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THEORIES OF EPISTEMOLOGICAL BELIEFS AND COMMUNICATION: A UNIFYING ATTEMPT

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In order to develop more detailed knowledge about possible effects of beliefs in mathematics education, it is suggested that we look more in-depth at more general types of theories. In particular, the study of relations between epistemological beliefs and communication is put forward as a good starting point in this endeavor. Theories of the constructs of epistemological beliefs and communication are analyzed in order to try to create a coherent theoretical foundation for the study of relations between the two constructs. Although some contradictions between theories are found, a type of unification is suggested, building on the theories of epistemological resources and discursive psychology.

INTRODUCTION

Regarding the study of beliefs, educational research has somewhat neglected theoretical aspects (Op't Eynde, De Corte, & Verschaffel, 2002; Thompson, 1992). Within cognitive psychology some more attention has been given to the development of theoretical models or frameworks, in particular regarding epistemological beliefs (see Hofer & Pintrich, 2002). Many studies about beliefs in mathematics education have been descriptive, by focusing on what different types of beliefs exist among students or teachers, where beliefs are seldom more directly related to other factors, such as students' learning (De Corte, Op't Eynde, & Verschaffel, 2002). By using theoretical frameworks from cognitive psychology, connections between epistemological beliefs and several different aspects of learning have been studied more in-depth, showing many connections (Pintrich, 2002). Mathematics education research could therefore benefit from relating to and utilizing more general types of research about epistemological beliefs, in particular regarding theory and relations between beliefs and aspects of learning.

A starting point for research about beliefs in mathematics education focused on students' learning and problem solving (Schoenfeld, 1983), but there seems to have been a shift in focus from students to teachers, and to the relation between teachers' beliefs and teaching practice. A general problem with this kind of research is the focus on such a "large" construct as teaching practice, since many factors can influence the decisions a teacher makes during lessons (Skott, 2005). Thus, there is a need to study possible influences of beliefs at a more detailed level. Cognitive psycholo-

gist have done such more detailed studies of relations between beliefs and other aspects of cognition, but almost all these results come from studies of correlations and there is a need for more theoretical work on explaining how and why these connections exist (Pintrich, 2002).

Communication is central to processes of teaching and learning, as it is to all social situations:

Language is so central to all social activities it is easy to take for granted. Its very familiarity sometimes makes it transparent to us. [...] Moreover, language is not just a code for communication. It is inseparably involved with processes of thinking and reasoning. (Potter & Wetherell, 1987, p. 9)

The last part of the quote stresses the close connection between the use of language and thinking. One way to study relations between beliefs and aspects of cognition and behavior in more detail can therefore be to examine relations between beliefs and communication. Such relations can include how beliefs can affect, or be affected by, communication, for example how one expresses oneself or how one interprets something expressed by someone else (in writing or orally). Another perspective on the relations between beliefs and communication is to not see them as two separate “objects” that can affect each other, but as more integrated aspects of cognition and/or behavior.

So far I have discussed both beliefs in general and also epistemological beliefs in particular. From here on I will limit myself to epistemological beliefs, for several reasons: A more focused theme is thereby created while at the same time it is general enough to be relevant for the study of many educational situations and phenomena, and also there exist elaborate theoretical frameworks for this type of belief.

The first step in the project of studying relations between epistemological beliefs and communication has been to focus on theoretical aspects of the two constructs; beliefs and communication. So far I have studied the notion of beliefs by examining existing types of definitions in mathematics education research literature (Österholm, 2009). It is common to define beliefs through the distinction between beliefs and knowledge, but for educational research the analysis of existing definitions shows that this distinction is problematic since it tends to create “an idealized picture of knowledge, as something pure and not ‘contaminated’ with affect or context” (Österholm, 2009, p. 6). Instead of focusing on this distinction one can utilize the notion of a person’s conceptions (as also suggested by Thompson, 1992) and focus on what a certain conception is about, such as epistemology. Thus, it is not important whether we label something as epistemological *belief* or epistemological *knowledge*. This conclusion is somewhat consistent with research in cognitive psychology, where the general notion of *personal epistemology* is used, which will be discussed later.

Purpose and structure of paper

In order to study relations between epistemological beliefs and communication, there is a need to have a theoretical framework that in a meaningful and coherent way

defines both these two constructs and describes possible ways to study them. This paper constitutes the starting point in the process of creating such a framework. Existing theories of the two main constructs will be analyzed and related to each other in order to examine if and how such theories can be used in the creation of the needed type of framework. The present paper will discuss (1) theoretical frameworks of each construct separately, including how the theory of one construct views the other construct, and (2) possibilities to unify frameworks of both constructs.

THEORIES OF EPISTEMOLOGICAL BELIEFS

Focus is here on theories of personal epistemology (Hofer & Pintrich, 2002), since this area of research is where a most comprehensive theoretical treatment of epistemological beliefs exists. However, even if all theories within this area of research agree on the basic focus of the research; “an individual’s cognition about knowledge and knowing” (Pintrich, 2002, p. 390), personal epistemology is not a unitary theoretical framework. Pintrich notes that differences between theories of personal epistemology can be related to more fundamentally different ways of viewing human cognition; developmental, cognitive and contextual approaches. An analysis of the different types of theories reveals that the developmental and cognitive approaches to personal epistemology cannot readily explain the empirical results showing a context dependence of epistemological beliefs (Louca, Elby, Hammer, & Kagey, 2004). Actually, many research methods used within these two approaches (implicitly) *presuppose* that epistemological beliefs are independent of context, for example by using questionnaires to simply ask a person about his or her beliefs (Hammer & Elby, 2002).

Instead of defining beliefs as a property of individuals’ mental representations, Hammer and colleagues (Hammer & Elby, 2002; Louca et al., 2004) define beliefs by referring to more fine-grained parts of mental representations called epistemological resources. These resources are directly related to specific individual experiences and are not more abstract types of epistemological theories that are applied in different situations. In a certain situation, different epistemological resources can be activated and thereby utilized in the activity at hand. For example, the resource ‘knowledge as propagated stuff’ can be seen when children determine that they know something because one of their parents has told them so (Hammer & Elby, 2002, p. 178). Beliefs can then be defined as a property of the whole of all resources that have been activated in a specific situation.

The view of communication

Since all theories of personal epistemology focus on (the activation of) certain parts of mental representations, communication is not part of such a theory but becomes a relevant topic when discussing how to study these mental representations. That is, communication becomes a mean for “identifying which cognitive structures should be attributed to individual minds” (Hammer & Elby, 2002, p. 184).

THEORIES OF COMMUNICATION

One way to define communication is to describe it as the transmission of information from a sender to a receiver, for example when one person says something and another person hears and interprets this. This quite simple model of communication has received much criticism for being too simplistic, for example since (1) the model describes language as a static system but language do change, even during one specific conversation, (2) language is not only referential but also constitutive, and (3) language is important for doing things (e.g., greeting and denying) (Taylor, 2001, pp. 6-7). Thus, instead of viewing the use of language in communication as a mere medium by which information is encoded and transmitted, a more constructive view of language can be adopted: The use of language is seen as “a medium *of* action” (Potter & te Molder, 2005, p. 3, emphasis added), and not solely a medium *for* transmission of information or *for* anything else. Such a view is fundamental in certain types of discourse analysis (Taylor, 2001) and analysis of natural interaction (Potter & te Molder, 2005), both which include a broad range of different types of research and which have many overlaps between them. However, this type of research has mostly focused on sociology and “questions of psychology have rarely been explicitly addressed” but that “discursive psychology is the perspective that has addressed cognition in the context of interaction most systematically in a psychological context” (Potter & te Molder, 2005, pp. 18-19). Thus, for the purpose of the present paper, when focusing on cognitive aspects of beliefs, discursive psychology is a good candidate for a suitable, more detailed perspective on communication.

As for all discourse analytic approaches, discursive psychology focuses on the language itself, and how it is used in natural occurring situations. Thus, instead of viewing psychological vocabulary as referring to some mental states, “these words are *themselves* an autonomous part of particular social practices” (Potter & Wetherell, 1987, p. 179). More specifically for discursive psychology, this perspective works in three ways (Edwards & Potter, 2005, pp. 241-242): (a) By exploring situated, rhetorical uses of psychological terms such as angry, know or believe, (b) by examining how psychological themes are handled without necessarily being expressed explicitly, for example to explore how intent, doubt or belief is constructed and made public indirectly through descriptions of events, objects, persons etc., and (c) by re-specifying standard psychological topics in terms of discourse practices, for example regarding the theory and measurement of attitude or of causal attributions, where often a criticism towards existing theories and measures in cognitive psychology is a central aspect.

The view of epistemological beliefs

Communication is here seen as the central site for psychology and not as a window to something else, where a researcher should not try “to see through their [speakers or writers] words to some underlying meaning, or to uncover attitudes or beliefs of which the speakers themselves are unaware” (Taylor, 2001, p. 19). Thus, as also

noted above, discursive psychology defines cognitive notions (such as belief) as parts of discourse practices instead of as parts of mental representations/processes.

THEORETICAL UNIFICATIONS

A general difference between cognitive psychology and discourse analytic approaches is that the object of study is either mental representations/processes or the use of language. This difference is not only an empirical matter but is also theoretical, since either the mental or the discourse is seen as ‘where the action is’. An analysis of theoretical possibilities for studying relations between epistemological beliefs and communication is here done in the following way: Discussions of potential limitations and developments within the theories of epistemological resources and discursive psychology will be used as a foundation for a discussion of the possibility to integrate the two theories.

Epistemological resources as a starting point

Within this theoretical approach, two aspects need improvement, for the study of relations between epistemological beliefs and communication: First, Pintrich (2002, p. 394) points to the general need within research about personal epistemology to develop models of how epistemological thinking may be represented cognitively. Second, communication needs to be problemized more in-depth, where a person’s statements cannot be seen as a direct reflection of mental representations. This second aspect refers both to a methodological problem (i.e., how to get a good ‘picture’ as possible of mental representations) and also to a theoretical problem (i.e., how to model communication and interaction). For the focus of the present paper, theories need to be of the kind that somehow relates communication to cognitive representations and processes. To include at least some aspects of communication within such a theory, Kintsch’s (1998) theory of ‘comprehension’ could be possible to use. This theory includes detailed models of mental representations (using associative networks) and of the process of interpreting/comprehending something ‘external’ (such as a text or an oral statement), and have proven useful when for example describing and predicting readers’ comprehension of texts.

The descriptions of epistemological resources as a fine-grained cognitive network and the utilization of these resources as the activation of different resources depending on the context (see Louca et al., 2004) also fit within Kintsch’s (1998) comprehension framework: The activation of resources can be modeled through the associative property of mental representations, which is a driving force in the activation of prior knowledge (resources) in the process of comprehension, in contrast to the activation of some abstract or general type of belief.

Discursive psychology as a starting point

From this theoretical perspective, one can see a need for redefining ‘beliefs’ in general and ‘epistemological resources’ in particular, in terms of discourse practices (however, for reasons discussed in the introduction, I am not primarily interested in

the notion of beliefs but on notions of epistemology). Such a respecification can be achieved by an analysis of the discourse in situations where a treatment of knowledge or learning occurs, or by an analysis of how people explicitly use and refer to epistemological notions. These types of analyses have some similarity with suggestions by Hammer and Elby (2002) of how to find possible epistemological resources by examining how people reason and draw conclusions in situations where they need to make some kind of judgment of knowledge. This kind of overlap between the different theories can be taken as a starting point in a possible unification, for example by seeing the activity, the discourse, as the site where epistemological beliefs come to existence, through explicit or implicit references to prior experiences (epistemological resources).

One limitation in discursive psychology is that thinking as an individual and silent activity is not included, since all psychological terms are specified in terms of discourse practices. Sfard (2008) suggests a type of expansion of a discourse analytic approach by defining thinking as the individual version of communicating. This suggestion somewhat removes the distinction between the mental/individual and the public/discourse. Therefore, such a theory can be seen as a possibility for joining the theory of epistemological resources (a theory about mental representations/processes) and the theory of discursive psychology (a theory about discourse practices).

A mixture of epistemological resources and discursive psychology

The two theories have so far often been described in a contrasting manner, in particular regarding how they see the existence or relevance of mental representations and processes. However, to focus a discussion on this issue may result in

fruitless debates about the reality or non-reality of mental entities, which can easily end in the kind of linguistic imperialism which denies all significance to cognitive processes (Potter & Wetherell, 1987, p. 180).

Therefore, in order to study aspects of epistemological beliefs and communication under the same theoretical framework, it is suggested that we both see the relevance of mental representations and processes and also adopt a constructive view of language (i.e., highlight the constitutive property). This suggestion is of course not new in a broader perspective (e.g., see the description of different authors' positions by Potter & te Molder, 2005, p. 5), but most relevant for the present paper is to discuss possible ways to draw on this suggestion specifically for theories of epistemological resources and discursive psychology, which is done in the following.

Epistemological resources are here not seen as necessarily consisting of mental entities that directly say something about epistemology, but that the resources consist of prior experiences that can be used for some kind of judgment of knowledge. Although not described in this manner by Hammer and colleagues (Hammer & Elby, 2002; Louca et al., 2004), this description seems to be in line with their description of looking at examples of children's behavior where they make some type of judgment of knowledge as an origin of a resource that can be used in other situations.

The utilization of prior experiences can be described in more detail by using a model of the structure of mental representations (i.e., memory of prior experiences) and a model of how these representations can be activated and utilized (i.e., the mental process), such as the theory of ‘comprehension’ mentioned earlier (Kintsch, 1998). Such models can then be used as a foundation for describing and explaining how and why certain prior experiences (resources) are used, and others are not, in a specific situation. This placement of a situation within a context, through references to and utilization of prior experiences, can also be seen as central to discourse analytic approaches, in particular since prior experiences is not limited to events long prior to a specific situation but can also include for example earlier statements in one conversation.

Epistemological belief is not seen as a property of mental representations but as a property of the activity in a certain situation, which is dependent on prior experiences (epistemological resources). However, beliefs are not *determined* by existing resources since the discourse is constitutive and not only a reference to mental representations. Thus, beliefs are being constructed in a specific situation. In this way, epistemological beliefs can be seen as different ways of thinking, where the processes of utilizing prior experiences and of participating in a discursive practice are of fundamental importance.

CONCLUSIONS

The present analysis has revealed different theoretical possibilities for future studies of relations between epistemological beliefs and communication. In particular, it seems possible to join the theories of epistemological resources and discursive psychology, through some additions or clarifications: (1) to include a model of the structure and utilization of mental representations, (2) that mental representations are primarily seen as describing the memory of prior experiences, and (3) that the utilization of prior experiences is seen as a central aspect of the contextualization of discourses. This suggested unification of theories is therefore seen as a good starting point for a continued development of theory and for future empirical studies.

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