Organization of mathematics courses in teacher education for compulsory school phase concerning students’ outcome: A metasynthesis

Reason for the study
To make qualitative results more accessible to researchers, educators and policy makers, there is a call for synthesizing findings and systematic reviews from related studies. Even though a large number of single qualitative studies have been conducted, comparative analysis of their findings and theoretical linkages of their conclusions to other relevant research have rarely been included (Finfgeld, 2003, Yore & Lerman, 2008). The challenging issue that Yore & Lerman (2008) address to the mathematics education community, is the need for better understanding of research results and well supported generalizations. They also argue that there is a call for such a synthesis on research in mathematics education, especially research with qualitative approaches. Mathematics education has benefited from both quantitative and qualitative approaches to knowledge-building over the last 30 years. “The question is not an either/or issue but one of rigorous and appropriate consideration of both approaches that reflects the research question, development of the problem space, and availability of associated research techniques, procedures, and technologies” (p. 217). One of the purposes of synthesising and reviewing studies is to provide the mathematics education research community, practitioners and policy-makers with direction for their practice related to the topic (Firestone, 1993; Yore, 2003; Yore & Lerman, 2008; Pawson, 2006).

The science and mathematics education research communities, although not as long-established as some others such as medical research, psychology, or sciences and mathematics themselves, have nevertheless reached a degree of maturity such that we can speak with authority about what we know about the teaching and learning of science and mathematics and how we have come to know what we know (Yore & Lerman, 2008, p. 222).

With this synthesis of findings on research related to the topic mathematics courses for the compulsory school phase, I will try to answer the question: What, if any, is the effect of the organization of the mathematics course regarding students’ outcome?

Metasynthesis
My view on metasynthesis is that it involves synthesizing results and findings of qualitative studies to present an overall perspective and to gain a better understanding of a particular phenomenon. However, the term metasynthesis has develop in recent years, and because of all the descriptions and definitions on metasynthesis, it is important to make clear the use and purpose. It can be confusing to read the literature since there are diverse method approaches and description used. Thorne et al (2004) are among those who describe this as a “terminological land mines” (p, 1343):

We see all metasynthesis, regardless of its terminological labels, as representing a family of methodological approaches to developing new knowledge based on rigorous analysis of existing qualitative research findings. And as with all families, disputations and dynamics are to be expected (Thorne et al., 2004, p. 1343).

In general, metasynthesis can be described as “the bringing together and breaking down of findings, examining them, discovering the essential features, and, in some way, combining
phenomena into a transformed whole” (Screiber et al., 1997, p. 314). Consequently, metasynthesis involves thoroughly investigating and interpreting the findings, as opposed to the raw data, of a number of qualitative research studies (Jensen & Allen, 1996). It is thus the qualitative counterpart of meta-analysis, which examine quantitative studies. Additionally, metasynthesis is neither a systematic review of the literature, nor secondary analysis of qualitative data. This means that not all related studies on the topic for an evidence-based approach will be included, as they do in (critical) systematic review. Furthermore, this is not a re-analyse of originally collections from the data sets as the method with secondary analysis (Thorne et al., 2004; Woods et al., 2004; Schreiber et al. 1997).

It is also needed to distinguish between integrative and interpretive synthesis, especially since this study is primarily interpretive but with an integrative approach in the process of analyzing. Woods et al. (2004) consider integrative and interpretive as forms of synthesis, so their way of thinking will therefore be explained. Woods et al. (2004) develop Noblit and Hare’s (1988) definition on integrative review and interpretive review. Noblit and Hare (1988) imply that integrative reviews are rooted in the positivist paradigm and use techniques such as meta-analysis so that data can be aggregated. They consider integrative reviews as primarily suitable for synthesizing quantitative studies. And conversely, they consider interpretive reviews as suitable for synthesizing interpretive studies to understand how things interact. In contrast, Woods et al. (2004) do not identify integrative with quantitative or positivist. Similarly, they do not say that interpretive synthesis can only be carried out on qualitative studies. They claim that these forms of synthesis are not completely distinct but will include elements from each other. They suggest that integrative synthesizes focus on summarizing data, “where the concepts (or variables) under which those data are to be summarised are assumed to be largely secure and well specified” (p.12). Further Woods et al. (2004) explain that key concepts are defined in early stages. These concepts form the categories under which the data extracted from any empirical studies are to be summarised. However, in this kind of summary they say that techniques such as meta-analysis or descriptive/narrative summary are used, but this is not the path I follow. Like Thorne et al. (2004), I understand qualitative metasynthesis “as an interpretive integration of qualitative findings that are themselves interpretive synthesises of data” (p.1358).

Template analysis is an approach to develop codes for analysing the studies. It is not grounded research, but the studies will be coded step by step, and the template will develop as new codes emerge. Similar to Au’s (2007) study, where template analysis is used as a technique to develop the codes, textual data are coded via a template developed by the researcher (Au, 2007; Crabtree & Miller, 1999; King, 1998, 2006). In the first process of reading and coding of the studies the initial template is based on a combination of a priori codes. In the next process this initial template is applied to the whole data set, and codes are added to the template as new themes occur. The final template will then be used to interpret the textual data set as a whole (Au, 2007; King, 1998, 2006). It is important to make clear that metasynthesis is the methodology used with the method of template analysis. Unlike Au (2007), I will not say that template analysis is used as “a specific form of qualitative metasynthesis” (p. 259) rather I conduct this metasynthesis-study using template analysis as a technique in analysing the data and the codes.

If one read the description, development and the history around the definitions of metasynthesis and then read about metasummary, it can look comparable to template analysis. It is therefore essential to also clarify why this is not a metasummary. Metasummary is a

1 This is similar to Template analysis: the approach used in this study which later will be described.
method that does not analyse the findings in depth; It is a quantitatively oriented integration of findings from qualitative studies that are themselves topical/thematic summaries of data. Even though both quantitatively and qualitatively oriented integration are used, the findings and results is synthesised and analysed carefully in depth (Au, 2007; Thorne et al., 2004, Sandelowski & Barroso, 2007).

After all, it is important to again illustrate why I choose this way of carry out this study. The goal with metasynthesis is to produce new and broader understanding of findings, that can be more substantive than those resulting from individual research, this methodology aims for clarifying concepts and patterns to build up a broader understanding (Sherwood, 1999; Thorne et al., 2004; Finfgeld, 2003).

The goal is to achieve more, not less. The outcome will be something like a common understanding of the nature of a phenomenon, not a consensual worldview. The result of a qualitative metasynthesis is not “the truth” or “the answer”; neither is it simply a narrative or a systematic review. Metasynthesis is quite different from secondary analysis, whereby data are reanalyzed with a new technique or new question. It cannot negate or violate the context or paradigm of the primary studies and, therefore, does not compensate for limited scientific rigor within a body of research (Thorne et al. 2004, p. 1346)

The challenge in conducting a metasynthesis

Researchers that carry out metasynthesis on qualitative studies write about the challenging issues the researcher should be aware of. Synthesizing findings of qualitative studies seems disputable, since the diversity within this practice of inquiry seems to work against inclusions or comparison. Qualitative researchers come from different disciplinary, philosophical, theoretical, social, political, and ethical commitments, and they often have very different views of how to carry out seemingly the same kind of qualitative research. Therefore, synthesizing qualitative research is both epistemologically and ethically demanding in the attempt to summarize findings from one or more qualitative studies about human experiences (Sandelowsky et al., 1997; Davis, 1991). However, Sandelowsky (1997) continues talking about the importance to synthesize qualitative research studies to reach a higher analytic goal.

 qualitative research is still falsely characterized as ungeneralizable, when generalization is narrowly conceived in terms of sampling and statistical significance.
Yet, qualitative research is directed toward naturalistic or idiographic generalizations, or the kind of generalizations made about particulars (Sandelowsky, 1997, p. 367).

As referred to Your and Lerman (2008) in the introduction, they talk about the importance to conduct these kind of studies in the field of Mathematics Education.

Reliability

To ensure reliability when using template approach in analysing the studies, different strategies were planned (King, 1998, 2006; Pawson, Greenhalgh, Harvey, & Walshe, 2005). To develop the template, we were a group of four people, starting out with a collection of five studies to analyze independently, before we discussed the codes. Secondly we read the studies again until we reached a uniform agreement. After a while we picked out more studies to read and used the same procedure over again. Consensus in coding was reached together. The collaboration was recommended by Glesne (1999) and Lincoln and Guba (1985) for bringing credibility and reliability to the research.
Since reliability is improved when researchers are clear about the process and their positioning, it is important to explain the research orientation and philosophical foundation (King, 1998, 2006; Pawson et al., 2005). My approach to this study is a realist approach (Pawson, 2006). This philosophical foundation has its roots on critical realism. A critical realist’s conception of social science is that it is socially situated, but not socially determined. Critical realists believe that this world is to varying degree knowable through human cognition and changeable relative to our knowledge of it. The real world exists objectively outside human perception and Bhaskar (1975) argues that reality exists independently of our knowledge of it. In these ways, critical realism acknowledges that there exists a mind-independent reality which is objectively knowable, but at the same time it talks about the important roles of insight and cognition as well (Collier 1994, Judd 2003). The motivation underlying critical realism is to understand the world to change it for the better (Benton & Craib, 2001; Bhaskar, 1989). My motivation, starting on the PhD-study, was to understand the political reasons behind the different educational reforms and the challenges and consequences for the mathematical courses in the teacher education regarding student’s outcome. And as a result change the education for the better. However, the political interests are put away for the principle of conducting a reliable PhD-study.

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2 Critical realism is most commonly associated with the work of Bhaskar and his critique of the competition between philosophies of the natural science and philosophies of the human science.
References


