes in goals associated to the organizational context. This is a difference when compared to the goals articulated by students. Few of the articulations of goals provided by students addressed these two topics.

(2) *All of the participants underscored the importance of communication skills and social skills.* Shared goals across the thirteen interviews pertain notably to the development of social skills, ability to work with diverse groups, ability to adapt to changes, learning teaching methods or techniques and learning how to communicate subject matter content. Eleven respondents articulated goals that fall into the group of goals that pertain to *learning how to teach math*. Eight respondents articulated goals that fall into the group of goals that pertain to *Social interaction*. Seven respondents articulated goals that fall into the group of goals that pertain to *Continuous change*.

(3) *Differences pertained to emphasis and number of goals.* Individual differences among respondents were discernable in emphases identifiable by the number and type of goals articulated. One respondent provided several goals associated to the communication of subject matter content (Teacher at field practice school). One respondent articulated several goals associated to the use of teaching techniques (Professor of Mathematics Education). One respondent articulated several goals associated to social interaction (Lecturer at Department of Mathematics and Statistics).

The following statements from research participants provide examples of how respondents in concrete terms described what they saw as important goals of teacher preparation. The statements are verbatim where quotation marks are used. Statements without quotation marks are synthetic renderings of key points articulated in longer, more detailed responses. I have observed variants

of the same goal for teacher preparation for statements where several respondents are named (names used are pseudonyms).

To support the development of teachers' ability to make reasoned theoretical and methodological choices for how to realize educational goals in specific teaching-learning situations.

(Jukka, Antti)

“To create the kind of circumstances in classroom teaching where as many students as possible would have the chance to experience meaningful moments of insight and no one walks away with a bad overall experience.” (Paavo, Natalya, Arno)

That teacher students gain a broader understanding of math. “We would hope that teachers could show that mathematics is more than calculations”.

(Marianne, Timo)

Teacher students' understanding of student-centered learning is supported by providing teacher students with personal experiences of student-centered learning. (Taimi)

5.1.2. Discussion on the goals of teacher preparation in science teacher preparation.

The purpose of this study was to investigate characteristics of a discourse on teacher preparation. A local discourse on the goals of science teacher preparation can be outlined along three axes that describe goals that pertain to: (1) making reasoned choices in the use of teaching methods and techniques, (2) adapting and changing practices associated to teaching and learning continuously, (3) developing social interaction skills and skills for working with diverse groups of learners.

Faculty and administrators articulated several goals associated to subject matter content and the need to adapt teaching and program goals to expectations that derive from the local organizational context and the national discourse on education more broadly. Students articulated few or no goals of this type. The observation that types of goals articulated by the respondent corresponded to the organizational position of the respondent was compounded and further confirmed by differences in individual emphases articulated by respondents.

The results of the study present a coherent conceptual model in which the primary goals of teacher preparation are seen as the development of an ability to reason about decisions about methods used for teaching and an ability to adapt methods for communicating subject matter specific content in ways that responds to different and changing needs among students. These goals encompass challenging teacher students expectations and ways of thinking about education and science so that teacher students are better prepared to meet students who have difficulties with math and students who do not think in a formal manner. Challenging teacher students aims at broadening the understanding teacher students have both of the field of education and the subject matter in which teacher students specialize, e.g. math and chemistry.

In this model, teacher-students are understood to be, in the moment that students enter the university, inexperienced in conceptualizing mathematics as something more than calculations and inexperienced in valuing Social sciences approaches. As such, teacher students were by all of the faculty respondents in this case study described as needing instruction for realizing that teaching-learning practices benefit from the use of different and multiple perspectives for understanding, learning and working with e.g. mathematical concepts. One of the faculty members expressed the above goal as follows:

“The concept of knowledge is very different in math and in education. Math is by nature very clearly structured, exact and cumulative. Many students in the natural sciences have been socialized to a particular way of looking at the natural sciences and it can be difficult for them to understand the value of research in education [kasvatustiede]. Education is not a hard science in the same way as the natural sciences. I want to open students up to reflection on these phenomena in a broader way. So that they understand that there is value in having different approaches to phenomena. It is not appropriate in the work of a teacher to wish for clear factual knowledge on which to build a teaching practice. Instead, the role of a teacher is to bring together different perspectives, thoughts and ideas in multiple ways. This kind of change in how preservice teachers think is what I try to achieve in the students”.

(Jukka, Professor of Mathematics Education, September 1st 2016)

The above interview excerpt identifies a specific change in teacher-students' ways of thinking about teaching that Jukka sought to achieve with his instruction.

Practices associated to the observed discourse include modeling student-centered teaching and learning practices in teacher preparation and challenging teacher students to reflect on the ways in which specific concepts are meaningful for different students and what students will get out of a specific way of teaching a topic. Such a practice is illustrated by the interview excerpt in the beginning of this section, in which Erik explained that something his students often did not expect to be part of teacher preparation was a reflection on "*what are students actually getting out of these topics and what does it mean for them?*" (Erik, September 19th 2016). Erik explained this type of challenge as an important goal that he sought to achieve. A goal to change the ways that many teacher-students in his experience thought about teaching.

I propose that findings presented in this section are significant in identifying a discourse that is distinct in the ways that it presents a local discourse of goals in science teacher preparation. An approach that purposively and explicitly challenges teacher-students to think. Notably, so that teacher-students would come to see the value of incorporating insights provided by social sciences approaches for developing teaching practices. A succinct articulation of the goal of teacher preparation observed in this case is to prepare teachers who are able to "*bring together different perspectives, thoughts and ideas in multiple ways*" (Jukka, September 1st 2016).

5.2. Collaborative practices.

I was the kind [of person] who really, really worked alone. Before university, I thought group-work was only something that slowed me down. Because I wanted to proceed faster, I wanted to proceed alone. And it was frustrating to have to explain to others. But then again, the contents were simpler [before university] so the concepts were easier to internalize without having to open them up. However, at university I realized that it was possible for the thought-process to start maturing only after getting as many perspectives as possible into different things. And that would not actually have come about by anything else except working in groups. In the lecture hall you'll get primarily the view of the lecturer. In section possibly the teaching assistant's view. But when you reflect in a group, you gain different approaches to the topic and you find that a solution can be achieved by many different means. [...]

(Anna, interview September 15th 2016)

Anna, a graduate student in the Mathematics and Physics strands provided the above reflections on the role of collaborative learning in teacher preparation. Other students similarly provided different articulations of how they had discovered the value of group- and team-work only after studies in higher education (tertiary education). In the following, I report on this and other themes that emerged in the interviews regarding the role of collaborative practices in science teacher preparation.

Interviews and observations were carried out in a program that prepares subject-matter specialized teachers at a research university in Finland. Participants were faculty, instructors and students from two university departments (the Faculty of Education and the Department of Mathematics and Statistics) and one field-practice school. The research question of the case study was: *What can the interviews conducted tell us regarding the characteristics of a local culture of teacher education?* Here, I focus on a narrower sub-question: *How did respondents articulate the role of collaborative practices in teacher preparation?*

This section is organized as follows. The first part presents research materials and findings focusing on respondent articulations of: (a) what are collaborative practices in teacher preparation,

(b) the role of collaborative practices in the preparation of science teachers, (c) concrete examples of how collaborative practices impact classroom teaching. The Second part of this section discusses findings using a structuration theory perspective.

5.2.1. Articulations and examples of the role of collaborative practices.

Thirteen semi-structured, open-ended, audio-recorded interviews averaging 59 minutes in length form the core of the research materials. I have formulated three assertions regarding characteristics of the discourse on teacher preparation observed:

(1) *Collaboration is part of a professional profile.* Collaboration among peers (among students, among teacher-students and among faculty) was described by research participants as a characteristic of the professional teaching community.

(2) *Collaboration is resisted.* The introduction and use of collaborative practices was described as meeting resistance due to the fact that many students were unaccustomed to valuing collaborative learning practices and in the case of faculty due to the fact that faculty were unaccustomed to working across subject matter specializations.

(3) *Collaboration was not common sense, except for a few participants.* The minority of respondents (two out of thirteen) who did not discuss resistance to collaboration, explained collaborative practices as common sense and necessary.

In analyzing different research participant articulations on collaboration, I noticed at first that there seemed to be a strong consensus on the topic of collaboration among research participants. The consensus was not expressed by the use of specific words or identical expressions or identical articulations or similar examples. Yet, it became clear from the interviews in this case that all respondents agreed on a number of points. These points, which were spontaneously constructed by research participants consisted of the following assertions: (a) Collaboration characterizes the

professional teacher community and teachers cannot function effectively without skills in collaborating with peers and skills in organizing student teamwork. (b) Collaboration is resisted both by faculty and teacher-students. Students often do not realize the benefits of collaborative learning practices until later. (c) Collaborative learning practices are not common sense and have traditionally not been used much in teaching-learning practices. All except three of the faculty respondents described collaborative learning practices as something that faculty was trying to increase and help students to understand the value of. All except one of the students described themselves as individual learners who had little prior experience of collaborative learning and who initially rejected collaborative learning practices as ineffective.

A shared characteristic of two of the respondents (one student and one faculty member) who did not describe collaborative learning as something to increase or something they had initially rejected is that both explained collaboration with peers and the use of collaborative teaching-learning practices a premise for productive teaching. In other words, these two respondents explained the use of collaborative practices as common sense while other respondents explained collaboration as difficult but necessary. The third respondent who did not express an interest to increase the use of collaborative learning practices in classroom teaching, described some of the problems associated to the use of collaborative learning practices such as the concern that individual students participating in group-work may remain disengaged. The same respondent underscored the importance of collaboration among teachers.

Four out of five students interviewed in this case identified the use of collaborative learning practices as an important take-away from the teacher preparation program, as a new insight and something they planned to use in their own teaching practice. All of the students interviewed, and all of the faculty and administrators interviewed in this case identified collaboration with peers as

a characteristic of the professional teaching community and a necessity for being able to productively and effectively function as a teacher in K-12 schools or as an instructor in higher education.

The following statements from research participants provide concrete examples of how respondents described the impact of collaborative practices on classroom teaching. The statements are verbatim where quotation marks are used. Statements without quotation marks are synthetic renderings of key points articulated in longer, more detailed responses. I have observed variants of the same goal for statements where several respondents are named (names used are pseudonyms).

“[... discussing math concepts in groups] your understanding of math as a language is enriched in the sense that you learn how to articulate concepts and thoughts.”

(Paavo, Anna, Jukka)

Collaboration among teachers is a resource for sharing experience, knowledge and for solving issues at school.

(Matti, Erik, Tarja, Natalya)

Collaborative learning practices help to motivate students and prevent drop-out.
(Kirsi, Marianne, Timo)

Teacher students resisted the use of collaborative teaching and learning practices initially. Several students realized later that such practices are a valuable take-away from the teacher preparation program. (Paavo, Anna, Antti, Timo, Erik)

5.2.2. Discussion on the role of collaborative practices in science teacher preparation.

The purpose of this study was to investigate characteristics of a discourse on teacher preparation. A local discourse on the role of collaborative practices in science teacher preparation can be outlined along three axes that describe collaborative practices as: (1) A premise for effective and productive teaching. (2) Associated to discovery and advanced understanding of math. (3) A practical measure for supporting student motivation and for preventing drop-out.

All of the respondents explained that collaboration among peers (among students, among teacher-students and among faculty) is a premise for productive teaching and learning. Eleven out of thirteen respondents described the use of collaborative practices as difficult, little practiced or as meeting resistance. Two respondents out of thirteen explained collaborative practices as common sense and necessary. The articulations of these two respondents differed from the other respondents in that these two respondents did not discuss resistance to collaboration.

Respondents identified two spheres of collaboration in response to my question on the role of collaboration in the preparation of science teachers. On one hand, collaboration was associated to the sharing of experience and contribution to the organization of teaching among teachers. On the other, the skills for organizing student team-work and the use of collaborative teaching and learning practices in classrooms. Several difficulties in the realization of teaching techniques using collaborative learning practices were noted and discussed by research participants. However, an overall consensus emerged regarding the necessity to include collaborative learning practices in order to achieve productive and effective teaching.

I propose that findings presented in this section are significant in identifying a discourse that is distinct in the ways that it presents a local discourse about the role of collaborative practices in science teacher preparation. In this approach, collaborative practices are valued but are also understood as challenging. Several examples of the ways in which both students and faculty have resisted and continue to resist the use of collaborative teaching and learning practices were noted by research participants. Four out of five students noted that practicing and learning about the use of collaborative practices was an important take-away from the teacher preparation program. Three out of five students provided narratives in which they described themselves as individual learners who prior to attending university avoided or disregarded the use of collaborative practices. Several

students described having perceived collaborative learning practices as inefficient prior to attending the program. However, by the time of the interview, each of the five students asserted that skills in organizing collaborative teaching and learning activities was important and central for learning and for their work as professional teachers.

5.3. Research.

There is a wish that the teacher would make decisions, important educational decisions based on an ability to see the value of research and what is known from research regarding good outcomes [in education]. That the principles used [in teaching] would be principles that have been tried. That [teachers] would not tag along to just anything ... well, or, of course you have the permission to try out different things. It's possible that interesting ways of doing things [teaching] can be found if teachers just try out whatever comes to mind, however, we would like them [teacher students] to see the relevance in that someone has actually conducted research on [a proposed teaching method].

(Taimi, September 6th 2016)

The above quote was provided by a university lecturer at the Faculty of Education. The quote expresses a theme that was taken up by several other faculty members both from the Department of Mathematics and Statistics as well as the Faculty of Education. Namely, that knowing about research was understood as important for teachers so that teachers would be better able to discern between good and poor teaching practices.

In the following, I report further articulations on the above theme and other articulations associated with the role of research in science teacher preparation as observed in a program that prepares subject-matter specialized teachers at a research university in Finland. Participants were faculty, instructors and students from two university departments (the Faculty of Education and the Department of Mathematics and Statistics) and one field-practice school. The research question of the case study was: *What can the interviews conducted tell us regarding the characteristics of a local culture of teacher education?* Here, I focus on a narrower sub-question: *How did respondents articulate the role of research in teacher preparation?*

This section is organized as follows. The first part presents research materials and findings focusing on respondent articulations of: (a) research that is relevant for teacher preparation, (b) the

role of research in the preparation of science teachers, (c) concrete examples of how research is relevant for classroom teaching. The second part of this section discusses findings using a structuration theory perspective.

5.3.1. Articulations and examples on the role of research.

Thirteen semi-structured, open-ended, audio-recorded interviews averaging 59 minutes in length form the core of the research materials. I have formulated three assertions regarding characteristics of the discourse on teacher preparation observed:

(1) Faculty and administrators assigned several roles for research and provided a greater variety of articulations in comparison to teacher students.

(2) Three shared themes in several of the interviews were that research was seen to support (a) *teachers' ability to discern among sources of information* and (b) *to stay up-to-date in their profession* and (c) respondents made a *distinction between research in education and research in the natural sciences*.

(3) The emphases on what kinds of research was understood as important for teacher preparation varied to some degree among respondents. Two out of thirteen respondents proposed that research was neither practically realizable nor necessary for teachers. The latter were one teacher student and one instructor with an initial degree in education from abroad.

The following statements from research participants provide concrete examples of how respondents described the role of research for teacher preparation and the role of research for the work of teachers in practice. The statements are verbatim where quotation marks are used. Statements without quotation marks paraphrase points articulated in longer, more detailed responses. I have observed variants of similar articulations for statements where several respondents are named (names used are pseudonyms).

Knowing about research is important for teachers' ability to stay up-to-date as professionals in their field.
(Tarja, Marianne, Arno, Anna, Kirsi)

Knowing about research helps teachers to discern among competing requests and pressure from society.
(Erik, Tarja, Jukka, Natalya)

The teacher education program complements the students' prior knowledge of research practices [in the subject matter they specialize] with a research-oriented course and a graduate seminar that supports the students understanding of research in the field of education.

(Tarja, Jukka, Taimi, Timo, Kirsi)

“Knowing about research is very important because a teacher will not be able to think critically otherwise.”
(Paavo, Anna, Matti, Marianne)

5.3.2. Discussion on the role of research in science teacher preparation.

The purpose of this study was to investigate characteristics of a discourse on teacher preparation. A local discourse on the role of research in science teacher preparation can be outlined along four axes that describe the role of research as:

(1) *Supporting teachers' ability to discern among information and priorities.* Knowing about research practices was described by research participants as related to the teachers' ability to discern among sources of information, ability to prioritize among competing demands and being able to discern among good and poor teaching practices.

(2) *The role of research in teacher preparation was articulated as associated to specific challenges.* One of the challenges identified was that the research traditions in the social sciences and natural sciences are quite different and that teacher students for this reason need introduction to different approaches to research. Another challenge identified was that of practical barriers

which often were related to resources such as “*teacher’s do not have time to conduct research*” (Marianne, Natalya) or that funding was lacking.

(3) Knowing about research was identified by several research participants as important for teachers for staying *up-to-date* as professionals.

(4) An expectation that faculty should build their instruction drawing on their own research was articulated and contrasted with the recognition that in reality, it was necessary for faculty in education to draw much on research conducted by other researchers (Erik).

Similarly as observed with regard to articulations on the role of critical thinking in teacher preparation, respondents demonstrated a clear hierarchy of articulations. A hierarchy, in the sense that faculty provided elaborate explanations of why and how research matters for teacher preparation, whereas students provided briefer and simpler answers that seemed to draw on faculty articulations. The latter observation may be related to greater experience among faculty members in conducting research. Accordingly, the observed hierarchy comes across as explainable by the degree of respondent experience in conducting research.

A similar hierarchy observed in articulations on the role of critical thinking was in turn observed to be controversial by one respondent (Marianne) due to key tenets of critical reasoning associated to autonomous thought. In other words, critical reasoning is supported by autonomous thought on behalf of the student and is to some degree contradicted by the hierarchal relationship of teacher and student inherent to many teaching-learning situations. While the hierarchal relationship manifested in the articulations regarding the role of research may come across as unproblematic, it is also interesting to note that a primary purpose of research, as identified by eight out of thirteen respondents, was the ability to discern among sources of information. In other words, more than half of the respondents considered teachers’ ability to conduct research, or teachers’ knowledge

about different forms of research important. Notably, as such skills were understood to support teachers' ability to think critically.

The results of the study present a coherent conceptual model in which teachers' research capacity is seen as important for discerning between good and poor teaching practices and for staying up-to-date as a professional. Several practical and primarily resource associated (lacking time or lacking funding) barriers were identified for why teachers do not conduct research. In this model, science teacher-students are understood as inexperienced in valuing approaches to research in the social sciences. Research in education, the natural sciences and other pertinent fields of research were explained, by research participants, to be necessary fundamentals for effective teaching.

Practices associated to this model include the provision of research focused seminars and courses in the field of subject matter specialization and education. The former, as part of an undergraduate thesis and the latter in the form of a graduate thesis for the Faculty of Education. I propose that findings presented in this section are significant in identifying a discourse that is characterized by the way that it emphasizes the importance of the development of skills in social science research as part of the preparation of science teachers. An approach in which knowing about different approaches to research is understood to enable critical thinking and reasoning about choices in the use of methods or teaching techniques.

5.4. Critical thinking.

One of the most important things that schools should teach to students is the ability to relate critically to information. In my view, mathematics plays an important role in that because mathematics is one of the few areas of science in which you do not have to rely on an authority. Even in the hard natural sciences, you have to be able to trust the word of a laboratory researcher. That it's true what the researcher says he or she has done for obtaining results and conclusions. You don't get to go into the laboratory [to verify]. However, mathematical truths are such that when you understand a phenomenon, you know it's true. You don't need to rely on what someone else says.

(Jukka, Professor of Mathematics Education, interview September 1st 2016)

The above quote is from the Professor in Mathematics Education at the Faculty of Education. The quote illustrates one of the themes that were taken up by other respondents as well. Namely, that critical thinking was understood as associated to teachers' and students' ability to discern among different sources of information. In the following, I report on further examples of this and other themes that emerged in respondent articulations on the role of critical thinking in science teacher preparation. Interviews and observations were conducted in a program that prepares subject-matter specialized teachers at a research university in Finland. Participants were faculty, instructors and students from two university departments (the Faculty of Education and the Department of Mathematics and Statistics) and one field-practice school. The research question of the case study was: *What can the interviews conducted tell us regarding the characteristics of a local culture of teacher education?* Here, I focus on a narrower sub-question: *How did respondents articulate the role of critical thinking in teacher preparation?*

This section is organized as follows. The first part presents research materials and findings focusing on respondent articulations of: (a) what critical thinking is, (b) the purpose of engaging critical thinking in science teaching, (c) concrete examples of critical thinking in classroom

teaching. The Second part of this section discusses findings using a structuration theory perspective.

5.4.1. Articulations and examples of critical thinking.

Thirteen semi-structured, open-ended, audio-recorded interviews averaging 59 minutes in length form the core of the research materials. I have formulated three assertions regarding characteristics of the discourse on teacher preparation observed:

(1) Position in the formal organizational hierarchy manifested itself in the degree of elaboration of responses. While faculty provided long and elaborate explanations, students provided shorter and narrower explanations.

(2) Shared references across respondents regarding the role of critical thinking show that twelve respondents provided variants of the following articulation: critical thinking is about *pro-active questioning of the occurrence of bias in teaching practices*. Eight respondents provided variants of the following articulation: *teachers need to be able to make autonomous decisions that differ with textbooks and curricula, in order to teach in a locally relevant and reasoned manner*. Eight respondents connected critical thought to the *ability to develop teaching practices drawing on research* (rather than opinion, fashion or political pressure).

(3) Individual differences in responses emerge in the emphases regarding the purpose of critical thought. Two student respondents emphasized the role of critical thought as the *accommodation of different student learning styles*. Three faculty members emphasized the role of critical thought for *enabling teacher autonomy*.

Respondent descriptions of concrete examples of critical thought in classroom teaching illustrate how participants translated critical thinking into practices (names used are pseudonyms).

Inquiring together with students into news about environmental deterioration, looking at how the claim is supported and trying out ways of verifying the claim.

(Arno, Matti)

Pushing teacher-students to question conventions in subject-matter teaching.

(Erik, Marianne)

Recognizing that statistical data can be presented in misleading ways.

(Jukka)

Recognizing that critical thinking in science teaching is a premise for active citizenship.

(Taimi)

The pilot study conducted in the U.S. in 2015 indicated that critical thought was associated with the idea that teachers should play a role in political activism and in ***changing society*** by addressing social injustices. Respondents in Finland instead indicated that students should be supported to learn to make critically informed pedagogical decisions that contribute to ***changing teaching practices***. The idea that teachers in Finland “*need to have a strong theoretical foundation and to be well-versed in research practices in order to withstand the crossfire of sometimes unreasonable expectations*” (Erik) was an articulation that characterized the approach to teacher preparation.

5.4.2. Discussion on the role of critical thought in science teacher preparation.

The purpose of this study was to investigate characteristics of a discourse on teacher preparation. A local discourse on the role of critical thought in science teacher preparation can be outlined along four axes that describe critical thinking as: (1) closely related to research capacity, (2) a premise for teacher autonomy, (3) necessary for resisting political pressure, (4) a pre-requisite for ethically guided professional work.

Respondents demonstrated a clear hierarchy of articulations in which faculty provided elaborate explanations of concepts of critical thinking and students provided simpler versions that seemed to draw on faculty articulations. A teacher who tells students to think critically can be seen to work against the principle of autonomy and thereby to undermine the students’ ability to think critically.

The hierarchy observed seems for this reason a paradox, as respondents assigned an important role also to autonomous reasoning.

The results of the study present a coherent conceptual model in which critical thought is understood in relation to research capacity and is seen as necessary for teacher integrity. In this model, teacher-students are understood as inexperienced in critical thinking and as such in need of guidance and instruction that encourages students to question conventions. Critical thinking was articulated as being part of scholarly and academic expertise that takes into consideration societal, historical, philosophical, political, human-development specific as well as subject-matter specific areas of knowledge.

Practices associated to this model include pro-active questioning of written regulations and existing teaching practices. Also, a pro-active effort to support the development of teachers able to work with groups of students that are diverse in terms of socio-economic status, gender and language or ethnic background (cultural/racial/economic differences). I propose that findings presented in this section are significant in identifying a discourse that is distinct in the ways that it proposes a local adaptation of globally relevant discourse traditions of critical thought. An approach in which critical thinking is understood as pro-active questioning of the occurrence of bias in teaching practices.

5.5. Different forms of knowledge and skills.

“ There’s an idea behind this that goes through all of how we teach math. Different people have different views on this. That is, what is the relationship between math in school and math at the university level? For some people, these are two entirely different things. For others, they are the same thing but different parts of a whole. For us, it’s the latter. I am very strongly, and our team is strongly for the latter take. [...] A concrete example of this is a question that is always acute for teacher students: “Why the heck do I have to study these kind of things as I am studying to become a teacher?” The idea is that a teacher has to understand what he or she is doing with the students in a way that goes beyond the textbooks and beyond the national curriculum.[...]”

I hope that the teacher would not be the kind of guide to a nature sanctuary in a swamp who knows how to say: - “ Here’s the trail made with the boardwalk, we’ll walk along the trail and we’ll be certain to be safe as long as we stay on it.” I wish instead that the teacher would be able to say: - “Uhuh, there’s an interesting looking hill, let’s start together going in that direction”. That the teacher knows the swamp well enough so that all are safe. Otherwise anything that is not taken up in the textbook, and you can’t say difficult things in a textbook nor should you try to, remains a scary unknown area for the teacher. Or every time the student asks something that is different from how the teacher thinks about it, you more or less have a situation in which [the student is told: -] “you’re not allowed to think like that, shut up”. And that’s horrible. Because exactly what the teacher should be doing is to encourage students to think. If what the students are thinking does not work, then to [say]: “Uhuh, that did not seem to work, let’s think of something else”. But not like: “That’s not in the textbook, don’t think like that”. This kind of narrow-minded condemning is inevitably taking place if the teacher does not have a broad and deep expertise and of course enthusiasm for students and the subject matter.”

(Timo, Professor of Mathematics, interview September 7th 2016)

The above quote from the Professor in charge of the development of mathematics instruction at the Department of Mathematics and Statistics articulates subject matter specific knowledge as one of the important areas of teachers’ knowledge and skills. Several other respondents discussed subject matter specific knowledge as an important knowledge area for teachers. In this section, I discuss further examples of this and other important knowledge and skills areas discussed by respondents.

Interviews and observations were conducted in a program that prepares subject-matter specialized teachers at a research university in Finland. Participants were faculty, instructors and

students from two university departments (the Faculty of Education and the Department of Mathematics and Statistics) and one field-practice school. The research question of the case study was: *What can the interviews conducted tell us regarding the characteristics of a local culture of teacher education?* Here, I focus on a narrower sub-question: *How did respondents articulate the knowledge areas and skills promoted in teacher preparation?*

This section is organized as follows. The first part presents research materials and findings focusing on respondent articulations of: (a) which knowledge areas and skill are relevant for teacher preparation, (b) knowledge areas and skills relevant for the preparation of science teachers, (c) concrete examples of knowledge and skills that are relevant for classroom teaching. The second part of this section discusses findings using a structuration theory perspective.

5.5.1. Articulations and examples of pertinent forms of knowledge and skills.

Thirteen semi-structured, open-ended, audio-recorded interviews averaging 59 minutes in length form the core of the research materials. I have formulated three assertions regarding characteristics of the discourse on teacher preparation observed:

(1) *Respondent answers on skills and knowledge reflected and partly overlapped the respondents' articulation of what it means to be a good teacher.* For example, the capacities of a good teacher and the forms of knowledge and skills a teacher needs to develop were articulated as one theme by Anna and Paavo.

(2) *Eight out of thirteen respondents described the teaching profession as a profession that required 'interlinked' sets of skills and knowledge.* In other words, several different forms of knowledge was required and the teacher needed to realize connections between different sets of knowledge. All of the staff members at the Faculty of Education articulated this point. Tarja's drawing about the different knowledge areas of a teacher illustrates the connections between

different areas of knowledge as partly overlapping concepts (Figure 12). Tarja explained to me while drawing figure 12 that her intention with the image was specifically to show how the different knowledge and skills areas of a teacher were interlinked. In Taimi's drawing (Figure 13), knowledge areas connect to a teacher in the middle of the illustration. The emphasis of the two illustrations is slightly different as Figure 12. depicts knowledge areas as abstract overlapping concepts, whereas Figure 13. places the teacher in the center of the image and therefore accords the teacher a role in making connections between knowledge areas. The difference is that the first illustration explains the nature of areas of knowledge as abstract symbolic concepts, whereas the latter assigns the act of linking knowledge areas to the teacher.

(3) *Differences were notable in the numbers of forms of knowledge and skills articulated by respondents.* The number of knowledge areas listed ranged from one (Antti) to forty (Taimi). Another difference was that subject matter related knowledge areas were emphasized by faculty at the Mathematics and Statistics Department whereas faculty at the Education Department emphasized the importance of psychological and social theories.

Natalya, a teacher in the field practice school identified four areas of knowledge that were in her view important for a teacher to master: (1) *to know how to teach*, (2) *to know how to communicate*, (3) *to know how to be fair and just*, (4) *to know mathematics* (September 14th 2016). When I subsequently asked her to draw an image that represented the knowledge areas of a teacher, she drew a large smiling sun (Figure 7.) and explained that a positive outlook was one of the most important features of a teacher. She added a few mathematical formulas as an afterthought when I asked further about how she conceptualized the knowledge and skills areas of a teacher. The mathematical formulas drawn connect to the fourth point of her verbal articulation of what teachers

need to know (to know mathematics). The positive outlook she described, was a feature of good teaching that underpinned the other points that she counted up.

Excerpt from interview (September 14th 2016):

Natalya: [...] I think that's an easy answer, let's draw a sun. A sun, that's a good style. You have to have, it's really important to have a good mood, even as eight graders can be really annoying sometimes [laughs]. Some behave badly, but you can't get angry at them, you have to meet them in a warm manner and good mood. You have to understand how to be in a good mood. You can't shout at them, shouting does not help. Does not solve problems. [...]

Susan: So the interaction is so important, that's what needs to be taught? But if we think about the knowledge and skills needed to learn for becoming a teacher, is there perhaps something else as well? Or?

Natalya: [laughs] I don't know what to envision [draw], I could draw some different formulas here, the square root is something that has to be known.

Susan: Yes, so skills in mathematics?

Natalya: Yes. Well, I could write five here. So skills in mathematics, that's really important, [that's something] that can't be depicted in in this [picture]. You have to know this cannot be negative. That kind of knowledge. Also, you have to be secretive at times. You can't just say everything straight out. For seventh graders you cannot tell why such a, where the formula for the surface of the sphere comes from. So you [the student] get to do some research, if you divide the circle, you put into the circle a polygon and calculate the surface of the polygon, you'll get approximately the same outcome. Or something like this.

Susan: So in a way to leave something there to be found?

Natalya: Yes. Hmm. [...]

Another of the respondents made a distinction between the knowledge areas a subject matter teacher needs to know and the skill-set and knowledge required to be a good teacher (Marianne). Marianne pointed out that it was possible to function as an advanced professional and to teach mathematics at a high level and to still be a lousy teacher. The distinction was a way of pointing out that subject matter specific knowledge was of primary importance for Marianne, however, that

the kinds of knowledge required for being a *teacher* were distinct from the skills and forms of knowledge required for being a *good teacher*. Yet, the latter was not possible to achieve without mastering the former. In other words, that knowledge of the subject matter was a fundamental starting point for a teacher, whereas knowledge in the field of education was necessary to be a good teacher.

Excerpt from interview (September 13th 2016):

Marianne: [...] For example, if I didn't have a subject matter teacher degree, I could still be a professional educator, while of course it [graduate studies in education] does add a specific structure, one knows how to look at things from a different perspective.

Susan: Do you think very good mastery of the subject matter content is a sufficient foundation on which one can function?

Marianne: It's possible, but in my view there are many teachers, in particular in higher education, who are not specialists in education or advanced professionals in education. [...] someone who actually thinks about the field of education and who tries in their own work to develop themselves and the field [...] specifically with regard to education. [...] It's a different thing to be a professional and really to be a specialist in something. It's possible to hold a position in which one teaches, and yet be lousy.

Susan: I see, so one does not need to be a specialist in order to be an advanced professional?

Marianne: Yes [laughs].

In our continued discussion, Marianne noted that mathematics teachers play a role in what kind of ideas about mathematics become common among the broader public. She said that mathematicians tend to regard that the concept of mathematics among the public is narrow. Marianne continued by saying that students who arrive at university, often have a very narrow perception of what mathematics is. She said, "*We would hope that the teachers could somehow show that mathematics is not only about calculations*" (Marianne, September 13th 2016).

The following statements from research participants provide further concrete examples of how respondents described the areas of knowledge and skills of science teachers. The statements are verbatim where quotation marks are used. Statements without quotation marks paraphrase points articulated in longer, more detailed responses. I have observed variants of similar articulations for statements where several respondents are named (names used are pseudonyms).

“Studying only math at first and learning about education later is suboptimal. It’s important that the understanding of math and how to teach are developed at the same time”
(Kirsi, Jukka, Tarja)

“A teacher needs to have social skills for communicating with diverse groups of learners.”
(Paavo, Arno, Marianne)

“Theoretical foundations prepare teacher students for meaningful growth in a professional community.”
(Taimi, Erik, Antti)

“Teachers’ participation in discussions that affect the context of work can help to prevent teacher burn-out.”
(Jukka, Erik, Taimi)

5.5.2. Discussion on knowledge and skills promoted in science teacher preparation.

The purpose of this study was to investigate characteristics of a discourse on teacher preparation. A local discourse on the areas of knowledge and skills that teachers need to master can be outlined along three axes: (1) *Broad understanding of the subject matter*. For students specializing in math, this includes university- and school-level math and the ability to teach the skill-sets that mathematicians need. (2) *Understanding of education as a field of research and practice*. This includes, but is not limited to, the development of social interaction skills and understanding of how to work with students from different backgrounds and social positionalities. (3) *Simultaneous engagement of several interlinked areas of knowledge*. This includes, but is not limited to, experience-based professional skills that are gained from working with local communities and

research-based knowledge of teaching-learning practices and phenomena pertinent to classroom teaching.

The results of the study present a coherent conceptual model in which knowledge and skills areas of a teacher correspond with the idea of what it means to be a *good teacher*. The definition of a good teacher is thereby in this discourse a concept that is understood as representative of articulated sets of knowledge and skills. In this model, teacher-students are understood as narrowly focused and as such in need of guidance and instruction that encourages students to broaden their understanding of sciences, education and society. The teacher profession is in this approach understood to require the ability to simultaneously engage multiple interlinked and broad sets of knowledge.

Practices associated to this model include familiarization of students with research practices in education as well as the subject matters in which students specialize. social sciences as well as the natural sciences. The development of social interaction skills and communication skills in parallel with theoretical understanding was in this program supported by alternating field practice with lectures and by supporting student learning by pair, team and group-work assignments in sections and as part of lectures. Becoming a teacher was described as a long term process that did not end at graduation from the program. Taking on various profession related roles in schools such as supporting the development of social cohesion in school, taking on roles in workplace policy development or development of education policies on the municipal level were some of the ways described as relevant for broadening teachers' knowledge and skills areas. Accordingly, the notion of broad knowledge of education included in important ways the experience that is obtainable only by working as a teacher and from gaining experience from different roles in the context of education such as associative and policy oriented assignments.

I propose that findings presented in this section are significant in identifying a discourse that is distinct in the ways that it proposes a local adaptation of globally relevant discourse traditions of the skills and knowledge areas of teachers. An approach in which “theoretical foundations prepare teacher students for meaningful growth in a professional community” (Taimi, interview September 2016).

5.6. The good teacher.

“A chemist is someone who first studies the qualities of natural phenomena and then formulates knowledge. After this, he/she [fi. hän]. spends a lot of time and effort to come up with applications of this knowledge, such as chemical compounds, for which the chemist invents uses for. After this, the chemist studies the use and the effects of the chemicals he or she has contributed to getting out into the use of societies. He/she studies the effects on human beings, plants and animals. The chemist registers the damage that the chemicals produce. Finally, the chemist tries to figure out some ways of dealing with the problems he/she has caused.”

(Matti, interview September 2nd 2016)

The above quote from one of the student respondents in this case study was provided by Matti after he had explained to me that humor was in his view an important part of being a good teacher. Matti told me that a Professor he had appreciated when he studied Chemistry had related the above narrative. Two other respondents similarly identified specific different teachers they had personally encountered as examples of what it meant to be a good teacher.

In the following, I report on articulations regarding what it means to be a good teacher, as observed in a program that prepares science teachers at a research university in Finland. Participants were faculty, instructors and students from two university departments (the Faculty of Education and the Department of Mathematics and Statistics) and one field-practice school.

The research question was: *What can the interviews conducted tell us regarding the characteristics of a local culture of teacher education?* Here, I focus on a narrower sub-question: *How did respondents articulate what it means to be a good teacher?*

In compiling different research participant articulations on what it means to be a good teacher, I noticed at first that similarly as with the articulations of goals, the total number of characteristics of a good teacher articulated exceeded the number of research participants. Each of the participants

identified a variety of different goals. I observed that faculty overall provided more complex responses. However, while I had observed in the articulations on goals a clear difference associated to organizational position (faculty vs. student), this was not the case for the articulations on what it meant to be a good teacher. I observed a lot of thematic overlap among respondent articulations. The overlap observed prompted me to articulate three thematic categories under which many, while not all, of the articulations can be grouped. The categories serve to identify cross-cutting themes:

(1) **Subject matter**, in this category I have grouped articulations focusing on a good teacher being a teacher who knows about the subject matter and how to communicate about the subject.

(2) **Social skills**, in this category I have grouped articulations focusing on a good teacher being a teacher who is skilled in social interaction, has humor and is reciprocal in his or her relationship to students.

(3) **Responsibility**, in this category I have grouped articulations that refer to the good teacher as someone who is morally and mentally accountable, someone who continues to learn, strives to be impartial in his or her treatment of students and someone who reflects on his or her teaching practices, is self-critical in reflecting on biases and reflects on what students get out of the teaching-learning activities.

Three out of seven male respondents said that using humor was an important skill for good teachers. Four out of six female respondents named “*determining which teaching-learning activities were appropriate for the developmental stage or age of students*” as an important skill of a good teacher. These observations indicate a gender difference where men in the observed context were more numerous in emphasizing the use of humor, whereas women were more numerous in emphasizing sensitivity to the developmental age of students.

The older research participants provided more complex and more elaborate articulations of what it means to be a good teacher. This age-related observation can be associated to experience with teaching and with the preparation of teacher students. In this sense, it is not age per se which is a necessarily relevant factor but rather the years of experience with teaching and teacher preparation.

What remains of this section is organized as follows. The first part presents research materials and findings focusing on respondent articulations of: (a) What is a good teacher, (b) What is meant by a good science teacher, (c) concrete examples of what a good teacher does in classroom teaching. The Second part of this section discusses findings using a structuration theory perspective.

5.6.1. Articulations and examples of the good teacher.

Thirteen semi-structured, open-ended, audio-recorded interviews averaging 59 minutes in length form the core of the research materials. I have formulated three assertions regarding characteristics of the discourse on teacher preparation observed:

(1) *The respondents did not distinguish between what it means to be a good teacher and what it means to be a good science teacher.* This was true both for the articulations provided by students and the more complex articulations provided by faculty and instructors.

(2) Important overlap in articulations was observed in that nine out of thirteen respondents addressed each of the following characteristics in a good teacher: mastery of *subject matter*, *social skills* and *responsibility*. Three out of thirteen addressed two of the above themes and one of thirteen addressed one of the above themes.

(3) *Individual differences in emphases and articulations were prominent.* For example, three of the respondents provided each different articulations drawing on personal encounters with teachers. The articulations on why a specific teacher was identified as an exemplary teacher was

in each of the three respondent articulations different. One emphasized the ability to communicate the subject matter, another emphasized a calm demeanor whereas the third emphasized the ability to use humor.

The following statements from research participants provide concrete examples of how respondents described the good teacher. The statements are verbatim where quotation marks are used. Statements without quotation marks paraphrase points articulated in longer, more detailed responses. I have observed variants of similar articulations for statements where several respondents are named (names used are pseudonyms).

“A good teacher is able to encourage all students irrespective of gender and other differences to experience success in their learning.”
(Kirsi, Arno, Taimi, Jukka)

A good teacher adjusts teaching-learning activities to the developmental age of the students and provides easier as well as more challenging assignments.
(Anna, Tarja, Taimi, Natalya)

A good teacher has the kind of sense of humor that connects to critical thinking, e.g. as exemplified by the story of the “Good Soldier Švejk”.
(Timo, Matti, Paavo)

“Taking on different profession related roles contributes to developing experience as a teacher, this can include efforts to develop teaching practices, efforts to support the development of social cohesion among students in school and contributing to public discourse.”
(Jukka, Erik, Taimi)

An interesting feature of the descriptions provided of the good teacher by research participants in this case study is that respondents did not distinguish between good teachers and good science teachers as two separate groups. Two of the student respondents articulated this stance in an explicit manner by noting that there are many kinds of good teachers. One of the students included in his conceptualization of good teachers and advanced professionals in education, in addition to

teachers and researchers, also those who work with early childhood programs as well as those who work with training soldiers in the army (Matti). Another student similarly noted that she included all qualified professionals working with children (Anna). A broad conceptualization of the profile of a good teacher was echoed also in faculty interviews.

Three faculty members articulated a number of profession related roles that teachers can take on in the school they work, in the local community or in public discourses (Erik, Jukka, Taimi). While faculty recognized that not every teacher will do all of these things, nevertheless, the concept of what it means to be a good teacher was in three of the faculty interviews articulated as the expectation that a good teacher takes on multiple profession-related roles over the course of his or her career as a way to gain experience (Jukka, Erik, Taimi). This expectation was not presented as being different for science teachers as compared to other professional teachers. Some of the different roles that a good teacher can engage as enumerated by Jukka were: (1) *following the development and participating in the public policy discourse on education*, (2) *participating in groups that discuss the development of the school in which the teacher works*, (3) *participating in groups that discuss the development of the education policies of the municipality that the teacher teaches in*, (4) *participating in the national teacher's union*, (5) *gaining a graduate degree in education*, (6) *proactive reflection*, (7) *experimenting and developing practices based on his/her reflection and* (8) *working with developing his or her own work*, (9) *following how the field is developing in his or her area of specialization*, (10) *supporting the development of social cohesion among the students in the school in which the teacher works..*

5.6.2. Discussion on the promotion of good teachers in science teacher preparation.

The purpose of this study was to investigate characteristics of a discourse on teacher preparation. A local discourse on what is meant by a good teacher can be outlined along three axes that describe characteristics assigned not only to science teachers but teachers in general as: (1) knowing how to communicate subject matter specific knowledge, (2) developing skills in social interaction, (3) taking on responsibility for keeping up-to-date, for providing relevant teaching and for reflecting in order to better meet the needs of the students.

The results of the study present a coherent conceptual model in which being a good teacher corresponds with the knowledge and skills areas of a teacher. The definition of a good teacher was understood as representative of an articulated sets of knowledge and skills. Interestingly, respondents did not distinguish between what it means to be a good teacher and what it means to be a good science teacher. Accordingly, the discourse documented in this case study illustrates an approach to teacher preparation where the skills and knowledge areas required for being a good teacher are not tied to the subject matter in which the teacher specializes. In other words, the kinds of skills and knowledge areas a good teacher in Physics needs were identified as the same set of skills and knowledge areas a good teacher in Music needs to master, with the difference that both need to master subject matter specific skills as well.

Practices associated to this model include efforts to advance the learning of all students irrespective of pre-existing skills and knowledge (or lack thereof) in diverse groups of learners. Associated practices include the use of humor in classroom teaching and adjusting teaching-learning practices to students at various stages of development and subject matter mastery. The importance of the former practice was emphasized by male respondents and the latter by female respondents. As noted in the above section on knowledge and skills areas of teachers, being a good

teacher was associated to a continued professional development and accumulated experience over time. Taking on roles such as participating in the teachers union, participating in education policy discussions in the local municipality or contributing to the development of textbooks were examples of the kind of roles that good teachers could take on.

I propose that findings presented in this section are significant in identifying a discourse that is distinct in the ways that it proposes a local adaptation of globally relevant discourse traditions of what it means to be a good teacher. An approach in which the *good* of the teacher was defined in a knowledge intensive form. The latter is emphasized by the fact that respondents associated critical thinking skills with the scientific method. This means in practice that even teachers efforts to treat students in impartial, non-biased ways was not articulated as an attitude issue or value issue but a as a skill that depended on teacher's knowledge about diverse learning approaches and different approaches to interrogate social and natural phenomena.

5.7. Comparison of an interview narrative with a vestige from the oral tradition.

In this section, I reflect on the narrative of the chemist provided by Matti (see beginning of section 5.6. above). I propose a comparison with an older documented narrative from the *Kalevala* that relates to the origin and uses of iron (Lönnrot, song 9, verses 29 - 416). Matti and the Professor of Chemistry who had related the narrative of the responsibilities of a chemist to Matti and his peers, likely did not intend the story as a parallel to the ninth song in Kalevala. However, I am suggesting that the ninth song supports a locally meaningful interpretation of the story about the chemist who needs to address the problems created by his inventions.

The ninth song in Kalevala explains the nature of iron, its' origin and how it is worked by a blacksmith into tools, weapons and ornaments. The ninth song also explains how weapons of iron betray humankind and how to stop blood from flowing. While the first part of the song (verses 29

– 258) is about the origin of iron and how iron is worked, the latter part of the song is about morally obligating iron (271 – 342), about stopping blood from flowing (343-418) and about treating wounds (419- 560). While it is likely that Lönnrot made decisions to bring together verses that may in different local traditions in Finland have been sung at separate occasions, the repetition and narrative continuation in verses 271 – 342 of explanations provided in verses 29-258 in particular, builds a coherent narrative in which iron is identified as a culprit for bleeding and in which iron subsequently is called upon to end the bleeding that it has caused. I propose that the overall structure of the narrative provided by Matti, as well as the meaning of the two stories compared, to a large extent are the same. The gist of both stories is that human ingenuity in using natural resources backfires and causes fatal outcomes to society.

One of the important differences in the two stories is that the ninth song presents an animistic world-view. The difference is illustrated in the locus of responsibility described in the two narratives. The chemist who represents a group of professionals who make a living from inventing potentially harmful products is also the individual or group of professionals who in the modern variant of the narrative are responsible for finding a solution to the problems caused. In the pre-Christian variant of the narrative however, the blacksmith is not blamed for the wrongdoings of iron. The blacksmith, according to the song, makes a pact with iron so that iron will not strike humans. The pact however is betrayed and iron is presented as something that has a will of its own, capable of doing evil as well as good.³

³ It can be interesting to note that the equivalent to the horn of plenty is not in *Kalevala*, as in Greek or Roman myths, a gift from the gods. *Sampo*, the Finnish equivalent to the horn of plenty, was according to the songs in *Kalevala*, forged by a blacksmith. Handling of iron clearly was of historical importance for the pre-Christian Finns, while the use of iron was recognized as a source of problems as well.

In song 9 verses 271-342, an old man explains that he now knows the origin of iron and that iron should be ashamed of the bad things it has done. The old man proposes that it was not the iron's kin (fire, water and three heavenly mothers) that told iron to do bad things (kill people). The old man proposes to go and tell iron's mother and parents and that this will cause work and trouble for the parents of a bad son (iron).

The animism expressed in the ninth song presents a very different world-view from the modern variant of the narrative in which individuals and a professional corps are identified as responsible for environmental threats. What both narratives share, is that both draw in an explicit manner on a framework of social responsibility. In the pre-Christian variant of the narrative, the somewhat silly sounding threat "*I will go and complain to your mother – this will pain your parents* [you should feel guilty]" (song 9, verses 335-342) is a reference to the primary organizational form of the tribe, i.e. the family and the clan. The use of iron is in the pre-Christian narrative understood primarily from the perspective of the form of society. Bleeding and death of members of the community caused by the use of weapons made out of iron, is described as a betrayal of the community. Motivation for actions, in this case using weapons made out of iron, was understood in relation to kin. The proper way to address and understand transgressions, such as the use of weapons made out of iron, was to engage members of the community.

Similarly, the modern variant of the story explains the use of chemicals from the perspective of the societal impact of the work of chemists. Chemists are presented as professionals who make a living by advancing science and by inventing applications and products that poison the environment. Therefore, chemists have the responsibility to try to figure out how they can fix the problems that they have created for society and the environment. As in the pre-Christian narrative, the impact of the use of chemicals is determined from the perspective of the form of society.

Motivation for the development of chemicals is understood in relation to the goals of modernity, i.e. to advance science. The proper way to address and understand transgressions such as adverse effects on health and environment, is to advance science further and to make scientists as group responsible of the adverse effects of their craft. A streak of humor in the modern narrative is associated to a recognition of the fact that doing more of the same, i.e. advancing science, seems contradictory to fixing problems caused by the same effort (i.e. advancing science).

I propose that the meaning of both of the narratives described lies notably in placing responsibility. The narratives are similar as both build on the assumption that the meaning of a given practice, be it the use of iron or the use of chemicals, is best understood, is motivated, and is best addressed by recognizing the societal context of the practice. Also, the idea that understanding the origin of a practice is connected to the ability to address the adverse outcomes of a given practice in society.

5.8. Discussion relating findings to structuration theory.

All of the actors involved in the day-to-day of social institutions such as a graduate program in teacher preparation contribute, following structuration theory, to the construction of meaning by which social institutions are best understood (Giddens, 1986). The term that Giddens uses for this reciprocal representation of what goes on in teacher preparation programs is that all participants, including faculty and students are *knowledgeable* actors. Another way to express the same concept is to say that individual conduct or behavior is understood as fundamentally purposive, even in such cases when behavior is severely limited by structural constraints (Giddens, 1986, p.308).

Constraints, such as sanctions and expectations associated to positionality (e.g. socio-economic status or race, gender, age) can be of different kinds and should be differentiated among. One of the key points in Giddens' theoretical efforts is the following. "[...] *to study the influence of*

structural constraint in any particular context of action implies specifying relevant aspects of the limits of agents' knowledgeability" (Giddens, 1986, p.308). The themes reviewed above help to identify the bounds of a specific discourse or culture of teacher preparation. The boundary so identified is a conceptual boundary of action, it is not an absolute boundary (Giddens, 1986, p.309). In other words, the material presented in this dissertation identifies boundaries that actors choose to limit their actions by. As asserted by Giddens, "*Identifying structural constraints in a specific context of action demands consideration of actors' reasons in relation to the motivation that is at origin of preferences.*" (ibid.) The open-ended articulation of such reasons by research participants, is what I have pursued in this case study. Accordingly, the model outlined in my research should not be seen as absolute, but rather a reduced description of how respondents framed their view of what it means to study to become a teacher and to be a teacher. The complexity of the research materials I have synthesized and the numerous different articulations, respondent feedback and observations I build on have helped me to triangulate my interpretations. However, the themes that I have derived and the synthesis of findings that I outline in the following conclusion, remain a reduced representation of the actual discourse that I have encountered and observed.

6. Conclusion

In this concluding chapter, I will start by commenting on the juxtaposition of socio-historical context and contemporary articulations that I have provided in the preceding chapters. Subsequently, I provide a synthesis of the empirical research findings. Finally, I will discuss the extent to which it seems reasonable to propose that a Finnish education discourse may constitute a distinct paradigm. Specifically, by considering comparative differences in language, political development and the historical development of higher education and teacher preparation in Finland. I propose that characteristics of the discourse I have identified include a conceptualization

of the learning subject that underscores the development of abstract thought and the societal purpose and context of education.

6.1. Juxtaposition of historical and contemporary examples of norms with contemporary articulations of meaning and purpose.

Throughout this dissertation, I have provided examples of elements that contribute to a Finnish normative framework. Examples such as the first Finnish language translation of the Bible that established a first written form of Finnish. I have provided examples of how animist tribal culture predating Swedish and Russian colonial rule remains part of imagined Finnish national and provincial identities. I have shown how it is possible to draw a parallel between an oral tradition narrative and a contemporary narrative of what it means to be a good teacher. I have provided other examples from a long historical perspective and from the contemporary context. I have three reasons for structuring my dissertation this way.

(1) I wanted to provide socio-historical context for outlining a few elements that frame some of the shared references and norms associated to a Finnish language community. That is, elements of a shared world-view associated to a shared language and culture. I see such examples as important for understanding features of the imagined political unit that is Finland (Anderson, 2006). Scholars such as de Sousa Santos and Braudel have proposed that a genuine effort to conduct the kind of intercultural translation that it takes to translate and to meaningfully understand concepts from one socio-historical context to another (Finnish to English in this case) requires us to take into consideration world-views that have formed in different regions over time (de Sousa Santos, 2014; Braudel, 1958). De Sousa Santos goes as far as to propose that if we do not, we will de facto carry out epistemicide, i.e. the obliteration by denial of varieties of knowledge ecologies (de Sousa Santos, 2014).

(2) Providing examples of Finnish culture from contemporary interactions and historical narratives, has allowed me to describe some of the ways that Finnish culture is known, some of the ways it is not known, some of the ways it is articulated, some of the ways it is contested, some of the ways it has been imagined and some of the ways it can be experienced in the contemporary context. As proposed by Giddens, these are elements that contribute to the knowledgeability by which teachers in Finland outline viable dreams and possible actions.

In the preceding chapters, I have juxtaposed elements of Finnish culture with articulations by research participants regarding the meaning and purposes of teacher preparation. I have done this in order to show some of the ways in which the formation of social norms in a long historical perspective can contribute to framing and to helping us to understand contemporary use of reference frameworks and norms in a context in which the professional community of practitioners of teacher educators that I have studied is situated (cf. Braudel, 1958). I propose that the politics and geopolitics of the past contribute to the norms of today.

(3) I propose that the specificity of a Finnish normative framework is effectively accessed through history and through Finnish language. Any efforts therefore to explain a Finnish practice as culturally specific or dependent on culture, will require an effort to understand some of the features of the symbolic systems, such as language, that are shared by practitioners in this case. As I noted in the introduction, any such efforts to describe the outlines or characteristics of societies, as well as sub-units within the same societies, are to some extent inconclusive and would be pointless to formulate as closed explanations. This is why I have seen it necessary to use open-ended questions as research instruments and why I see it necessary to provide open-ended explanations of a Finnish normative framework and the discourse that I have documented. A local discourse that I situate within a Finnish normative framework.

6.2. Synthesis of empirical findings.

I have identified a discourse about teacher preparation as outlined by six themes. The themes were: (1) the goals of teacher preparation, (2) the role of collaborative practices in teacher preparation, (3) the role of research in teacher preparation, (4) the role of critical thinking in teacher preparation, (5) the knowledge areas of a teacher and finally (6) articulations of what it means to be a good teacher. The research question was: *What can thirteen interviews conducted at a graduate level teacher preparation program tell us about the characteristics of a local discourse and local culture of teacher preparation?*

In the culture or variant of teacher preparation that I have encountered, respondents have explained to me that the different knowledge areas and skills of a teacher are interlinked (interviews September 2016, Taimi, Tarja, Jukka, Erik, Kirsi, Paavo, Anna, Natalya). In practice, this translates into a recommendation following which subject matter specific knowledge and knowledge about education more broadly as well as knowledge about how to teach a given subject matter, are acquired in parallel. The recommendation was reflected in the way that the preparation of subject matter teachers in mathematics was in this program realized as a five-year degree consisting of three years of undergraduate and two years of graduate studies.

A larger number of education courses were placed in the graduate level part of the degree (education courses equivalent to one year of full time studies). Undergraduate studies held a larger number of subject-matter specific courses. Faculty at the Mathematics and Statistics department explained to me that teacher students tended to form a cohesive group within the Mathematics program. Also, faculty members at both departments (Faculty of Education and Department of Mathematics and Statistics) stated that cohesion among students was purposively promoted by

faculty at both departments as a means to support student motivation and educational goals such as the development of social skills.

Another example of the interlinked nature of the different areas of knowledge a teacher needs to engage was the idea that critical thinking and researcher capacity were understood as closely connected. This is a point that emerged from several interviews (interviews September 2016, Paavo, Marianne, Jukka, Matti, Anna, Erik). Respondents underscored the importance of teachers' ability to discern among sources of information and to engage students in questioning sources and different arguments. The link between being able to discern among sources of information and to think critically came through at both departments and across respondents, as evidenced both by student and faculty responses. In practice, this specific view can be connected to a recommendation following which teacher students need to become familiar with different approaches to research. Notably, research practices for the subject matter they will teach and fields that inform education as a practice. The latter was explained by respondents to include disciplines engaged in developmental and societal research (psychology, social sciences). Practices associated to this approach include the provision of research focused seminars and courses in the field of subject matter specialization and education. The former, as part of an undergraduate thesis and the latter in the form of a graduate thesis for the Faculty of Education.

Yet another expression of the interlinked nature of the different knowledge areas and skills of a teacher was expressed by the fact that research participants did not distinguish between what it means to be a good teacher and what it means to be a good science teacher. This was true both for the articulations provided by students and the more complex articulations provided by faculty and instructors. Respondents did recognize differences in research traditions and the importance of broad knowledge of the subject matter that the teacher specialized in. However, being a good

teacher was defined as sets of knowledge and skills beyond subject matter specialization. A good teacher was identified as someone who (1) holds broad knowledge about the subject matter he or she teaches, (2) holds broad knowledge of education, (3) is morally and mentally accountable, (4) is skilled in communicating and (5) is skilled in social interaction.

Themes articulated by respondents in the 2016 case study that I had not anticipated, emphasized the importance of humor, ethics and the responsibilities associated both to the professional roles of scientists and teachers. These three unanticipated themes are illustrated by the narrative of the chemist provided by Matti (see beginning of section 5.6.). The theme of humor was engaged also by Timo, Matti and Paavo.

The theme of ethics is noticeable in several respondents' explanations that self-critical evaluation of teachers aimed notably at developing the teachers' ability to guide all students irrespective of differences in student ability. In other words, an articulated effort to teach students from different socio-economic and socio-cultural backgrounds in an impartial manner (September 2016, Paavo, Arno, Kirsi, Taimi, Erik).

More than half of the respondents considered teachers' ability to conduct research, or teachers' knowledge about different forms of research important. Notably, as such skills were understood to support teachers' ability to think critically. Research capacity, critical thinking and ethics were articulated by research participants as connected and complementary features of what it means to be a good teacher.

Several respondents articulated the professional role of teachers as associated with responsibility in three ways. (1) Teachers were explained as being obligated to reflect on the vulnerable position of very young students (Tarja). (2) A good teacher was described as someone who is able to adjust teaching-learning activities to the developmental stage of students (Anna, Taimi, Tarja, Natalya).

(3) A good teacher was described as someone who was able to communicate to students about the professional role and responsibilities associated to work as a mathematician, chemist or other subject matter relevant professions (Matti, Timo, Marianne, Jukka).

A goal of the teacher preparation program as articulated independently by each of the faculty members at the Faculty of Education as well as the Department of Mathematics and Statistics, was to challenge students to think. This challenge took several forms including: (1) to challenge conventional ideas regarding teaching-learning practices, (2) to challenge teacher students to value social sciences approaches to research, (3) to challenge teacher students to reflect on why students may or may not be interested in a subject matter, (4) to challenge teacher students to work with and to understand how to support students who do not think in a formal manner, i.e. students that are not habile in the use of mathematics as a language.

Responses that corresponded to positionality (age, gender, ethnicity, organizational position) were in this case study noticeable in that more of the respondents that self-identified as men proposed that the use of humor in classroom instruction is an important skill for a teacher. In contrast, several of the respondents who self-identified as women proposed that an important skill for a good teacher was to adjust teaching practices to the developmental stage of individual students.

Students articulated the goals of the teacher education program in terms of skills that students were interested in developing, such as how to activate and engage students in classroom instruction. Faculty and instructors articulated program goals in terms of organizational goals and field specific goals, e.g. goals such as conveying to science students why research approaches from the social sciences are valuable. Respondents who held long term experience in teacher preparation (more than five years) provided longer and more complex articulations and explanations of the

goals of teacher preparation, what the role of research is for teacher preparation, what the role of critical thinking in teacher preparation is, what it means to be a good teacher and the knowledge and skills areas of a teacher.

While I observed the above patterns associated to the positionality of the respondents, I observed also a lot of variation within groups and overlap in the articulations of respondents irrespective of positionality. I observed overlap notably in responses regarding the role of collaborative practices in teaching, the role of critical thinking in teacher preparation and the knowledge and skills areas of a teacher.

All of the respondents noted collaborative practices as important. Eleven out of thirteen respondents described challenges in the realization of collaborative practices. Collaborative practices were by research participants described as: (1) A premise for effective and productive teaching. (2) Associated to discovery and advanced understanding of mathematics. (3) A practical measure for supporting student motivation and for preventing drop-out.

The majority of respondents associated the role of critical thinking in teacher preparation as associated to the ability to discern among sources of information and for discerning among priorities. Much of what the respondents articulated about the knowledge and skills areas of teachers overlapped with the articulations of what it means to be a good teacher. In other words, the conceptualization of the good teacher was articulated as knowledge intensive. Respondents defined a good teacher by the skills and knowledge that a teacher holds. Such skills and knowledge areas were communication skills, social interaction skills, broad knowledge of the subject matter, broad knowledge of education and being morally and mentally accountable.

Having provided a synthesis of my findings on each theme, I conclude this chapter by reflecting on the Finnish paradigm of teacher training.

6.3. A Finnish paradigm of teacher training.

The case study I have conducted does not allow me to comment to what extent another teacher education program at another university in Finland is guided by the same approach as outlined in this case study. However, the fact that three of the faculty members interviewed had previously held faculty positions in other universities in different parts of Finland indicates that there is some degree of overlap. Also, the fact that the Finnish education system historically has been organized in a comparatively centralized manner and the site historically and to this day is considered a leading university in Finland contributes to the likelihood that other universities in Finland follow, at least in part, similar practices.

The stance that I encountered in my interviews in Finland emphasized a hope that science teacher students would learn to change teaching practices by making well-reasoned pedagogical decisions in their everyday teaching. The political aspect of the work of teachers was not downplayed, I encountered several articulations that recognized political pressures under which teachers work. Strong theoretical understanding and understanding of research were proposed as tools for teachers to counter such pressures. One articulation of this was that teachers “*need to have a strong theoretical foundation and to be well-versed in research practices in order to withstand the crossfire of sometimes unreasonable expectations under which teachers work in their day-to-day*” (interview, Erik, September 19th 2016). Similar articulations were pronounced by other faculty members as well. I understand this articulation by Erik as characteristic for the discourse I have documented in this case study.

What I discovered in the context of teacher preparation in Finland is that solid research was by my respondents understood to include reflections on the societal purposes and societal context of education. A characteristic of the observed discourse is the explanation of social responsibility and

how social responsibility was explained as relevant for teacher preparation. Social responsibility was described as connected to teacher preparation by efforts to develop teacher students understanding of the social sciences as a research discipline and by encouraging students to question established practices and existing power-structures in society and in the classrooms. This characteristic of the discourse does not come across as unique in the sense that the question of social responsibility clearly plays a central role in other teacher education programs in other regions as well.

However, I propose a specificity of this discourse is how responsibility was connected to the way in which the learning subject, i.e. the student, was constructed in this discourse. The students were described by faculty as knowing little about critical stances, about different types of research and as being stuck in conventional practices of education. Students were described as needing guidance for developing an understanding of the value of social sciences approaches to research in education, as needing guidance for broadening their understanding of scientific concepts as well as needing to learn about social interaction and communication in teaching-learning situations in practice. I see the emphasis on the importance of theoretical understanding that was articulated by several of the respondents as indicative of a comparatively greater emphasis on the development of abstract thought in teacher students.

As discussed in the literature review, Vygotsky identified a distinction between different early approaches to cognitive research. One focused on measurable outcomes (as with laboratory rats) and the other focused on the development of abstract thinking. The latter, in Vygotsky's view was characteristic for human learning and was best understood in a societal contextualization of learning (Vygotsky, 1978). I propose that some approaches to teacher preparation have chosen a greater focus on behavioristic explanations of the learning subject. I propose that a characteristic

of the discourse that I have encountered in this case study indicates a comparatively greater emphasis on explanations following the latter, while also recognizing the relevance of the former.

The historical and ethical frameworks of teacher preparation provide another characteristic that comes across as relevant when using structuration theory as a framework of analysis. The separation of church and school was a fundamental principle of modern schools. Finland however was slow in carrying out a separation of schools and religious teaching which was not proposed until 1857 by Cygnaeus (Lönnbeck, 1910). Teacher education was in the early Finnish universities supported by pedagogical lectures in the 1700s and a first Chair of Education in 1852 (Pennanen, 1997). Teacher preparation was over a long time period associated to moral education within a recognized ethical framework associated to a state religion (Lutheran) (Pennanen, 1997).⁴ The separation of state and church propagated by the Enlightenment movement, has in Finland been gradual and incomplete (cf. Geiger, 2016, 2015).⁵

What can be interesting to note as a factor that may have contributed to a perception that it was not necessary to separate the state and church in Finland, was that Finland under Swedish rule adopted legislation protecting the freedom of speech already in 1766. The first amendment was adopted in the U.S. twenty-five years later in 1791. The first amendment was in 1791 a point of distinction in relation to the former colonial rule of the U.S. by Britain. Britain had no regulations established for explicitly supporting the freedom of press, even though increasingly more lenient court verdicts in cases of breach of licensure⁶ were seen in Britain from the 1770s on.

⁴ Perhaps this is one of the reasons that there has not been a perceived need to bring back 'spirit' as recently proposed by the government of Ontario, Canada, or other newly identified political conceptualizations of ethics, into the schools in Finland (Government of Ontario, 2016).

⁵ Over time, the curriculum on religion has changed in Finland to an instruction on world religions. Municipalities in Finland are obligated by law to provide individualized curricula for religious minorities as long as at least three students in a school adhere to the religious minority (Opetushallitus, 2018).

⁶ A form control of who may and who may not publish.

This meant in practice that while studies in theology, ethics and pedagogy were maintained at public universities in Finland, the church (or the sovereign) exercised comparatively little censorship or licensing controls on what academics wrote and published. In contrast, comparatively more censorship was formally maintained in Britain and France until late in modernity.⁷ Censorship together with other regulations by which Britain tried to control its' colonies can be seen to have contributed to the political will in the U.S. to separate from Britain in the latter part of the 18th century.

Geopolitics may in this vein provide one explanation for some of the differences in how education discourses have formed over time in Finland as compared e.g. to the U.S. and France. I see this as a possible explanation for why some terms in education that are valid, respected and were repeatedly used by my research participants, while rejected in the context of the U.S. and France. Terms such as *opettajankoulutus* [teacher training], *didaktiikka* [didactics], *kasvatustiede* [science of education] *pedagogiikka* [pedagogy] hold very different meanings in English, Finnish and French.

The literal translation of *opettajankoulutus* is *teacher education*, however, the term *opettajankoulutus* is used in the Finnish discourse on teacher preparation in instances where English language discourses have commonly used the term *teacher training*. *Didactics* seems to be a derogatory term commonly disdained in the U.S. where the meaning of this term is associated to poor teaching practices (cf. Merriam-Webster, 2018). In France, I discovered that the term *pedagogy* was disdained by experts in education as a derogatory term of not very advanced learning practices, such as teaching and learning practices associated with old fashioned ideas of Durkheim and culturally oriented activities for small children. I propose the rejection I have

⁷ A state agency overseeing blasphemy cases in the UK functioned until as late as 2008.

observed among education experts reflect discourses in which it is assumed that *didactics* is something outdated in the context of education in the U.S. and *pedagogical* approaches are something outdated in the context of education discourses in France.

The university climate in Finland was in the 1960s and 1970s, marked by a hate-love relationship with Soviet thinkers and propaganda (Suominen, 1997). Many students and researchers were, as described by Suominen, either rejecting Russian and Soviet thinkers to the point of phobia, or were swept away in a cult-like experience of faith in the possibilities of advances of the large authoritarian military power looming over the eastern horizon (cf. Suominen, 1997). New translations of the works of Dewey and other prominent U.S. thinkers were at the same time published in Finland and many viewed the U.S. as the true economic and political model.

U.S. policies for societal organization were highly influential for Finland in the period after World War II. The influence can be seen e.g. in the post-war reconstruction to which the Finnish modernist architect Alvar Aalto contributed by adapting designs for small-house suburbs, villas and infrastructure projects using U.S. models for inspiration (cf. Standertskjöld, 2011; Wiksten, 2003). In brief, Finnish academia and cultural life was influenced during the Cold War both by the East as well as the West. Such influences framed the local education discourses and have contributed to the contemporary understandings of what has been considered *solid research* and what has been understood as appropriate to bracket from research on education.

I propose that one of the characteristics that I have encountered in my case study relates to the conceptualization of social responsibility in which teacher students are not expected to accept a social order as given but are challenged to question the societal context of education. Not as a purely political exercise but as an effort to weigh different sources of information, including research in the social sciences.

This study is significant in the ways that it provides a documentation of how concepts in education are translated into practices in a specific context. How social norms in a local discourse interact with the interpretation of what it means, in practice, to engage with concepts such as social responsibility in education. The interesting part of this study, is in particular the concrete examples of practical implementation suggested by research participants, such as Erik's description of why he used discussions in small groups as part of his teaching practices.

Erik explained that working with small group discussions with teacher students aimed the development of trust within the group. However, Erik did not articulate the fostering of trust as an end goal. The purpose of trying to construct a good atmosphere in the classroom was for Erik only a first step for doing something more difficult with the students. Namely, for discussing politically sensitive and difficult topics on which the students were likely to disagree (interview, September 19th 2016).

The conceptual models guiding teacher preparation in this case do not come across as a singular theoretical approach to teacher preparation. The model or approach does however come across as a distinct culture of teacher preparation, i.e. a distinct set of social norms that guide teacher preparation. An approach that includes pro-active, research informed questioning of biases in teaching practices and in the use of guiding documents such as textbooks and curricula. I propose that the scientific significance of outlining social norms that contribute to our understanding of how different concepts, such as what it means to be a good teacher, are understood in a local context, is crucial for a deeper and more meaningful understanding of what is known about student outcomes from standardized testing and large-scale surveys. Large scale surveys provide important information but cannot afford respondents the freedom to articulate a demographic profile that

accords to respondents' individual perceptions of identity, let alone reasoning that drives locally relevant teaching practices.

The set-up, history and constellation of stakeholder roles in social institutions such as education vary from one context to another. When the motivation of individual actors in different contexts is assumed without inquiry, research efforts can be understood to contribute to enforcing global norms that pressure a kind of homogenization of the ways in which we understand the purposes and motivations at play in education (cf. Andrews et al., 2014). The value of complementing what we know from larger surveys with efforts to discern local discourses is that such efforts allow us to consider what motivates individual actors as they contribute to local practices in the day-to-day. I propose that this case-study is significant in identifying a local discourse that is distinct in the ways that it proposes a local adaptation of globally relevant discourse traditions.

Perhaps it is not the tests of the Programme for International Student Assessment of fifteen year olds (PISA) that as such are damaging education worldwide as proposed by Andrews et. al. (2014) but the lack of complementary research that would interpret standardized results in locally meaningful ways. In other words, understanding what a specific test outcome means for a specific context requires the construction and maintenance of a knowledge base of how local actors contribute to education practices in different contexts. Teacher preparation in research universities provides one opportunity for accumulating and systematically distributing such a body of knowledge.

What has been understood as scientific in education research in Finland included in the post WWII period certain branches of sociological thought that were approached in different times, with different political connotations and with different emphasis in the English speaking world. This may indicate a difference in paradigms attributable to politics, history and language.

Following the definition of a paradigm as shared references on which a community of researchers agree, we could perhaps on the above background propose that the Finnish approach to teacher preparation is a distinct paradigm of teacher preparation (cf. Kuhn, 1962). That is, if we accept that a different language and an institutional set-up that has evolved in a different manner over time are sufficient for distinguishing a different paradigm.

Yet, I am reluctant to call the Finnish approach to teacher preparation a different paradigm because of the extensive import of both political movements and scholarship in education, that over the course of the past seven hundred years or so have framed the discourse on education in Finland. These influences include but are not limited to: Christianity, the Enlightenment movement, land reform, liberal parliamentarism, modernism and welfare state policies. Notable scholars for such influences include e.g. Pestalozzi, Grundtvig, Dewey, Froebel, Keynes and Myrdal. I see as the more appropriate characterization of the Finnish approach to teacher training that it is a locally adjusted variant that has followed Western traditions of thought.

6.4. The Programme for International Student Assessment (PISA) as guide for what may be worthwhile to imitate in the Finnish paradigm of teacher preparation.

One of the reasons for why the math and literacy skills of fifteen year old students in Finland has gained attention internationally since the 1990s is that the comparatively good outcomes have been fairly consistent in the past 30 years or so (cf. OECD, 2016a; OECD, 2014; OECD, 2010; OECD, 2004; OECD, 2001). This indicates that there is something on the level of the education system that is working in an effective manner. Another reason for why the performance of the young in Finland has been seen as a good outcome is that the data has shown that a large part of the students are doing comparatively well. The latter point indicates that the Finnish education system has managed to support students in an equitable manner. The question that such observations has

prompted is whether there is something in the education practices in Finland that would be worthwhile imitating, or possible to imitate?

Due to practical barriers of language and nationally embedded purposes and uses of education, the question of whether or not it is worthwhile to imitate practices from Finland has become a political pawn in education policy discourses. In other words, when it suits experts in education to bolster a locally relevant argument with a reference to Finland, the hypothetical example of Finland can sometimes be mentioned. Accordingly, many of the explanations provided tend to reflect to a greater extent the interpretative framework and the education context of the speaker and to a lesser extent familiarity with actual circumstances or practices in Finland. For example, experts from the U.S. will often explain the Finnish outcomes as an outcome of lacking diversity in the population. French experts tend to explain the Finnish outcomes as connected to Protestantism. One of the big issues in education in the U.S. has since 1954 been the racial desegregation of education. One of the big issues in education in France has since 1799 been the secular provision of education. This shows two examples of how the hypothetical example of comparatively strong student outcomes in Finland has functioned as an imaginary mirror for self-reflection for experts in the U.S. and in France.

One of the problems with trying to reason about what it is that works and might be possible to imitate, is that it is very difficult to articulate these points in a meaningful way by anyone who is primarily familiar with one national system only. A related problem has by comparative researchers in education been addressed within the discourse of *methodological nationalism* (Dale, 2005). That is, problems that emanate from the assumption that a nation-state is a relevant unit of analysis to begin with. The complex question of whether imitating would be worthwhile or even possible has in many cases been rejected by scholars as there are few who can speak to this question

in an intelligible way. Experts in education will off-hand dismiss the thought of looking into practices in education in Finland as a luxury that cannot be afforded. The fields of expertise that best speak to this question are fields that do not reflect dominant ideas of academic efficiency, these are fields of research such as the humanities, area studies and the study of small languages. With small languages I refer to languages that are not languages of large populations and geopolitical power players.

Having carried out this case study, I am convinced that the correct answer to the PISA imitation question is provided by the political economy of education. That is, the interplay of political regime, social policies and how education is organized. I agree with David Berliner that it is to some extent pointless to look only at what is going on in individual schools, in individual classrooms or even only at what is going on in education as a sector (Berliner, 2013). We need to look at the broader societal context. This is indeed what the faculty I spoke with in Finland, repeatedly pointed out. An easy way to dismiss regional problems and regional solutions as irrelevant for another region is to say that due to regionally specific cultures, we cannot learn anything from each other. A hypothetical stance, let's call it stance Y, could accordingly propose that "We need to first deal with our social policies before even looking at how educators in another culturally different context are working with their students".

The very unfortunate outcome of stance Y is that it deprives educators from their constructive role in contributing to viable improvements in their practices. I have discussed this using as example the determinist stance adopted by Putnam and colleagues in the conclusion of their analysis of governance practices in Italy (Putnam et al., 1994). In brief, assuming that the work of practitioners is culturally pre-determined effectively renders practitioners such as teachers and nurses a kind of intellectual cripples. This is not only detrimental for the motivation of those who

consider to continue working as practitioners, it can also be associated to a systematic production of practitioners who think that it is okay to not think for themselves.

Arendt provides in her analysis of Adolf Eichmann an insightful example of why it is a bad idea to employ, let alone train, practitioners that hold the view that it is laudable to comply *ad absurdum* (Arendt, 1977). That complying trumps reasoning. That a practitioner could justify his or her actions by proposing that he or she was not expected to reflect on, or analyze, the grounds on which the practitioner has decided to follow guidelines in the way that the practitioner has chosen to do (Arendt, 1963). That thoughtless compliance in dealing with human beings would somehow be justifiable in a professional role.

The argument that our need to look at a broader societal context for understanding outcomes of education could be used for articulating another stance, let's call it stance E. Stance E could propose that we should not focus our attention on teachers. Instead, teachers should be allowed to do their work as they please. That it is unfair to pin everything that youth at the age of fifteen years can do, or cannot do, on the teachers they have interacted with. Stance E seems very reasonable indeed. Stance E addresses concerns such as the reality that it is unfair to blame the poverty in a society on teachers. A student may have lived his or her childhood in such stressful circumstances that he or she has great difficulty learning, irrespective of how well a teacher works (Lowenberg Ball et al., 2018). Following stance E, we could propose that it is simply not just or right to propose that teachers are the explanation for the successes or failures of education systems.

Yet, I challenge stance E. I have a very practical reason for doing so. My reason for challenging stance E draws on the fact that I see the political economy of education as the most plausible answer to the PISA imitation question. For a given political regime, the most effective means to impact educational outcomes is teacher preparation. There are three reasons for this. (1) The largest

expense in an education system are salaries and pensions to teachers. (2) A systematic manner by which education policy recommendations can effectively reach the entire education system is through the mediation of a professional corps that is willing and able to implement guidelines in locally relevant ways. (3) Public policy holds a legitimate position for regulating the teaching profession by means of making provisions for how teachers are prepared. In contrast, I propose that national education policies ought not attempt to control the demographic composition of the student population. I propose that it is morally reprehensible for public policy to seek to homogenize the diversity of the student population on the basis of gender, ethnicity, race, or e.g. socio-economic status. In other words, education policies are suited for addressing the question of how teachers are prepared, but are poorly placed for addressing the question of the composition of the student population. Education ought to serve a population. Education ought not seek to control or segregate a population.

My challenge to stance E builds on the idea that the responsibility of the quality of education should first and foremost be addressed by the provider of education, not by those subjected to practices of education. Explanations that propose that cultural diversity is a reason for why not all students can do well, or explanations that propose that some students simply are more adept in different school subjects are premised on the allocation of responsibility of educational outcomes on minorities and individual students. This is an example of how different world-views will lead to different answers regarding the PISA imitation question.

For example, a world view, let's call this world-view T, proposes that individuals exist as separate entities in the world. According to world-view T, individuals hold within themselves all the means for success and failure. Following world-view T, it is pointless to look at outcomes in education in Finland as the imagined political unit of Finland has nothing to do with the capacities

of individuals. Following world-view T, it may be more interesting to invest in constructing and conducting personality tests than to look at longitudinal outcomes in education in a region. Following world-view T, the PISA survey as well as teacher preparation, ditto education policy are unjustifiable expenses.

Another world-view, let's call it world view P, proposes that student outcomes are predetermined by student's family and cultural background. Following world-view P, student outcomes in Finland are explained by a different culture. In perspective P, it is not worthwhile to address teacher preparation by policy or regulations as teacher preparation has nothing to do with the demographic profile of students. However, re-distribution of resources in society e.g. through taxes and social policies could in perspective P help to mitigate the reality that students who otherwise would grow up in abject poverty could perform better and thereby such students could contribute to higher country averages.

Another world-view, let's call it perspective S, proposes that education is regulated by a political regime. The political regime requires children by law to attend school and therefore it is also the political regime that is ultimately responsible for the forms of segregation, tracking and stigmatization that education produces. As the political regime forces children into schools, it is the responsibility of the political regime to train teachers that can serve as best as possible the interest of all of the students that attend schools. Following perspective S it is interesting to look more closely at how teacher preparation in different political regimes is organized as teacher preparation is an important responsibility of the political regime. The PISA study can in this perspective be interesting for indicating which political regimes have succeeded in serving their populations. However, the PISA study tells us nothing about why a given political regime has been successful in the provision of education. In order to answer why, we need to study the political

economy of education in varieties of political regimes for answering why good outcomes have been achieved in one or other context. In other words, while the key for understanding good outcomes lies in the relationship and interaction of policies and stakeholders including national curricula, families, teachers, school boards etc., the preparation of teachers provides an important indication of how a given political regime addresses its responsibility to serve its population.

The difference in stances T, P and S are in the allocation of responsibility. Stance T is a *stateless approach* that does not recognize human beings or language as products of societies. Stance T proposes that political units have no obligation to provide citizens with education. Stance P in turn is a *neo-tribal approach* in which education is explained by factors entirely outside the formal structures and provisions of education. Stance P proposes that education does not contribute to culture and that political units support the education of citizens best by leaving education unregulated. Stance P is compatible with the idea that families are responsible for educating their children and society has nothing to gain from bringing diverse groups of children together in classrooms. Accordingly, stance P lends itself to supporting the end of public education and a renewal of segregation in education on grounds of gender, race, ethnicity or income levels. Following stance P, the most effective means to educate minorities is not by negotiated policies but by segregation. Stance S in contrast, connects the negotiation of shared interests to education policies and proposes that a given political unit is responsible for building reasonable structures for education and practices that serve the needs of the citizens.

If we were to take stance S as a starting point, we could explain the PISA outcomes in Finland by the development of education policies that respond to the needs of the population. That is, not by a single intervention, not by a single law, not by a single school, not by a single concept, not by a single reform, not by a single leader but instead by a living structure of decisions and

responses that has been able to change over time in a manner that corresponds to the changing needs of society and the changing needs of the population. A key for being able to construct flexible and yet sustainable education policies is in my view to establish structures that support feedback loops from the classrooms to the policy level. One way to do so is to prepare teachers who hold a recognized role as experts in education. A role that is backed up by a formally recognized tertiary degree (as is the case for the profession of medical doctors). A profession constructed as something more than an easy access second chance. A profession that requires intellectual and ethical commitment as well as methodological expertise. Finally, a profession that is recognized for these attributes. The construction of such a profession has in the context of Finland contributed to the fact that teachers unions have since the 1970s become recognized and respected partners in education policy development.

Finally, my response to the PISA imitation question is the following: Let's consider a situation in which insights from the PISA studies were used for supporting a trend in which an idea announced by Natalya or some other specific individual would for the next five years gain attention as a buzz-word around which various education experts construct rebuttals and re-envision education goals. In such a situation I would agree with Andrews et al. that PISA could be seen as damaging education world-wide (Andrews et al., 2014). This would be a poor and misguided use of the PISA survey data. An example of pointless imitation.

Let's consider a different use of the PISA survey data. The PISA survey outcomes can be used for guiding policy makers in education to pose serious questions regarding the extent to which education policies in a political unit respond to the needs of the population. This latter way of using the PISA survey data does in my view seem as something worthwhile to imitate.

7. Agenda for Future Research

My observations as a researcher trained in the U.S., have led me to conclude that education policy reforms, in particular reforms that affect teacher preparation would benefit from the added perspective provided by comparative international research in education (CIE). In this chapter, I discuss expectations based on empirical work that I had when starting the case study and an agenda for continued research. Observations during the time that I have prepared this case study have prompted me to articulate a number of questions that would benefit from further empirical research. My goal is to continue my work as a scholar in CIE and to expand on insights from this case study with examples from other teacher preparation programs, for example in the U.S. I am interested also in the role of practitioners in a broader sense and I see interesting possibilities in research across professional fields in comparing with the preparation of practitioners for example in health care.

This chapter is structured as follows. The first part presents a typology of higher education models that prompted an initial expectation. The second part discusses what Comparative International Education CIE has to offer for research on teacher preparation. The third part presents some of the questions I have extrapolated from my case study and from having been immersed in a research environment in the U.S. for five years. I draw also on my experience in having spent two years in an education research context in France (2011-2013).

7.1. Typology of higher education systems and a bypassed question

Before carrying out the interviews, I considered that the Finnish context may exhibit some features similar to the *Humboldtian* tradition of higher education. Two reasons prompted this inkling. (1) I have an initial M.A. degree from Finland and thereby a first-hand experience of the higher education system. (2) I have worked with credential evaluation comparing Finnish, British, Indian

and other degrees with French degrees. My analysis of hundreds of teaching degrees from Scandinavia and from British Commonwealth countries in 2012-2013 contributed to said inkling. I considered the possibility of finding something old-fashioned, something that had evolved at a different pace, retaining older practices that had fallen out of fashion in the English speaking context.

The *Humboldtian* system is a reference that many credential evaluators are familiar with . The requirements for higher education degrees have historically built on a number of different models. One such model is the German academic tradition that is sometimes referred to as the Humboldt model in reference to Wilhelm von Humboldt . Another, is named after the Napoleonic reform of higher education that was particularly influential and served as a model for universities in countries with Latin based languages such as France, Spain, Portugal and Argentina.

The English tradition has historically been influential for English speaking countries. However, regional and local higher education systems show local characteristics and the U.S. higher education system has evolved into a distinct model that was influenced also by the Humboldt model. As an outcome of idiosyncratic developments in the U.S., the U.S. model has become a distinct model. This is in part due to efforts and influences such as an early Carnegie foundation report for the development of medical schools (Flexner, 1910) and legislation passed in California in the post WWII period (Douglass, 2010). The U.S. model has in turn influenced degree structures in Europe through the Bologna process (EU legislation, 2015).

Characteristics of the older Humboldtian approach were e.g. that students were understood to benefit from spending time at different universities. Arriving at a degree was not only about plowing through a set of content in a set time. Indeed, the stretching out of the time that it would take to complete a degree was not an indication of poor quality. It could mean that the student had

achieved a genuine *Bildung*, a classical education, by attending the seminars of different professors at different universities in different regions and having developed an archipelago of knowledge rather than a narrow technical specialization (cf. Ash, 2006).

It's good to note that the proposed typology is not absolute. While some regional characteristics persist in education practices, it is also good to consider the typologies in relation to time. It is not entirely a coincidence that the Napoleonic model of higher education was particularly influential in the 1800-hundreds and the German model was particularly influential in approximately the same period, whereas the U.S. model has been influential in particular in the latter half of the 1900s and in the 2000s. If we consider who were geopolitical power players in these time periods, we can observe some degree of overlap. Political power serves, as Braudel has pointed out, as a kind of megaphone (*haut-parleur*) for the academics from geopolitically influential regions (Braudel, 1978, p. 250).

However, in discussing with my research participants, there was little talk about Humboldt. In fact, there was none as I did not choose to introduce these thoughts into the discussion and none of my research participants ventured on such trains of thought. What I did notice however was a somewhat different use of words such as *teacher training*, *didactics*, *pedagogy* and *learning sciences*, as I have discussed in the above. It would be interesting to conduct further inquiries on the use of these words in different regional discourses.

Another set of questions that come to my mind pertain to the sociological framework that I have observed as holding a prominent role in the Finnish discourse on education. I wonder if this framework is comparable or similar in stances to the work of an older generation of scholars in the U.S. today? I'm thinking of a generation of scholars in education who started their careers in the U.S. in the 1960s and 1970s. For example, Dr. Ralph Larkin noted at the AERA conference in

2018, that there are comparatively few readers in the U.S. for the branch of sociology of education that he has worked on (cf. Larkin, 2007). Yet, the topic of his research, namely school shootings, is of foremost contemporary concern (Shapiro, 2018). Is it possible that these types of frameworks hold a comparatively more marginal position in education research in the U.S.?

While the findings of my study do not confirm (nor negate) a Humboldtian system in the traditional sense in Finland, it does seem that some old-fashioned ideas linger in the Finnish discourse on education. It would be interesting to make an effort to produce empirical materials that would help to shed light on how this relates to discourses in other countries. What is driving the fashions of education policy in different countries? Can e.g. geopolitical shifts provide a partial answer to this?

7.2. How Comparative and International Education matters for teacher preparation

Articles in Comparative and International Education (CIE) will often start by counting up a number of researchers among whom we find e.g. Jullien de Paris, Kandel and Dewey (Manzon, 2018; Auld & Morris, 2014). Identifying specific early European efforts to conduct more systematic studies of education in different regions of the world is a convention in writings about CIE. The practice of framing CIE in this way is legitimate to the extent that whatever is meant by CIE at a given time period, is the sum of the various forms of research undertaken under the broad umbrella concept of CIE.

An important shift in CIE in the past ten years is perhaps best described as a sprawl. As a result of multiple forms of globalizations (cf. Torres, 2015), CIE has expanded in a fragmented way where many of the actors who work with education development and teacher education do not see themselves as contributors to CIE. Early 19th century comparative studies in the form of travelers' reports were *curiosa* in the sense that they were few and far apart (Epstein, 1994, p. 918-919). In

contrast, the sheer volume of contemporary research and associated industries (publishing, development projects) employs a large host of professionals across the world both in academia, in non-governmental organizations, in government agencies as well as the private sector.

While counting up various examples of research is an important way of identifying a field of practice and research, I nevertheless find the conventional account short-sighted. The question I like to pose pertains to the meaning of the examples identified. *Why is there a tradition in CIE to count up research from France from the late 1700s, early 1800s and research from the U.K from the 1800s and from the U.S. from the 1900s?* The reality is that comparative research in education historically was carried out by others as well. One little known example is that of Uno Cygnaeus who constructed his proposition for teacher preparation and public education in Finland on comparative research in education. Research that he conducted in Switzerland, Germany, Denmark and Sweden in the 1800s (Lönnebeck, 1910).

The reason for the conventional account that starts in France is a political movement that has become subsumed as a standard assumption in scientific discourses since the 1700s, namely the Enlightenment movement (cf. Rousseau, 1957; Rousseau, 1762). The Enlightenment movement ushered in several countries a popular support for broader access to education and the development of common schools, or what today is referred to as public education. Early proponents of public curricula include scholars, politicians and educators such as Johann Pestalozzi, Mary Wollstonecraft, Nikolaj Grundtvig and Horace Mann (Pestalozzi, 1790; Wollstonecraft, 1792; Grundtvig, 1832; Mann, 1848). The Enlightenment movement proposed the political formation of a secular nation-state that was not governed by a sovereign or by religious leadership. The agenda of public education followed the agenda of the Enlightenment in efforts to construct the envisioned nation-state.

Conceptually, studies of comparison in CIE depend on the recognition of the Enlightenment era concept of a political unit that is also a nation-state. This contributes, as has been recognized by many scholars in CIE as well as other fields of research, several problems (Cowen, 1996). A discourse that partly articulates associated problems is the discourse on *methodological nationalism* (Dale, 2005, p.124). That is, a recognition of the fact that specific forms of bias are embedded in research that builds on the assumption that nation-states are value-neutral and unproblematic units of analysis. Conceptually, the set of problems associated to the modern nation state project are explained in postmodern and post-structuralist discourses (cf. Best & Kellner, 1991; Deleuze & Guattari, 2004; Cowen, 1996). Practical examples or manifestations of the cluster of problems I refer to, include forms of cultural violence suffered by historical minorities and indigenous populations (cf. Hall, 2006; hooks, 2009).

In this vein, while education has functioned as a political unifier, it has also functioned as an enforcer of hegemony. That is, a top-down enforcer of a singular vision of culture. Yet, even Gramsci, the scholar who introduced the critical term *hegemony*, proposed that education can serve an important role in securing societies against cultural violence and intolerance (Gramsci, 1971). Gramsci proposed that in order for younger generations to resist authoritarian political movements, it was important that younger generations would learn about the political thought and reasoning of previous eras (Morrow & Torres, 1995, p. 249-281).

CIE remains a meaningful approach to research on education and educational practices as long as we recognize that CIE is motivated by an agenda that aims to construct and establish nation-states. That is, to the extent we are interested in interrogating the meaning, the role and the purposes of the nation-state. Proposing that it would be fine to focus on this or that technical detail of how e.g. teacher preparation is carried out in a specific context, without identifying the societal and

political context of the researcher and the research participants is in my view fundamentally unethical and problematic. This is my interpretation of the outrage caused among academics regarding the much publicized PISA studies (Andrews et al., 2014), i.e. international comparative surveys documenting student outcomes in high-income countries at age fifteen (OECD Programme for International Student Assessment, 2014). The critique provided by Andrews et al. regarding the globalizing force of international surveys together with scholarly analyses of the work of international think-tanks such as OECD (Sellar & Lingard, 2014), show that there is a need to better understand the various contexts of teacher preparation and different cultures of teacher preparation.

7.3. The relationship of research to practice.

The relationship of research to practice occupies a central role in this case study on teacher preparation. During the course of my research in the past few years, I have worked with experts in the development of teacher preparation in various settings beyond the case study on which this dissertation reports. I have e.g. coordinated consultations among experts in education from different continents. This has included working with education development experts from the global south and north and from several different countries (cf. Wiksten 2017). I have noticed that there are very different takes on the relationship of research and practice. There exists no universally accepted consensus on this point as far as I have seen. However, while the stances vary importantly, I have also noticed that those I have talked with and received feedback from tend to be very convinced of the stance that each has adopted. Also, often oblivious regarding alternative stances.

I do not think the neglect of alternative perspectives is a neglect by ill will, rather it is symptomatic to one of the core challenges and objects of study for the social sciences, i.e. everyday

assumptions associated to everyday practices. For example, I have encountered respondents who do not think it necessary that teachers know about research or carry out research. I have also encountered respondents who elaborate in convincing ways about the importance of teachers' understanding of research practices. I encountered the latter explanations notably in Finland and the premise such statements build on is the following. *In order for teachers' to be able to function as professionals with integrity, teachers need to be able to discern among sources of information and teaching practices* (September 2016 interviews with Erik, Jukka, Taimi, Kirsi, Timo, Natalya, Matti, Paavo, Anna). This was by a few of my respondents in 2016 identified as an important point in particular because education does not exist, nor function, in a value-neutral context but under various and changing political pressures that are felt in multiple ways on several levels, be it on the level of schools, school leadership or on the level of individual teachers (Jukka, Taimi, Erik).

To the extent comparative studies are helpful in feeding public discussions, policy discussions and education development, CIE can contribute to well-reasoned practices in education. Notably, by raising the question of different perspectives and the purposes of education. I have in the past two years had the unfortunate privilege to review a handful of reports on education development projects that have received international aid funding and that show no awareness of the existence of CIE. I say unfortunate, because this has been surprising and disconcerting to see. For me, the latter serves an indicator that it is important that scholars in CIE do their best to promote a broader awareness and recognition of CIE. Not as an intellectual exercise, but as a historical and contemporary knowledge base on which education development efforts have built and would benefit from building upon in the future as well.

In situations where techniques or technical applications are proposed for export or import from one context to another without well-reasoned arguments that connect to analyses of the societal

context, I propose we will soon find ourselves surrounded by the cluster of problems that I have outlined in the above. Or, as one of my respondents in Finland expressed it in September 2016: “*Going along with so called innovations that do not build on solid research, is just a waste of money*”. (Erik, interview September 19th 2016).

7.4. Further questions to explore

As discussed in chapter five, the over-arching goals of teacher education that I have observed in Finland did not come across as very different from other contexts. I draw on my researcher training in the U.S. and my experience as credential evaluator, when I propose that we will encounter comparable goals articulated in many other teacher preparation units across the world.

While an understanding of the importance of the social context for learning was theorized and underscored already by Dewey (Dewey, 1916). It seems, in part from the interviews I have reviewed, that the practical realization of this insight has been interpreted somewhat differently in the education discourses in the U.S. and in Finland. Some of the questions that this observation has prompted for me are the following: Can empirical evidence show that the former hold a comparatively greater rejection of theoretical preoccupations as elitist and non-essential for practices in education (U.S.)? Is the metaphor of the teacher as a soldier for the local community warranted in the U.S.? Perhaps a compliance leader of a decentralized hierarchal secular society?

One of the reasons that I propose the above questions is that the discourse encountered seemed to indicate that the role of the Finnish teacher emphasizes comparatively more the importance of theoretical understanding as a foundation for sound practices. Following the discourse I encountered in Finland, good practices in secondary science teacher preparation build on a good understanding of theory in the subject matter that the teacher teaches, in cognitive development but also in sociology. A metaphor that could in turn be used to describe the latter is perhaps a sage

for the local community. The latter could be proposed to retain features of the priest and tribal elder whose authority some of the Enlightenment movement followers, such as Cygnaeus, wanted to replace with public school teachers (cf. Lönnbeck, 1910).

Also, to what extent can empirical evidence support what may be a key feature of the education discourses in the U.S., namely *social justice* in the form of a political and moral agenda? An agenda that teachers and schools are expected to embrace, engage and incorporate into their practices? Preferably, in ways that celebrate important thought leaders such as e.g. bell hooks (hooks, 2009).

Is the rejection of the term didactics in the context of U.S. associated to a long-standing understanding that theological departments and therefore teaching practices that drew on traditions of religious teaching did not belong in public higher education and public education? Many of the faith communities that have funded universities in the U.S. have had the freedom to disagree by founding their own universities (cf. Geiger, 2016, 2015). Yet, did these faith based universities exist in a context in which the leading idea of excellence as proposed by the Enlightenment was that good research did not draw primarily on the intellectual authority of faith communities?

In the context of France, was the rejection of the term pedagogy associated to the Enlightenment scholars rejection of religious authority in research and teaching? Or was it related to an adoption of a mainstream discourse on cognition that has focused on behavioristic explanations of the learner rather than a learner whose abstract thinking is understood as evolved through interaction with social structures?

It is clear that the work of Vygotsky and his successors, among whom I count Bronfenbrenner, have been appreciated in the U.S. (cf. Bronfenbrenner, 1977). One of the special interest groups of the American Educational Research Association specifically focused for a number of years on the work of Vygotsky. However, it could be interesting to try to establish with further empirical

evidence, whether geopolitical factors contributed to a different emphasis in how the work of a theorists of social psychology such as Vygotsky was taken up among teacher education leaders in Finland. Was there a slower or otherwise different uptake of Vygotsky's ideas in the U.S. due to the *Red Scares* that followed both World Wars?

The reason I propose the above questions is that geopolitics and questions pertaining to science education are often treated as separate interest areas. At AERA 2018, I spoke with an expert in the preparation of science teachers in the U.S. who proposed that science is best understood as pure and free from politics. Notably, in the context of science teacher preparation. I propose that such an opinion is not unusual. However, this is a point where the stance of my respondents in Finland differed. The thirteen interviews I have conducted propose a stance in which a stronger approach to teaching how to teach science is, not to set social and political questions aside but, to incorporate such perspectives. The purpose of doing so is to mitigate biases.

Biases such as associated to intersectional positionality (economic, gender, race, age, first language), are not set aside by ignoring biases, just as science is not taught well by ignoring the social reality in which both students and teachers live. The phenomena associated to the hard sciences do not exist in a separate universe from social phenomena. If we try to prepare teachers in a way in which we do not provide them a robust understanding of social phenomena and social and natural science theories, teacher students will not learn to distinguish between bias and categorical rejection. Teacher students will think it is okay to not think of social theory. This will put teachers in a weaker position to understand their own positionality and the struggles they themselves and their students face in trying to understand scientific concepts and the difficulties associated to the practical implementation of such concepts.

Another take-away from AERA 2018 for me was a conversation about the difficulty of moving from the so called silo-approach to a more connected approach. This discourse has been a fashionable topic in education for a while now (cf. Pearson, 2015). No actionable or functioning solution has been found, noted one conference participant that I happened to overhear. This observation prompted the following question. Can empirical evidence help to show whether such connections are more likely to appear if science teachers and those who prepare science teachers inquired into the need that pre-service teachers may have, to learn about phenomena in the hard natural sciences *and* the soft social sciences as both being real and relevant *scientific* phenomena? Could it help if we made further efforts in teacher preparation programs to explicitly recognize and further explain why *hard* and *soft* phenomena are poorly understood separately?

As it often is with research in the social sciences, I have found more questions than generalizable truths. However, along the way, I have collected and constructed a set of descriptions about the discourse that I have encountered and as such it is possible for my reader to go through a number of questions I have posed and answers I have received in thirteen open-ended interviews. My goal has been to provide a sufficiently rich documentation, in order to allow my reader to consider alternative explanations. Finding new questions is not a weakness in research. I believe we need to ask more questions about the purpose, meaning and practices of education.

Appendix I

Guide for semi structured open ended interviews with students, instructors and faculty

Guiding questions for open-ended and semi-structured interviews focus in this study, on asking students, instructors and course responsible about motivation, goals, values and beliefs with regard to participation in the course. Also, with regard to what the importance of research is for practicing education professionals such as teachers and what does it mean to be a knowledge producer, in their view?

Kysymykset opiskelijalle [Eng.: Questions to students]

- *Onko sinulla aiempaa kokemusta opettamisesta?* [Eng.: - Have you worked with teaching before?]

- *Kuinka päädyit ottamaan tämän kurssin?* [Eng.: How did you decide to take this course?]

- *Mitä mieltä olet kurssin rakenteesta? Muodostuuko opetuksen yhteydessä opiskelijaryhmiä vuosittain, eli seuraatko opetusta tuttujen opiskelijoiden kanssa?* [Eng.: What do you think of the cohort model? Do you know the other students?]

-*Kuinka tärkeää yhdessä työskenteleminen on sinulle?* [Eng.: How important is collaborative work for you?]

- *Mitkä ovat sinun tavoitteesi näissä opinnoissa?* [Eng.: What are your goals with these studies?]

- *Minkälaista on tämänhetkinen osallistumisesi luokkaopetukseen?* [Eng.: What is your current participation in classroom teaching like?]

- *Tiedätkö missä haluaisit työskennellä valmistuttuasi?* [Eng.: Do you know where you would like to be working after graduation?]

- *Minkälaista tietoa ja/tai osaamista odotat tämän kurssin vahvistavan?* [Eng.: What kind of knowledge and/or skills do you expect this course will strengthen?]

-*Missä seikoissa kurssi parhaassa tapauksessa voisi sinua tukea?* [Eng.: What would the coursework ideally support you with?]

- *Mitä sinun mielestäsi tarkoittaa olla kasvatusalan asiantuntija?* [Eng.: For you, what does it mean to be a specialist in education?]

- *Kuka on kasvatusalan varsinainen tai pitkälle edennyt ammattilainen?* [Eng.: Who is an advanced professional in education?]

- *Mitä sinun mielestäsi tarkoittaa kriittisen ajattelun käyttäminen työskennellessäsi opettajana?* [Eng.: For you, what does it mean to use critical thinking skills in your profession as a teacher?]

-*Voitko antaa esimerkin käytännöstä, mitä kriittinen ajattelu voisi käytännössä merkitä luokassa?* [Eng.: Can you give a practical example, what could critical thinking in practice mean in a classroom?]

- *Onko tärkeää että opettaja osaa ja tietää tutkimuksesta ja tutkimuskäytännöistä? Millä tavoin? Milloin?* [Eng. For a teacher, is it important to know about research? In which way? When?]

- *Mitä mieltä olet ajatuksesta että opettaja on tiedon tuottaja?* [Eng. What do you think of the idea that a teacher is a knowledge producer?]

- *Olisitko kiinnostunut tekemään tutkimusta tulevaisuudessa?* [Eng. Would you be interested in doing research in the future?].

-*(Luuletko että tulet tekemään tutkimusta tulevaisuudessa?)* [Eng. (Do you think you will be doing research in the future?)]

-*Minkä ikäinen olet?* [Eng. What is your age?]

-*Sukupuolesi on?* [Eng. What is your gender?]

- *Jos voit vapaasti määritellä kieli, kulttuuri tai etnisen määritelmän joka parhaiten kuvailee sinun identiteettiäsi, kuinka määrittelisit sen?* [Eng. If you are free to define yourself, what culture, language or ethnicity do you define yourself primarily as being part of?]

-*Minkälaista osaamista, kykyjä tai tapoja arvostat opettajassa jos et ensisijaisesti harkitse omaa opetustyyliäsi mutta toisia opettajia?* [Eng. What kind of qualities do you appreciate in a teacher, if you do not primarily think about yourself but other teachers?]

Kysymykset luennoitsijalle ja/tai ohjaajalle [Eng. Questions to lecturer or instructor]

- *Minkälainen tausta sinulla on kasvatusalalla? Oletko toiminut opettajana kauan?* [Eng. What is your teaching background?]

- *Kuinka kauan olet opettanut tätä kurssia?* [Eng. How long have you taught this course?]

-*Onko opetusohjelma muuttunut sinä aikana?* [Eng. Has the syllabus/curriculum changed much in that time?]

- *(Tuleeko mieleen merkittäviä muutoksia?)* [Eng. (Has there been particularly significant changes that come to mind?)]

-*Kuinka kuvailisit tämän kurssin keskeisiä päämääriä?* [Eng. What are central goals of this course?]

-*Työskentelevätkö opiskelijat yhdessä tämän kurssin aikana, esimerkiksi ryhmätyön muodossa tai muussa muodossa?* [Eng. Do the students do collaborative or group-work in this course?]

-*Seuraavatko opiskelijat opetusta vuosiryhmittäin? Eli oppivatko tuntemaan opiskelijoita jotka seuraavat samoja kursseja? Mikä sinun mielestä voisi olla etuna opetuksen seuraamisessa*

vuosiryhmittäin? Olisiko sellaisessa kurssirakenteessa etuja tai ei? [Eng. In your view, what is the advantage of using a cohort model for the course?]

- *Kuinka pitkälle osallistut tämän kurssin kehitykseen?* [Eng. To what extent do you participate in developing this course?]

- *Kuinka tärkeä on tutkimus-osio opettajankoulutusohjelmassa?* [Eng. How significant is the research component as part of the TEP studies?]

- *Mitä tutkimus-osio sisältää, mitä tarkoittaa tutkimus-osioista puhuminen tämän kurssin yhteydessä?* [Eng. What is the research component, or what would it mean to discuss a research component with regard to this course?]

- *Olisiko mielestäsi hyvä olla pienempi määrä tai suurempi määrä tutkimukseen suuntautuvaa kurssi-sisältöä tai kursseja?* [Eng. Do you think it would be good to have less, or more of research oriented contents/courses?]

- *Maisterin opintoja vastaavan tason tutkija-opettaja valmius eli tutkivan opettajan kykyihin valmistaminen. Onko tämä osa päämääriä?* [Eng. Graduate level preparation for researcher-practitioner capacity. Is this a part of the goals?]

- *Kuinka tärkeä kyky on, kriittinen ajattelu? Mitä tämä opettajalle käytännössä tarkoittaa?* [Eng. Critical thinking. How significant is this skill? For teachers, what does it mean in practice?]

- *Onko kriittinen ajattelu keskeisempää jonkin toisen kurssin yhteydessä?* [Eng. Is critical thinking more relevant for another course than this one?]

- *Opettajan osa oman alansa edistäjänä (ammattilaisena). Mitä tämä tarkoittaa?* [Eng. Teacher's role as actors in advancing their field (professionals). What does this mean?]

- *Kuinka tässä kurssissa lähestytään uusia innovatiivisia käytäntöjä koskevia kysymyksiä?* [Eng. How is the question of innovative new practices approached as part of this course?]

- *Mitä sinun mielestäsi tarkoittaa olla kasvatusalan asiantuntija?* [Eng.: For you, what does it mean to be a specialist in education?]

- *Kuka on kasvatusalan varsinainen tai pitkälle edennyt ammattilainen?* [Eng.: Who is an advanced professional in education?]

- *Onko tärkeää että opettaja osaa ja tietää tutkimuksesta ja tutkimuskäytännöistä? Millä tavoin? Milloin?* [Eng. For a teacher, is it important to know about research? In which way? When?]

- *Mitä mieltä olet ajatuksesta että opettaja on tiedon tuottaja?* [Eng. What do you think of the idea that a teacher is a knowledge producer?]

- *Teetkö tällä hetkellä tutkimusta? Olisitko kiinnostunut tekemään tutkimusta tulevaisuudessa? (Luueltko tekeväsi tutkimusta tulevaisuudssa?)* [Eng. Are you currently conducting research? Would you be interested to do research in the future? (Do you think you will be doing research in the future?)]

- *Minkä ikäinen olet?* [Eng. What is your age?]

- *Sukupuolesi on?* [Eng. What is your gender?]

- *Jos voit vapaasti määritellä kieli, kulttuuri tai etnisen määritelmän joka parhaiten kuvailee sinun identiteettiäsi, kuinka määrittelisit sen?* [Eng. If you are free to define yourself, what culture, language or ethnicity do you define yourself primarily as being part of?]

-*Minkälaista osaamista, kykyjä tai tapoja arvostat opettajassa jos et ensisijaisesti harkitse omaa opetustyyliäsi mutta toisia opettajia?* [Eng. What kind of qualities do you appreciate in a teacher, if you do not primarily think about yourself but other teachers?]

Kysymykset aineen opetuksesta vastaavalle, oppilaiden aineen-ohjaajalle ja/tai kurssista vastaavalle. [Eng. Questions to program leader, faculty and course responsible]

-*Kuinka kauan olet vastannut tästä kurssista? Onko opetusohjelma muuttunut sinä aikana? - (Tuleeko mieleen merkittäviä muutoksia?)* [Eng. How long have you been responsible of this course? Has the syllabus/curriculum changed much in that time? (Has there been particularly significant changes that come to mind?)]

-*Seuraavatko opiskelijat opetusta vuosiryhmittäin? Eli oppivatko tuntemaan opiskelijoita jotka seuraavat samoja kursseja? Mikä sinun mielestä on etuna opetuksen seuraamisessa vuosiryhmittäin? Olisiko sellaisessa kurssirakenteessa etuja tai ei?* [Eng. In your view, what is the advantage of using a cohort model for the course?]

- *Mitkä seikat ohjaavat tämän kurssin kehitystä?* [Eng. What drives the development of this course?]

- *Minkälainen tausta sinulla on kasvatusalalla? Oletko toiminut opettajana kauan?* [Eng. What is your teaching background?]

-*Oletko itse opettanut tätä kurssia? Opetatko osioita tästä kurssista?* [Eng. Have you taught this course yourself, do you teach components of it?]

- *Kuinka kuvailisit tämän kurssin keskeistä päämäärää? Liittykö tämänhetkinen tutkimus-työsi näihin päämääriin?* [Eng. What is the main goal of this course? Does this connect your current research?]

-*Kuinka tärkeää on mielestäsi yhteistyö-taitojen kehittäminen, esimerkiksi ryhmätyön muodossa tämän kurssin yhteydessä?* [Eng. In your view, how important is it to promote collaborative skills, e.g. work in groups for the students of this course?]

- *Mitä sinun mielestäsi tarkoittaa olla kasvatusalan asiantuntija?* [Eng.: For you, what does it mean to be a specialist in education?]

- *Kuka on kasvatusalan varsinainen tai pitkälle edennyt ammattilainen?* [Eng.: Who is an advanced professional in education?]

- *Liittyvätkö opetusohjelman muutokset tai päivitykset tutkimukseen? Mikäli näin on, millä tavoin ja millin?* [Eng. Does the course syllabus and curriculum and the updates connect to research? If so, how and when?]

- *Kuinka tärkeä tutkimus-osio tai tutkimuksen tekoon valmistava osio on opettaja-opiskelijoiden opinnoissa?* [Eng. For the teacher students, how significant is a research component as part of the TEP studies?]

- *Liittyko tähän kurssiin tutkimus-osiota? Mitä tutkimus-osiosta puhuminen tämän kurssin yhteydessä tarkoittaisi?* [Eng. Is there a research component to this course? What would it mean to discuss a research component with regard to this course?].

- *Olisiko mielestäsi hyvä olla pienempi määrä tai suurempi määrä tutkimukseen suuntautuvaa kurssi-sisältöä tässä kurssissa tai opettajankoulutus ohjelmassa laajemmin?* [Eng. Do you think it would be good to have less, or more, of research oriented content in this course or in the TEP program in general?].

- *Maisterin opintoja vastaavan tason tutkija-opettaja valmius eli tutkivan opettajan kykyihin valmistaminen. Onko tämä osa päämääriä?* [Eng. Graduate level preparation for researcher-practitioner capacity. Is this a part of the goals?]

- *Kuinka tärkeää tämän päivän opettajalle on kyky ajatella kriittisesti? Mitä tämä opettajalle käytännössä tarkoittaa?* [Eng. Critical thinking. How significant is this skill? For teachers, what does it mean in practice?]

- *Critical thinking. How significant is this skill for teachers today? For teachers, what does practicing critical thinking as an educator, what does it mean in practice?*

- *Onko kriittinen ajattelu keskeisempää jonkin toisen kurssin yhteydessä?* [Eng. Is critical thinking more relevant for another course than this one?]

- *Opettajien osa oman alansa edistäjinä (ammattilaisina). Mitä tämä tarkoittaa?* [Eng. Teachers' role as actors in advancing their field (professionals). What does this mean?]

- *Kuinka tässä kurssissa lähestytään uusia innovatiivisia käytäntöjä koskevia kysymyksiä?* [Eng. How is the question of innovative new practices approached as part of this course?]

- *Onko tärkeää että opettaja osaa ja tietää tutkimuksesta ja tutkimuskäytännöistä? Millä tavoin? Milloin?* [Eng. For a teacher, is it important to know about research? In which way? When?]

- *Mitä mieltä olet ajatuksesta että opettaja on tiedon tuottaja?* [Eng. What do you think of the idea that a teacher is a knowledge producer?]

- *Mihin aiheeseen tämänhetkisen tutkimuksesi keskittyy?* [Eng. What does your current research focus on?]

- *Minkälainen tutkimus mielestäsi tulee tulevaisuudessa, olemaan tärkeämpää? Lähitulevaisuudessa tai pidemmällä tähtäimellä?* [Eng. Looking ahead, what kind of research do you think will become more important? In the immediate future or a longer term perspective?]

- *Kuka käytännössä vaikuttaa tulevan tutkimuksen prioriteetteihin kasvatustieteissä?* [Eng. In practice, who has a say in this, who impacts what will be future focus areas of educational research?]

- *Minkälainen tutkimus mielestäsi voisi tukea tämän kurssin tavoitteita?* [Eng. What kind of research do you think could contribute to supporting the goals of this course?]

-*Minkä ikäinen olet?* [Eng. What is your age?]

-*Sukupuolesi on?* [Eng. What is your gender?]

- *Jos voit vapaasti määritellä kieli, kulttuuri tai etnisen määritelmän joka parhaiten kuvailee sinun identiteettiäsi, kuinka määrittelisit sen?* [Eng. If you are free to define your identity, what culture, language or ethnicity do you define yourself primarily as being part of?]

-*Minkälaista osaamista, kykyjä tai tapoja arvostat opettajassa, jos et ensisijaisesti harkitse omaa opetustyyliäsi mutta toisia opettajia?* [Eng. What kind of qualities do you appreciate in a teacher, if you do not primarily think about yourself but other teachers?]

Appendix II, Tables 1 – 7.

Table 1. Demographic profile of research participants (by participant self-identification)

Pseudonym	Position	Ethnicity, race or culture	Age	Gender
Arno	Student	Human being.	22	Man
Matti	Student	Environmentally conscious, ethically oriented.	40	Man
Paavo	Student	Swedish ethnic minority	32	Man
Anna	Student	Not Finnish origin.	31	Woman
Antti	Student	Finnish	49	Man
Kirsi	Instructor , Department of Mathematics and Statistics.	Finnish	35	Woman
Marianne	University Lecturer in Mathematics , Department of Mathematics and Statistics.	Finnish	35	Woman
Timo	Professor of Mathematics , Department of Mathematics and Statistics.	Finnish	64	Man
Natalya	Teacher at the Normal School	Russian	44	Woman
Taimi	University lecturer in Mathematics Education , Faculty of Education.	Third generation teacher.	56	Woman
Jukka	Professor of Mathematics Education , Faculty of Education.	Not a member of any minority.	52	Man
Tarja	Program coordinator , Faculty of Education.	Finnish	36	Woman
Erik	Director of subject-matter specialized teacher preparation, Faculty of Education.	Swedish ethnic minority.	53	Man

Table 2. Goals

	Goals of teacher preparation are	To develop skills in social interaction	To adapt to change	To learn how to teach subject matter content	Concrete example
Arno	Learn to attend to the needs of several and different students at the same time.	Learning how to collaborate with students, peers and superiors.		To learn teaching practices that lead to outcomes [effective teaching].	<i>'Working with others is more difficult than working alone [...]'</i> .
Matti	To obtain formal recognition.		To get the teacher credential.	Learning to activate students in classroom instruction.	Supporting students' understanding of work in science fields such as chemistry.
Paavo	Broaden understanding of differences in how people learn math.	Learning about differences in learning styles.		To learn good and fun ways of expressing that learning math requires efforts.	<i>That as many students as possible would experience meaningful moments of insight.</i>
Anna	To take on the role of a teacher.	To develop contacts with others who will work as subject matter teachers.		Learning how to communicate mathematical reasoning.	<i>Communicating mathematical reasoning does not come naturally for those who are mathematically skilled from a young age.</i>
Antti	To become a leader.	To learn to lead the learning process of groups.	To develop a theoretical reference framework for teaching.	To learn methods for teaching.	<i>Theoretical frameworks help to understand why a specific teaching method should or should not be used.</i>
Kirsi	To integrate studies in teaching and math.		Development of collaborative learning among students and across university programs.	To encourage the use and understanding of student-centered teaching and learning practices.	<i>Supporting students to see that subject matter studies and teacher education studies are integrated components of their degree.</i>
Marianne	Inclusion into a mathematical community.	Becoming a mathematician.		Increasing student interaction.	<i>We would hope that the teachers could show that mathematics is more than calculations'.</i>
Timo	To develop the teacher students' mathematical understanding.		Fostering life-long learners.	To support teachers ability to genuinely use what they learn in math.	<i>To provide courses associated to specific skills called for in the teacher profession. The call for different tools keeps changing.</i>

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(Table 2. Goals, continued from previous page)

	Goals of teacher preparation are	To develop skills in social interaction	To adapt to change	To learn how to teach subject matter content	Concrete example
Natalya	Learning how to present topics for a classroom.	Learning how to construct a supportive and flexible atmosphere for communicating content.		To use examples that help to communicate concepts in ways that support memory.	<i>A classroom teacher is like a performing artist in the sense that a teacher needs to discuss with students and to build an atmosphere in which students are not afraid to answer.</i>
Taimi	To challenge teacher students and to get teacher students to think.	To support teacher students' transition to the role of teacher.	Developing a skill-set for continued learning.	To learn about student-centered learning.	Teacher students' understanding of student-centered learning is supported by providing students with personal experiences of student-centered learning.
Jukka	To challenge teacher students and to get teacher students to think.	Preparing locally, socially and politically capable teachers.	Teachers with know-how in evaluation and in contributing to a continued development of education.	Support teachers' ability to make reasoned theoretical and methodological choices for how to realize educational goals in different situations.	<i>'Education is not a hard science in the same way as the natural sciences. I want to open students up to reflection on these phenomena so that they understand that there is value in having different approaches to phenomena.'</i>
Tarja	Development of an interlinked understanding of several fields.		Resisting unnecessary reforms, in order to avoid fixing something that has not been broken.	Provision of subject matter specific didactics and field-practice are two important goals for of the TEP.	<i>We get excited about new things but we leave the freedom to realize experiments regarding new practices to the teachers.</i>
Erik	Preparing thoughtful teachers who question what topics mean for students and what students get out of the studies.	To learn about educational goals of a general nature, i.e. all that relates to the growth and development of children.	Faculty in education draw on their own research and need to draw on research conducted by other researchers as well.	That the teacher will be able to realize education in his/her field of specialization in a fruitful way, is able to evaluate his/her teaching and is able to use the national curriculum.	One of the goals of the subject matter teacher program is to get teacher students to become interested in youth research. <i>'Students bring a number of issues into the classroom. It's not just about teaching.'</i>

Table 3. Collaborative Practices

	Collaborative practices in teacher preparation are	A premise for effective and productive teaching	A way to create community and prevent disengagement	Associated to discovery	Concrete example
Arno	Often more difficult than working alone.	Necessary for being able to work as a teacher.		One of the skill-sets that Arno said he would like to develop.	<i>'[...] in the classroom the teacher needs to be able to work with the students.'</i>
Matti	A characteristic of the professional teacher community.		For sharing experience, knowledge and for solving issues at school.		<i>'if there is some kind of problem situation [...] there's always someone who has experience so that we find a route we can proceed by.'</i>
Paavo	Important for developing a language about mathematics.			Unexpected concrete benefits of collaboration for learning math.	<i>'[...] your understanding of math as a language is enriched, you learn how to articulate concepts and thoughts.'</i>
Anna	Advanced math requires collaborative forms of learning.	Important to realize that there are several approaches for arriving at the same solution.		Used to think that group-work was a waste of time.	<i>'[...]if you are just working alone you'll get a terribly one-sided view of things.'</i>
Antti	A take-away that Antti plans to use in his own teaching practice.			Collaborative learning more common now, if compared to 25-30 years earlier.	<i>Team-work and collaborative practices are used in research both in the public and private sectors.</i>
Kirsi	Part of introductory course for students studying to become mathematics teachers.	Instructors from the natural sciences share experiences about the development of introduction courses.	Helps to develop a sense of community among the students.		Some students were considering dropping out and collaborative learning practices supported the motivation and inspiration to follow through.
Marianne	Important for developing a range of skills. Notably, skills in communicating, in cooperating and social skills.		<i>'[...] human beings are social by nature, there are many students who are lonely.'</i>	<i>Prior to 2011, teaching at the mathematics and Statistics department was lecture-centered.'</i>	<i>Students are encouraged to form groups spontaneously. Group work is supported with assigned lounge area and student facilitators.</i>

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(Table 3. Collaborative practices, continued from previous page)

	Collaborative practices in teacher preparation are	A premise for effective and productive teaching	A way to create community and prevent disengagement	Associated to discovery	Concrete example
Timo	An important support for learning mathematics and for motivating students.	The Department seeks to increase collaborative forms of learning.		<i>Many who self-identify with a preference for working alone, nevertheless benefit from collaborative approaches.'</i>	<i>"We had a problem with the drop-out rates, [...] We had to try something".</i>
Natalya	Associated to innovation in the realization of instruction.		Mathematics teachers at the school discuss goals, guidelines, practices and exams together.	Important for advancing practices in teaching.	<i>'[...] we plan together these [exams] so that all of our students get the same exam.'</i>
Taimi	The program supports cohort formation and learning to work together with different kinds of persons.			Collaborative practices have remained surprisingly uncommon in field-teaching practice lessons.	Approximately 30% of seminar time is used for presenting theory while 70% for group-assignments or discussions.
Jukka	<i>Skills for collaborating and for social interaction are central to the profession of a teacher'.</i>	<i>'[...] the role of the teacher is to facilitate how the classroom as a social group produces knowledge.'</i>	Annual inter-departmental meeting supports curriculum development.		<i>[...] it's about the teacher's abilities to work with other teachers and [...] organizing student teamwork.'</i>
Tarja	Committees provide an important support for organizational processes.		Negotiations in committees support communication and feedback.	Supports acceptance of organizational changes.	Difficult for individual faculty members to see the benefits of collaborating across institutionally established units.
Erik	Helps to develop a sense of shared responsibility.	An important part of the teacher preparation program.	Supports the trust that is necessary for taking on difficult topics.	Beneficial to foster willingness to collaborate across subject matter specializations.	Sharing with colleagues helps so that commonplace difficulties in early teaching are not taken too harshly as personal failures.

Table 4. Research

	The role of research in teacher preparation	To develop skills for discerning among sources of information.	Supports teachers ability to stay up-to-date	Plurality of research approaches: math, education etc.	Concrete example
Arno	For staying up to date. Teachers do not need to know how to do research.		Important that teachers keep up-to-date regarding effective teaching practices.		'[...] <i>it's not necessary for all teachers to be researchers.'</i>
Matti	Research is part of what it means to be an expert in education.	Important for questioning the sources of information used in teaching.			' <i>Looking with students into source information to see how e.g. claims in news are supported.'</i>
Paavo	Teachers need to know how math is applied in research and what mathematicians do.	'[...] <i>important because a teacher will not be able to think critically otherwise.'</i>			Motivates students to learn that math is a science with unsolved questions, a field of inquiry that is alive.
Anna	Important that teachers know how to distinguish between good and poor research.	A teacher needs to be able to read research in a critical manner.	<i>A teacher needs to follow research [... to] develop teaching practices moving forward.'</i>		<i>To know more e.g. about good ways to teach specific mathematical content.</i>
Antti	Beneficial to learn how researchers work with the subject in professional contexts.			Good to know of different research methods as e.g. the field of Physics uses different research-approaches.'	Students could use different research approaches and the class compare results.
Kirsi	<i>"Research supports teachers' continued growth into becoming good teachers."</i>		We prepare teachers who are not 'done' but are professionals who will continue to develop.	Preparation for researcher capacity takes place mostly at the Faculty of Education.	Students write an undergraduate thesis (math) and a graduate thesis (math or didactics).
Marianne	' <i>Sometimes we study things that we won't be using in the form that we've learnt them and yet it can be beneficial.'</i>	Important that the teacher is able to read research articles and assess whether the research seems solid or not.	Important to the extent it supports (1.) self-evaluation and (2.) staying up-to-date.	<i>Teaching practices at the department connect to advances in research on math-teaching.'</i>	<i>Teachers have no time to conduct research, still it's important that teachers learn to discern among research.</i>

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Table 4. Research, continued from previous page)

	The role of research in teacher preparation	To develop skills for discerning among sources of information.	Supports teachers ability to stay up-to-date	Plurality of research approaches: math, education etc.	Concrete example
Timo	Development of teaching-learning practices is closely connected to research.			Research in math is very different from research in education.	<i>University context allows students to reflect on a freer, experimental and theoretical range.</i>
Natalya	Research capacity requirement not important for teachers.	Not all research is relevant for teaching.	Natalya likes to read research on how students respond to formative feedback.	The research in mathematics that she did for her master's thesis has been very important for her as a teacher.	<i>Valuable research is such that can be implemented in classroom education.</i>
Taimi	Students benefit from being introduced to different research approaches.	Research in education provides means for articulating what goes on in schools and in teaching practices.	Research helps teachers improve their practices and to reason for why they decide to use specific teaching practices.	<i>"The difference in the discourse traditions of natural sciences and social sciences poses a challenge for teacher preparation."</i>	<i>Research in education provides means for articulating everyday phenomena that take place in schools.'</i>
Jukka	Supports teachers' ability to collect information and to discern among information sources.	<i>"Teachers have to deal with contradictory information, as a teacher it is important to seek counter-arguments."</i>	Provides students with the tools for collecting information in their local community and in the classroom.	The research of the faculty influences the form of teacher preparation that the faculty member provides.	<i>Teachers will be able to function with greater strength if they have the capacity to be researchers of their own work.</i>
Tarja	The teacher's role is to support and guide the process of research undertaken by students.	Knowing about research allows teachers to determine which changes are relevant for them and which are not.	Important for teachers' ability to stay up-to-date with the field they have specialized in.	The program complements students' prior knowledge of research with research in the field of education.	School and society change, <i>'a teacher also needs to change [...]</i> "
Erik	The teaching profession is based on research.	Knowing about research helps teachers to discern among competing requests and to prioritize.	Research allows to distinguish real innovation from waste of money.	.	One of the goals is to get teacher students interested in youth research.

Table 5. Critical Thinking

	Critical thinking is	To develop practices based on good research	Accommodating different learning styles	Teacher autonomy	Concrete example
Arno	Teacher engages a reflective process on his or her own biases.		Teacher needs to be able to teach all students.		Testing claims of environmental deterioration with students.
Matti	Interrogating sources of information and using several sources of information.	Critical thinking is closely connected to the scientific method.			Testing claims of environmental deterioration with students.
Paavo	Ability and courage to tell when to not follow a textbook.	Knowing about research and research methods.			Ability to teach differently than proposed by textbook.
Anna	Ability to reflect on weaknesses in one's teaching practice.	Ability to tell good and relevant research from poor research .			Ability to teach differently than proposed by textbook.
Antti	The recognition that students learn in different ways.		Important for understanding that students learn in different ways .		Supporting students to develop understanding beyond notions.
Kirsi	The realization that there are more than one good way to teach.			Deciding autonomously between methods.	Teacher autonomy.
Marianne	To think and reason without relying on convention or authority.	Trying to get the students used to new approaches to mathematics.			Trying to get the students used to new approaches to mathematics.
Timo	That teachers adjust curricula and understand curricula as compounds of ideas of different people.			Elites should not be in control of teaching materials.	Rejecting the placement of any single scholar, researcher or practitioner on a pedestal.
Natalya	To question the methods and tools that are used for teaching.			Teaching new technology takes away time from teaching.	Questioning the use of new technology in classroom teaching.

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(Table 5. Critical Thinking, continued from previous page)

	Critical thinking is	To develop practices based on good research	Accommodating different learning styles	Teacher autonomy	Concrete example
Taimi	Understanding the process and the political decisions that go into the development of curricula.	Necessary to discuss the fact that some educational tools do not work.			Critical thinking is a premise for active citizenship.
Jukka	Ability to place subject matter specific knowledge in a socio-historical, psychological and a philosophical context.	As teachers have to deal with contradictory information it is important that teachers seek out counter-arguments.		Teachers will be able to function with greater strength if they have the capacity to be researchers of their own work.	Recognizing that statistical data can be displayed in misleading ways.
Tarja	Reflection combined with evaluation of teaching and learning practices.	Research, critical thinking and the improvement of teaching practices are interlinked.			That teachers use feedback from peers in developing practices.
Erik	A self-critical teacher thinks about whether practices in use are good.	Teachers make better pedagogical decisions when they have a strong theoretical foundation.			That teachers are skilled in reasoning so that they can resist unreasonable expectations.

Table 6. Knowledge and skills

	The knowledge areas and skills of a teacher are	Subject matter specific	Specific to the field of education	Multiple interlinked and broad sets of knowledge that are engaged simultaneously	Concrete example
Arno	The subject matter and knowing how to support diverse students.	Knowledge in the field of the subject matter that the teacher teaches.	To know how to support diverse students.		<i>" [...] education is about providing support to human development as growth. That's perhaps what all professionals in education share."</i>
Matti	Subject matter and knowledge of phenomena in the classroom.	Knowledge in the field of the subject matter that the teacher teaches.	Teaching-learning related phenomena that occur in the classroom.		<i>"A teacher needs to be knowledgeable [...] of] teaching-learning related phenomena that can be observed in the classroom."</i>
Paavo	Math, social skills and humor.	Broad understanding of the field of math.		The teacher needs to have humor.	<i>A teacher needs to have social skills for communicating with diverse groups of learners.</i>
Anna	A teacher needs to have authority and ability to consider the developmental age of students.	Know-how to communicate by using concrete examples.	Has multiple tools for directing the attention and motivation of students.	A teacher knows how to be happy.	<i>Student motivation can be supported by variation and depth of assignments.</i>
Antti	The subject matter.	A teacher should know about his subject matter in a broad way.			<i>If the teacher is a Physics teacher then he or she should know about Physics in a broad way.</i>
Kirsi	Subject matter and how to teach mathematical thinking.	Subject matter specific knowledge.	Knowledge about how to teach mathematical thinking.	Important to learn math and how to teach at the same time.	<i>' It's important that the understanding of math and how to teach are developed at the same time.'</i>
Marianne	Knowing what a mathematician needs to know.	Knowing how to support the students develop the skills of mathematician.			<i>'We would hope that the teachers could somehow show that mathematics is more than calculations'</i>

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(Table 6. Knowledge and skills, continued from previous page)

	The knowledge areas and skills of a teacher are	Subject matter specific	Specific to the field of education	Multiple interlinked and broad sets of knowledge that are engaged simultaneously	Concrete example
Timo	Both school and university level mathematics. 'We see these as complementary, not as separate fields.'	The didactics of teaching mathematics.			Not possible to support different ways students approach phenomena if the teacher does not have enthusiasm for students and broad and deep subject matter knowledge.
Natalya	To have a positive outlook.	To know mathematics and to encourage discovery.	To know how to teach and how to communicate.	To know how to be just and fair.	<i>For example, by not telling where the formula for the surface of the sphere comes from. [... the student] can do some research.</i>
Taimi	A teacher's knowledge areas are not singular entities.	'[... teachers] needs to be able to transcend the confines of individual subject matter specialization'	Research based knowledge in education.	A teacher's experience grows from taking on different professional roles over time.	Theoretical foundations prepare teacher students for meaningful growth in a professional community.
Jukka	Knowledge about how learning takes place over time.		Knowledge about cognition, motivation and emotion.	Physiological theories, Psychological theories, Social theories.	Mathematics teaching does not deal only with inherent stable traits or acquirable stable traits of teachers and learners but deals also with flows of choices and affect that are not static.
Tarja	Several interlinked areas of knowledge.	Knowledge about theory and practices of subject matter specific teaching.	Knowledge about the development of children.	Knowledge about research and how to develop and further one's field of work.	Education is a demanding field to define because it is composed of several important areas of knowledge that are interlinked.
Erik	Teachers can contribute to the development of practices in schools and to the development of education policies.	One of the goals of teacher preparation is to strengthen the students understanding of the subject matter.	To learn about the development of children and to learn to question what students get out of teaching-learning activities.	Knowing about regulatory frameworks and participating in policy discourses.	<i>"Teachers' participation in discussions that affect the context of work can help to prevent teacher burn-out."</i>

Table 7. The good teacher

	The good teacher	Knows about the subject matter and how to communicate about the subject.	Has social skills, is reciprocal and has humor.	Is reflective, continues to learn, strives to be impartial.	Concrete example
Arno	Is able to pay attention to the needs of several and different students.	Has a broad set of skills and knowledge for varying teaching.	Knows how to motivate students.	A good teacher reflects on his or her biases.	<i>'It's important that the teacher engages a reflective process on his or her own biases.'</i>
Matti	Can be a teacher in a school. Can also be a trainer in the military or an educator in an early childhood program.	<i>A good teacher can e.g. tell a story that helps to illustrate the broader context of the subject matter.</i>	A good teacher has a sense of humor.	Is not about working relentlessly.	<i>'Rather than the teacher is kind than a genius'.</i>
Paavo	Has an ability to understand math and human beings.	<i>A good teacher needs to be sufficiently socially skilled to transmit knowledge.'</i>	A good teacher has a sense of humor.		<i>My motivation was supported by the opportunity to study with a Professor skilled in presenting complex mathematical concepts in a simple and accessible way.'</i>
Anna	All qualified professionals working with children can be good teachers.	<i>the capacity to provide concrete examples that communicate to students'.</i>	<i>A good teacher is pleasant and happy while maintaining authority.</i>	A good teacher adjusts teaching-learning activities to the developmental age of the students.	A versatile pleasant teacher who has authority and who has different tools that she can use for directing the students' attention.
Antti	<i>knows the subject matter he or she teaches and is a role model.'</i>	<i>Has ability and skills in providing feedback.</i>		<i>Continues to learn, is fair and just'.</i>	<i>A teacher should know about his subject matter in a broad way. For example, in Physics if he or she is a Physics teacher.'</i>
Kirsi	<i>Represents the subject matter and is knowledgeable about how that subject matter is taught.'</i>	Is well-versed in his or her subject matter.	Has experience with group-work and collaborative learning.	Has the ability to be open-minded, self-critical, persistent, and has courage to experiment.	Is able to encourage all students, irrespective of gender and other differences, to experience success in their learning.'

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(Table 7. The good teacher, continued from previous page)

	The good teacher	Knows about the subject matter and how to communicate about the subject.	Has social skills, is reciprocal and has humor.	Is reflective, continues to learn, strives to be impartial.	Concrete example
Marianne	Has the ability to break out from his or her own certainties.	<i>A teacher needs to be able to listen more than to talk.'</i>	Has social skills and skills in cooperating.	Has tools for evaluating her or his own teaching practices.	<i>'To be able to always think in new ways about things so that you don't get stuck in the old.'</i>
Timo	<i>Has enthusiasm both for students and the subject matters in which he or she has specialized.'</i>	A good teacher uses all of his or her senses for seeing and hearing students.	Has humor that connects to critical thinking, e.g. like the 'Good Soldier Švejk'.	A good teacher continues to develop his or her understanding of scientific knowledge.	<i>Using understanding of science plus all sorts of teaching materials textbooks etc., the teacher makes a filtered version that is appropriate to the stage of students that she or he is teaching.</i>
Natalya	<i>A good teacher takes responsibility for keeping up-to-date.</i>	<i>Important that a teacher has skills in communicating.</i>		<i>Strives to handle students in an impartial manner.</i>	<i>'It would be ideal if new technology could be used to facilitate without taking up too much of the time.'</i>
Taimi	<i>A good teacher responds to the needs of the students and is able to step aside.</i>	A large arsenal of teaching techniques and tools for being able to meet diverse groups of students.	Ability to individualize teaching between and within groups of students.	<i>Ability to encourage the advancement of students in many subject matters.</i>	<i>'I want students to have ideas and tools for realizing that 'this could be done in the classroom'.</i>
Jukka	<i>A good teacher is a professional that is active in multiple areas.</i>	<i>A good teacher is able to use information technology in productive ways.</i>	<i>A good teacher uses methods that activate students.</i>	Taking on different roles in order to gain experience. E.g. contributing to public discourse.	<i>Challenging teacher students to think aims at preparing teacher students to meet in their classrooms those students who have difficulties with math.</i>
Tarja	<i>A good teacher understands the differences in the ways different age groups learn.</i>			A good teacher is well at terms with himself or herself.	<i>'The greatest difference in teaching older students is that the target is different and the starting point is different, there is no clean slate to start from'</i>
Erik	A good teacher asks 'why should or might these students be interested in this topic?'	A good teacher is a skilled educator and a skilled subject-matter teacher.	Has the ability to observe own and other peoples actions critically.	A good teacher reflects and is thoughtful.	<i>That the teacher actively considers what students are getting out of the teaching-learning activities organized by the teacher.</i>

Appendix III

Figures 1 – 13. Skills and knowledge areas that are important for a teacher, participant drawings.

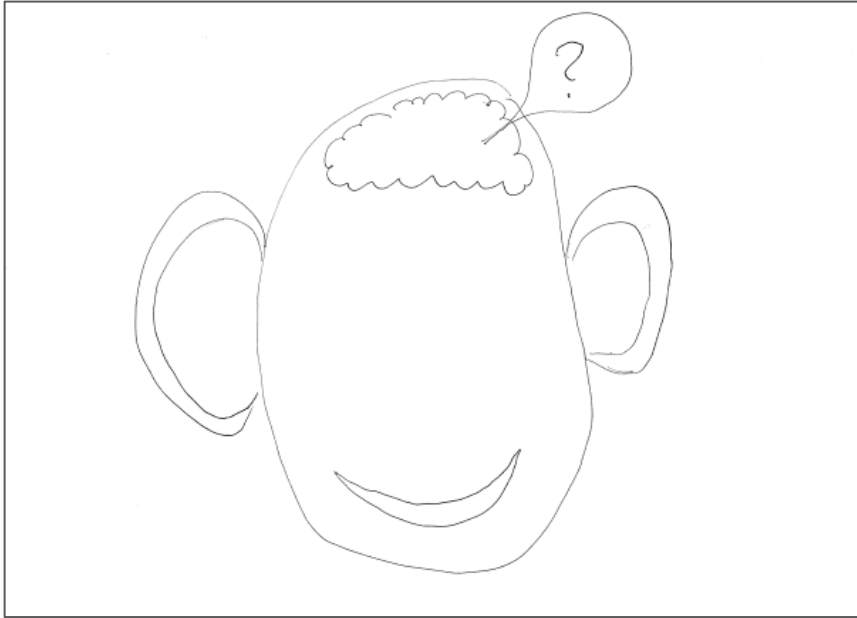


Figure 1. Marianne

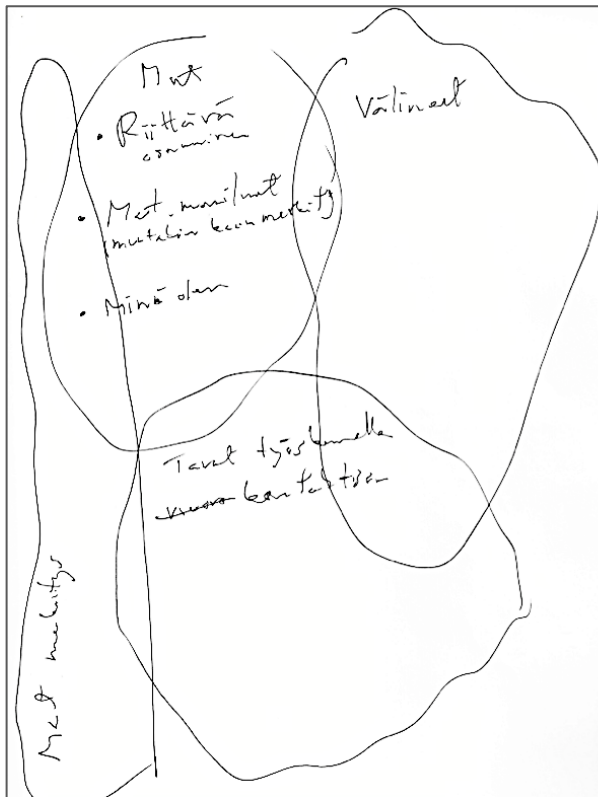


Figure 2. Timo

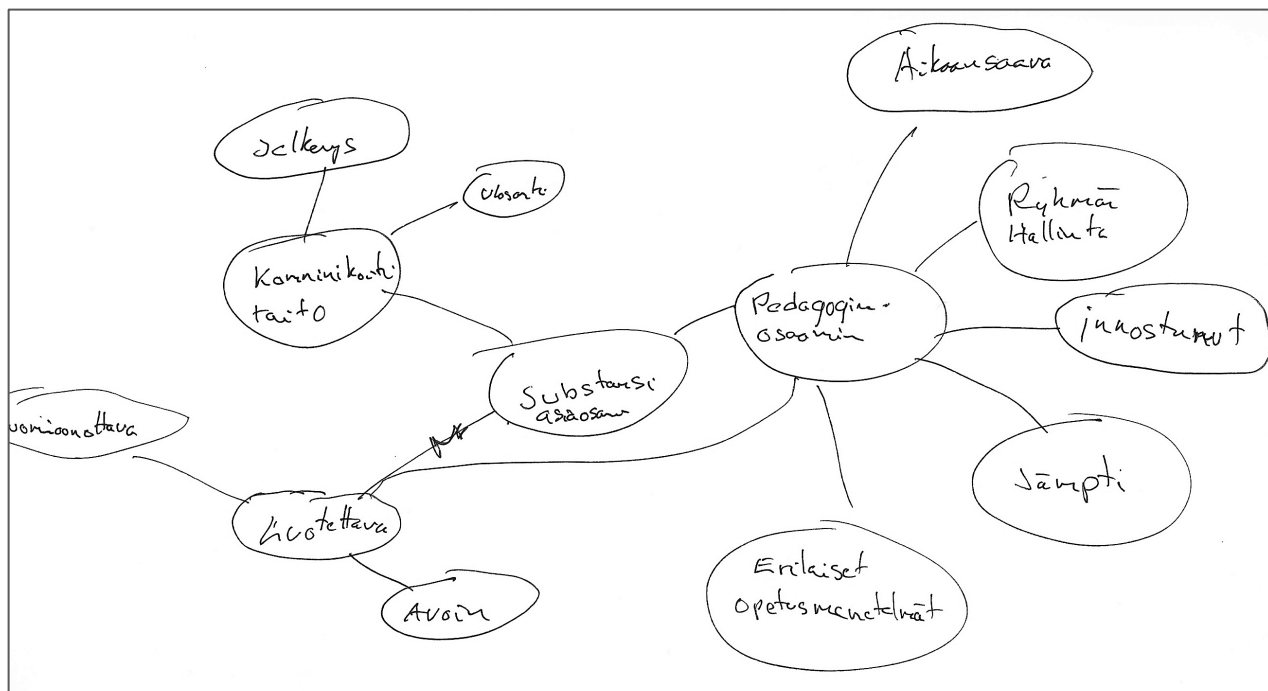


Figure 3. Antti

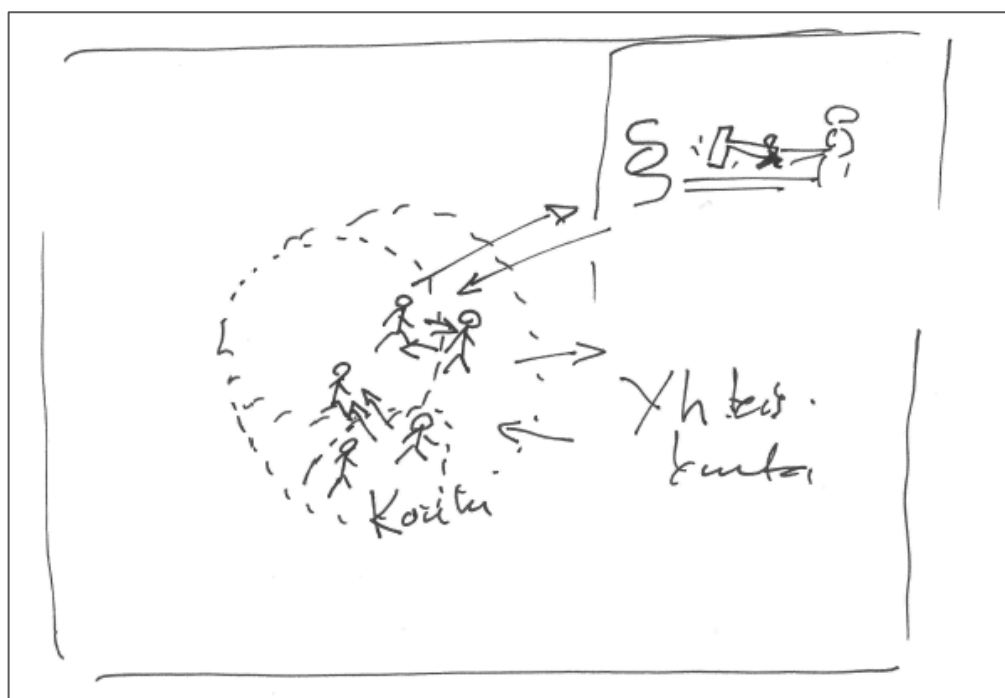


Figure 4. Erik

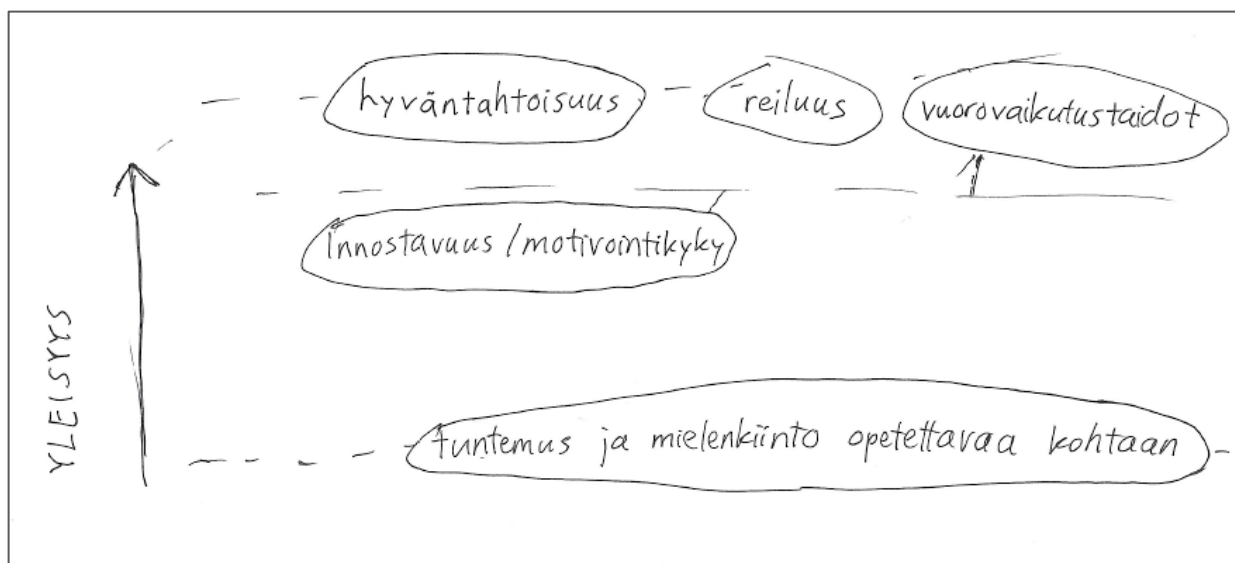


Figure 5. Arno

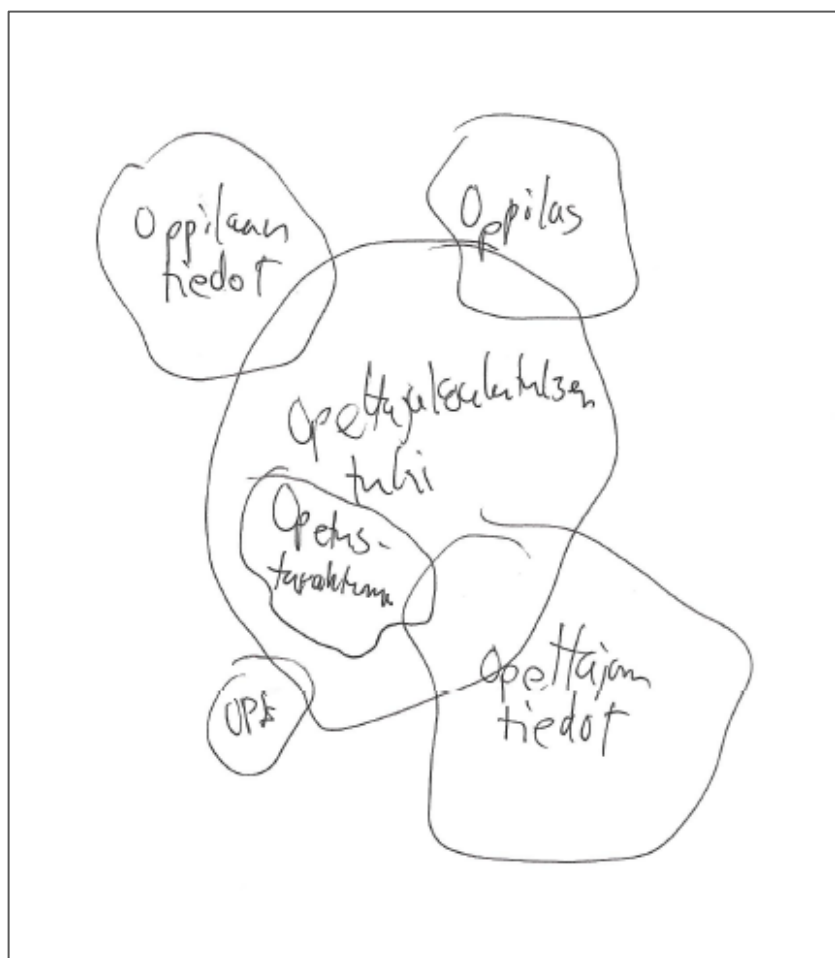


Figure 6. Matti

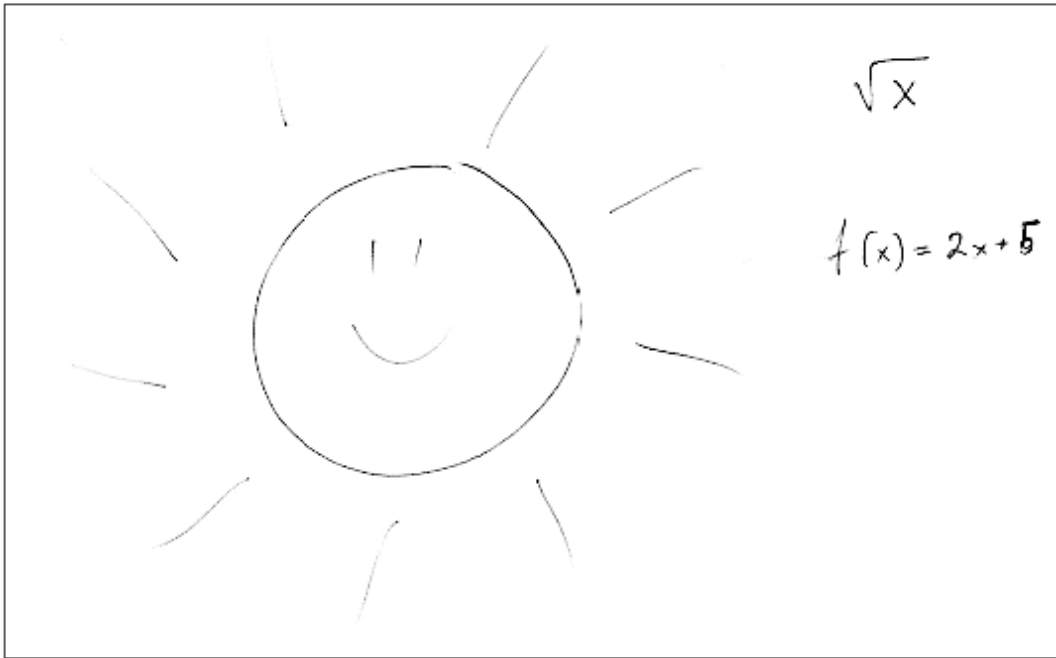


Figure 7. Natalya

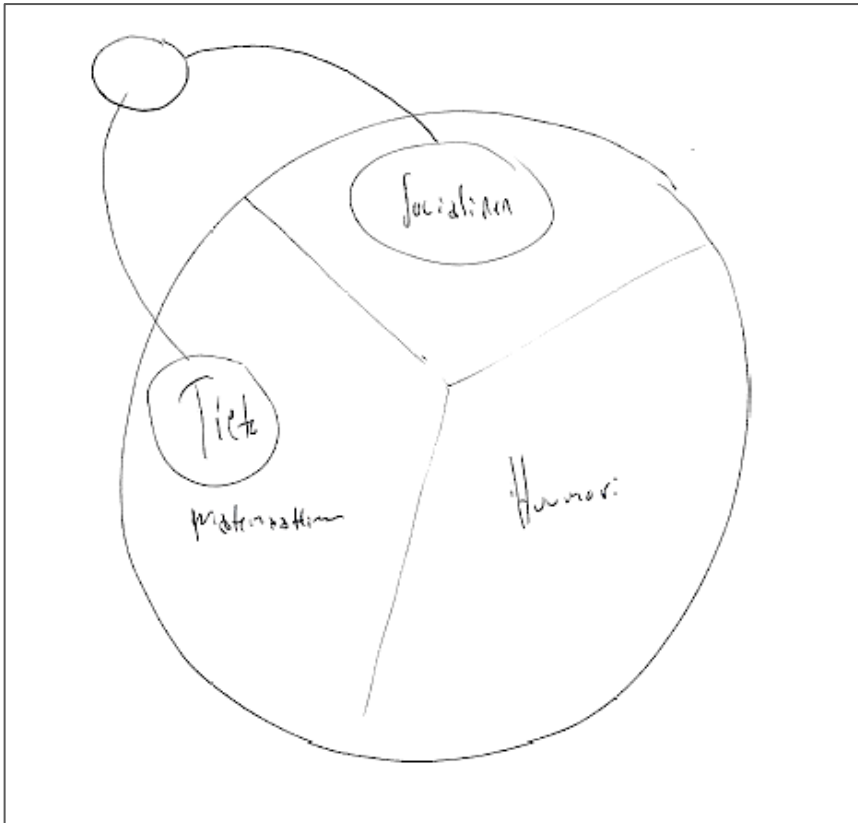


Figure 8. Paavo

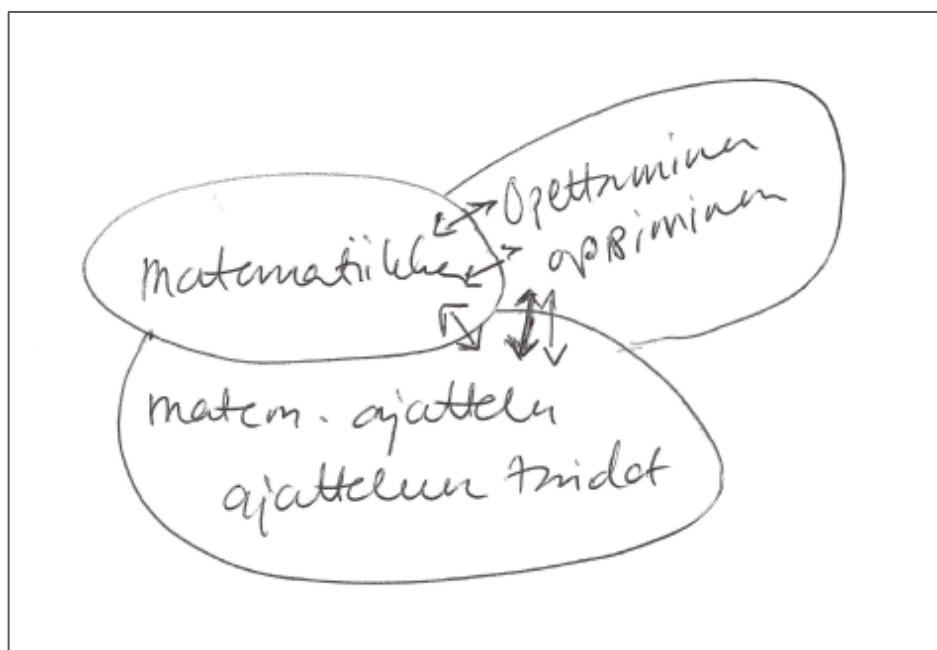


Figure 9. Kirsi



Figure 10. Anna

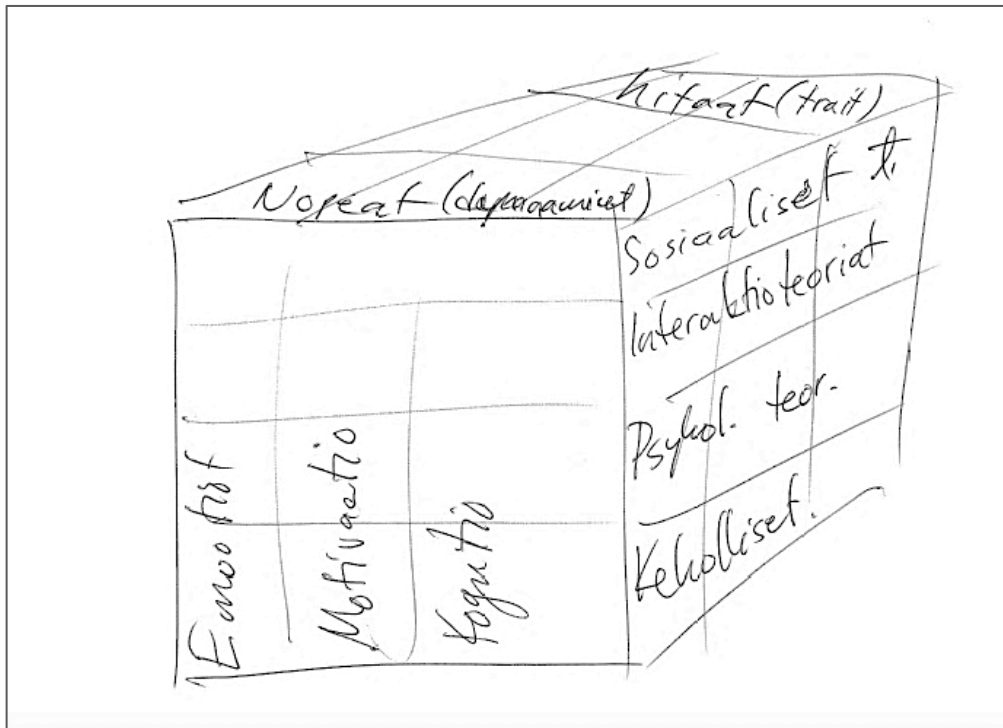


Figure 11. Jukka

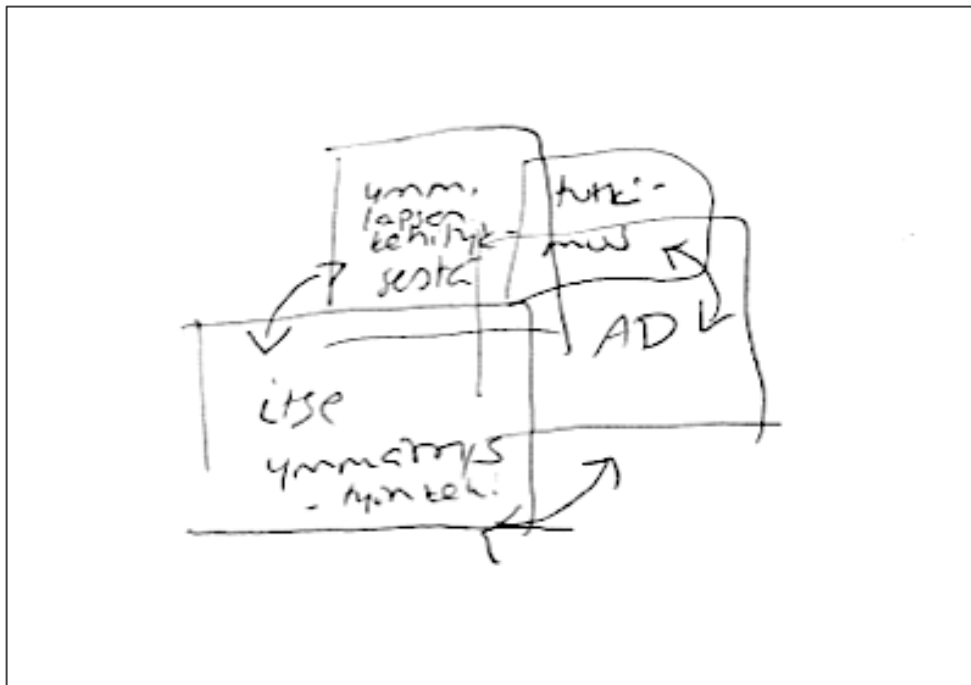


Figure 12. Tarja

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