

THE ONTOLOGY OF BELIEFS FROM A COGNITIVE PERSPECTIVE

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In order to refine existing theories of beliefs, attention is given to the ontology of beliefs, in particular how a belief can be seen as a mental object or a mental process. The analysis focuses on some central aspects of beliefs; unconsciousness, contextualization, and creation and change of beliefs, but also relates to research methodology. Through the analysis, the creation of belief is highlighted as a central aspect for more in-depth theories of beliefs. The outline of a theoretical framework is described – a framework that has the benefit of creating a coherent integration of all different aspects discussed, and which can also be used as a framework when designing and analyzing methods for empirical research.

INTRODUCTION

Regarding the study of beliefs, educational research has somewhat neglected theoretical aspects (Op't Eynde, De Corte, & Verschaffel, 2002; Thompson, 1992). In many studies of beliefs, the term ‘belief’ is not even explicitly defined, but it is assumed that the reader knows what is meant (Thompson, 1992). In addition, an analysis of existing definitions, regarding their focus on the distinction between belief and knowledge, highlighted some problematic issues (Österholm, 2009a). These issues include that different perspectives are mixed when describing definitions and properties of beliefs (whether taking a social or individual perspective regarding where the difference between belief and knowledge is located), and that given definitions often are of an informal type (as labeled by McLeod & McLeod, 2002).

For educational research that focuses on cognition and behavior of individuals, I am rejecting the starting-point of defining beliefs through the distinction between belief and knowledge, primarily because this distinction tends to create “an idealized picture of knowledge, as something pure and not ‘contaminated’ with affect or context” (Österholm, 2009a, p. 6). Instead of focusing on this distinction we can for example utilize the more general notion of a person’s conceptions (as also suggested by Thompson, 1992) and focus on what a certain conception is about, such as epistemology, which is my main interest. Thus, it is not important whether we label something as epistemological *belief* or epistemological *knowledge*. Instead, we can for example talk about *personal epistemology*, which refers to “an individual’s cognition about knowledge and knowing” (Pintrich, 2002, p. 390).

Again, I argue that the important thing is what a person's belief/knowledge/cognition *is about*¹, and not whether we label it as belief, knowledge, or cognition. Even if I sometimes in the present paper focus on *epistemological* beliefs (i.e., cognition *about knowledge and knowing*), I see most of the types of analyses and arguments presented as equally relevant for beliefs in general. In addition, since I do not see the distinction between belief and knowledge as important, more general aspects of cognition will also be discussed. Thus, a central focus of the present paper is to relate to and utilize more general types of cognitive theories and results in an attempt to develop existing theories of (epistemological) beliefs.

Perhaps it is clear from what I have described above, but I want to make explicit that my focus on beliefs here is on the individual's cognition and behavior, and not on more philosophical aspects of belief (e.g., see Gettier, 1963) or on more social aspects, such as classroom norms (Yackel & Rasmussen, 2002).

Purpose and structure of paper

The present paper is a continuation of my previous analyses and development of theories of (epistemological) beliefs. Besides the already mentioned analysis of definitions and properties of beliefs (see Österholm, 2009a), I have also analyzed relations between theories of epistemological beliefs and communication (see Österholm, 2009b). This latter type of analysis highlighted the need to take more fundamental aspects of cognition and behavior into account when trying to formulate details of theoretical frameworks, in particular regarding structure and utilization of mental representations on the one hand and discourse on the other hand. If talk is not only seen as a mirror of cognitive content or process, there is certainly a need to problemize discourse also for the study of beliefs, but this paper focuses on deeper analyses of cognitive aspects of beliefs.

The purpose of the present paper is to develop existing theoretical perspectives of (epistemological) beliefs. Through the analyses in the present paper, the goal is to create possible ways to refine theories of beliefs, by attending to more general aspects of cognition in relation to definitions and properties of beliefs that seem unclear or problematic in descriptions of existing theories.

Therefore, the present paper focuses on the ontology of beliefs, starting with an analysis of possible meanings of the notion of 'having a belief'. This analysis, which includes some relations to research methodology, opens up questions about other aspects of beliefs. Some of these aspects are discussed, including unconsciousness, contextualization, and creation and change of beliefs². Within the analyses I suggest

¹ This is also a central part of Törner's (2002) theory of beliefs through the notion of "belief objects".

² Of course, there are many other aspects that also could be analyzed, such as the affective dimension and the degree of truth or certainty, but it is not possible to include all relevant aspects in the present paper.

how to theorize about belief more in-depth, and at the end of the paper these analyses are summarized and discussed as parts of a coherent framework.

THE ONTOLOGY OF BELIEFS

A general starting point regarding ontology of belief can be to focus on where this belief should be “located” or what type of entity ‘belief’ refers to. For example, is ‘belief’ a purely cognitive notion or is it more closely related to behavior in some way? I see at least four different “locations” that can be used as a starting point in thinking about the ontology of beliefs; regarding a belief X (that X is true) that this belief is:

1. The proposition X stored in long term memory (a mental object)
2. A way of thinking around what X is about (a mental process)
3. Behavior congruent with X
4. Discourse practice around what X is about

An example regarding the fourth point is the suggestion to re-specify standard psychological topics in terms of discourse practices, which is the case within the theory of discursive psychology (Edwards & Potter, 2005). Gilbert (1991) can be given as an example regarding the third point in the list above, but also as an example showing that some researchers see the ontology of belief as a combination of some points in the list above. Gilbert notes that if you believe X, you have the information X stored in your mental system and you behave as though this information is true.

In this paper I focus on a cognitive perspective, and therefore discuss the first two points in the list above in more detail.

It seems common to see a belief as something a person *has*, for example by describing beliefs as something a person ‘holds’ (as is done by for example Op’t Eynde et al., 2002). One possible interpretation of this notion is to see belief as a mental object, which is in line with Gilbert’s (1991) description of belief as including a mental representation of a proposition together with a positive evaluation of the information given by this proposition. Thus, a representation of the statement that is believed (to be true) exists as an object in the mental system.

One problematic aspect of this objectification of belief is regarding research methodology, that is, how we can examine these beliefs. In empirical studies of beliefs, the connection between definition/theory of belief and methodology is sometimes quite weak or of a more intuitive kind. For example, if we view belief as a mental object and want to examine a certain belief, it is unclear why we would need to ask a person several questions that are *related to* this belief (this proposition) but that are not *directly* questioning this belief, which is often done when using Likert-scales in questionnaires (Kislenko & Grevholm, 2008). At least two motives could be given for this way of examining beliefs, which relate to two aspects that are discussed in later sections of the paper: First, it could be argued that a person perhaps does not

want to or are not *able to* express this belief, which can be related to unconsciousness of beliefs, which is discussed more in the next section. Second, a methodological argument could be given, in that a person is asked questions that are assumed to measure the same type of belief, for which the answers then can be combined to create a better measure. The notion that these different questions are measuring the same thing is based on the assumption that the belief is a general type of mental object that is used when answering all the different questions. This aspect is discussed more in a later section, in relation to contextualization.

These arguments aside, a central question regarding the theoretical notion of belief as a mental object is whether it is a reasonable assumption that all persons have a mental object that directly represents a specific belief. An answer to this question would demand a more elaborate theory of properties of mental objects and how these objects are created, and the creation of beliefs is discussed more in a later section. However, I argue that it is unreasonable that persons in general have mental objects that represent a belief you want to study, since this seems to demand that all persons have previously thought about exactly this aspect, in order for it to exist as a mental object. This issue is related to a general problem of whether something is actually created in the investigation and not just observed, which certainly seems possible if persons are asked questions that they have not directly thought about before. What are you then measuring with your questions, if the mental object, the belief, was not there before your investigation?

There is another way to theorize about beliefs as part of cognition, by not seeing belief as a mental object but as a mental process (as a way of thinking). For example, Hofer (2004) describes epistemological beliefs as metacognitive processes. In this case it seems more reasonable that different questions can measure the same thing; the same type of mental process, for example a person's thinking about epistemology. In contrast, when seeing belief as a mental object you have to assume that this object is of a more general type in order for different questions to measure the same thing (i.e., this object). When viewing belief as a mental process, there is no need for a specific mental object that represents a belief to exist, but the mental process can be thought of as potentially utilizing all existing mental objects (which does not exclude the possibility that there is a mental object that more specifically represent what a belief is about³). Even if there is no direct need to theorize about specific properties of mental structure and content, such a theory could help in making more explicit what is meant by seeing belief as a mental process, which is discussed at the end of the paper.

³ This has similarities with the notion of concept definition and concept image (Vinner, 1983) in that you can have a mental object that more directly represents a certain belief (corresponding to a concept definition) but that the thinking around what the belief is about depends on all related experiences (corresponding to a concept image). The corresponding concept image for a belief seems to be what Törner (2002) describes as “the content set of a belief”.

In summary, the notion that a person *has* a belief might signal that this refers to some kind of mental object. Some arguments against the reasonableness of this assumption have here been put forward, in particular when analyzed in relation to empirical methodology. Instead, the notion of belief as a mental process is seen as more reasonable. In this way, a belief is not primarily seen as something a person *has* but something a person *does*. Thereby, ‘belief’ is perhaps more clearly defined as an analytical notion, since it is more clearly referring to a result of analyses of empirical observations and not to a more abstract type of entity existing within individuals. A reason for stressing this is that other analyses of empirical research about beliefs have shown the necessity to stress that all claims about beliefs are a function of a researcher’s analyses (e.g., regarding the notions of professed and attributed beliefs, see Speer, 2005), which highlights the important issue of interplay between theory, including ontological aspects, and methodology. In this section of the present paper this type of interplay has been discussed through notions about what we actually can and try to observe and analyze.

Unconscious/implicit beliefs

As noted in a previous analysis (Österholm, 2009a), even if it is noted that beliefs can be unconscious, the notion of unconsciousness is never really explained in relation to, or as a part of, the definition of beliefs. For example, regarding epistemological beliefs Schommer-Aikins (2004) notes that they are often unconscious and regarding beliefs in general Pehkonen and Törner (1996) distinguish between conscious and unconscious beliefs.

In his critical analysis of belief-research, Skott (2005) notes that the reference to unconsciousness is made when trying to explain what are considered contradictory empirical results. However, this inclusion of unconsciousness in the theory of beliefs is ad hoc since neither a definition of unconsciousness nor the problem of examining aspects of unconsciousness is discussed (see e.g. Dienes, 2008, for such type of analysis), and the concept of unconsciousness is not directly related to the rest of the theory of beliefs.

It is here not possible to give a thorough analysis of unconscious aspects of cognition in relation to beliefs, but at least some aspects of *tacit knowledge* can be discussed. You can separate between different kinds of tacit knowledge (e.g., see a description by Barbiero, 2004); referring to skill/expertise, to cognitive competence (e.g., language competence), or to a more general “cognitive background”. All these types seem to have some things in common; in particular that the implicitness is related to the level of communicability of the knowledge and that the knowledge is built up through experiences, often in plenty, around what the knowledge is about. For example, regarding implicit knowledge of the first type that an expert “acts, makes judgments, and so forth without explicitly reflecting on the principles or rules involved” or implicit knowledge of the third type “that objects are rigid, a bit of knowledge few people ever bother to formulate” (Barbiero, 2004).

Based on the common properties of tacit knowledge, unconscious belief can be seen as having been created through experiences related to what the belief is about. For example, regarding epistemological beliefs, the experiences can include situations where you come to know something or where you decide if you know something. This perspective is in line with the theory of epistemological resources (Hammer & Elby, 2002), which does not pre-suppose the existence of a more general type of individual epistemological theory, but sees the utilization of simpler forms of mental entities as central to personal epistemology.

Thus, it seems unreasonable that an unconscious type of belief is represented mentally as a specific object, but more reasonable that a number of objects, that represent all relevant prior experiences, together create the foundation for a belief, which then can be realized through the process of activating and utilizing (some of) these prior experiences.

Furthermore, as with tacit knowledge (see Barbiero, 2004), an unconscious belief can be something that is difficult, or virtually impossible, to communicate or something that is communicable but that just has not (yet) been communicated and will be communicated if the right conditions appear. If an unconscious belief is directly represented by a mental object, it seems reasonable that this belief can be communicated and made conscious if focus is put on the content of this belief⁴, for example by a direct question. This is perhaps not as self-evident to happen if a belief is represented as a process since then a more holistic view (or reflection) of the mental process seems necessary. However, even when seeing a belief as a process, if focus is put on the content of this belief it could be that the person becomes aware of this process (this way of thinking) and thus makes it conscious. In addition, note that the mental representation of this specific experience, when becoming aware of this process, can thereafter be seen as a more direct representation of this belief, in the form of a specific mental object. You could thereby attempt to distinguish between conscious and unconscious beliefs by stating that beliefs are conscious if there exist a mental object that can be seen as a direct representation of (what is claimed in) the belief, since these objects refer to a specific experience of reflection on the content of the belief, while beliefs otherwise are unconscious⁵. However, it should be noted that even if a mental object exists that can be seen as more directly representing a belief, my previous arguments are still valid regarding the need to define the belief not as the existence of this object but as a mental process, where many mental objects are activated. Therefore, this attempt to distinguish between conscious and unconscious

⁴ Assuming that this type of mental representation is more directly connected to language and does not consist of some kind of abstract entity that is not necessarily communicable.

⁵ I have not seen this type of distinction in any studies of beliefs, but it was discussed at a workshop on mathematical beliefs (November 4-5, 2009, at Umeå University, Sweden, see <http://www.ufm.umu.se/english/events/womb/>).

beliefs through the distinction between mental object and process does not seem useful.

The analysis above can be related to metacognition, which can be described as cognition about your own cognitions (e.g., see Schraw & Moshman, 1995). In general, beliefs as well as consciousness can be placed within cognition, and consciousness of beliefs is therefore by definition metacognitive. In addition, epistemological beliefs can themselves be seen as metacognitive since they deal with beliefs about knowledge and knowing⁶, which places consciousness about these types of beliefs at the meta-meta-level.

Besides the possibility to create a more coherent theory, for example through the utilization of relations to more general types of cognitive theories, what does the notion of unconsciousness add to the theory of beliefs? For most studies about beliefs, I suggest that the notion of unconsciousness is superfluous, for two reasons. First, since many definitions that are in use today do not seem to be of an extended type (as labeled by McLeod & McLeod, 2002), the inclusion of unconsciousness as a (defining) property of belief will probably not clarify the construct, while a more thorough elaboration of the more fundamental parts of a definition will. Second, the inclusion of unconsciousness as a means to explain a perceived contradiction between different types of empirical data, in particular regarding teachers' beliefs and teaching practice, seems unwarranted due to that there are methodological aspects not taken into consideration (Speer, 2005) and that there are many factors that influence a teacher's classroom behavior (Skott, 2005).

Contextualization of beliefs

If you are surprised when you encounter a type of contradiction between what someone is saying in one situation and what the same person is doing in another situation, as is the case in some studies about teachers' beliefs and teaching practice (Speer, 2005), you are working under the assumption that there exists a kind of general belief that affects a person's all cognition and behavior. Even if this kind of assumption of generality of cognition has existed in cognitive science, now it seems more or less generally agreed upon that knowledge is context dependent. It now also seems common to describe beliefs as contextualized (Leder & Grootenboer, 2005), and specifically for epistemological beliefs most researchers seem to agree that these kinds of beliefs are domain-dependant, but that some disagreement exist regarding exactly how fine-grained a domain can be (Pintrich, 2002).

Contextualization is thus seen as a general property of cognition, in particular that a belief is, at least initially, tightly connected to the types of situations when the belief was created. This view does not exclude the possibility that more general types of beliefs can exist, only that there is a shift in the basic assumption about beliefs, from

⁶ For example, epistemological beliefs have been described as metacognitive processes (Hofer, 2004).

seeing beliefs as primarily general, but occasionally more context-dependant, to seeing beliefs as primarily context-dependant, but potentially more general. For example, it seems reasonable that a person has some type of fundamental, more general beliefs (or ‘values’, or ‘norms’) that actually affect most of that person’s cognition and behavior, such as that you should not hurt people. Details about if and how beliefs can have this property, and about relationships between beliefs, values, and norms need further investigations, for which there is not room here.

The posited context-dependence puts some demands on research methods. For example, by using questionnaires to simply ask a person about his or her beliefs you seem to (implicitly) presuppose that beliefs are independent of context. There exist other types of self-reports that seem to better address the issue of contextualization, for example the experience sampling method (Leder & Forgasz, 2002).

Creation and change of beliefs

It seems common to describe, or even define, belief as something stable/robust (Louca, Elby, Hammer, & Kagey, 2004), sometimes in conjunction with referring to belief as developing under a long time period (McLeod, 1992). However, there are also studies focusing on belief change, for example by measuring beliefs before and after a specific activity (e.g., Beswick, 2006). In order to get a better understanding of the process of change it seems necessary to relate change to the process of creation, either by seeing these two processes as aspects of some more general cognitive process or by viewing the process of change as dependent on the process of creation. An example of the latter view is to see beliefs tacitly constructed through lived experiences as changing in ways similar to conceptual change (Liljedahl, Rolka, & Rösken, 2007).

The creation of unconscious types of beliefs was discussed earlier in the present paper, but it seems reasonable that there are also other types of processes that can create a belief, for example a form of direct instruction. A simple example could be that someone makes the claim X, and that you thereafter believe that X is true, and a more conscious type of belief has thus been created. However, it is important to notice that when someone makes the claim X, you always interpret this using your prior experiences and knowledge of relevance in relation to X; both in relation to the person making the claim, as well as in relation to the situation when the claim was made, which all together will make up a mental representation of the whole experience of listening to this claim. In this way, this specific experience can be said to create a belief about the same thing the claim X is about, or possibly influence an already existing belief. This description shows the possibility to see both the creation and also the change of belief as built up by the same type of mental process; an interpretation of a specific situation. The complexity becomes evident when we imagine the number of such interpretations made in only a short conversation or in only one minute of a mathematics lesson.

The creation of a belief thus happens through interpretations of concrete experiences relevant for what the belief is about. Assuming a continued occurrence of such experiences, there is a potential for the belief to take on a more coherent, theory-like property through the ongoing interpretation of new experiences in relation to old ones. In addition, experiences including the reflection of your own thinking seem to have the potential to create a more hierarchical structure of the belief since the experience of self-reflection act as a meta-level in relation to other types of experiences. However, a coherent, theory-like, hierarchical structure is not anything that exists by definition for beliefs, but something that *can* develop. It could very well be that there is a big variety regarding this type of development between different individuals and between different types of beliefs for one individual. This is supported by Hofer's (2004, p. 53) study of epistemological beliefs, which shows that development happens primarily "as disciplinary training is advanced and appears more related to course-taking than to age or year in school".

THEORY OF BELIEF AS A MENTAL CONSTRUCT

The analyses so far have described belief as (1) better characterized as a mental process than a mental object, (2) conscious or unconscious, depending on how the belief was created, (3) primarily context-dependent but with a possibility of becoming more general, and (4) instable but with a possibility of becoming more robust through recurring interpretations of experiences around what the belief is about. All these aspects of belief can be related to, or depend on, the description of how beliefs are created, which highlights the centrality of the aspect of creation of belief.

The process of creation (and change) of belief draws on the process of interpretation, which in turn can draw on a theory of 'comprehension' (Kintsch, 1998), about effects of limitation of working memory together with the associative nature of mental structure and of activation of content from long term memory in the process of interpreting something. There is no room for a more detailed description of this theory here, but regarding for example context-dependence, this can be described and explained through the associative property and the limitation of working memory: You activate the kind of prior experiences that somehow are associated with a present experience, regarding the type of situation, specific words or formulations used in a given question, other persons that are present, etc., and that you cannot activate *all* relevant prior experiences.

A main benefit from the analyses and theory described here is that a coherent framework is built up around the ontology of belief regarding all different aspects, and in particular regarding the creation of belief. Note also that this kind of theory is not only of relevance when describing creation of belief (in relation to all other aspects) but also when you want to empirically examine a belief. For example, in a research study using questionnaires or interviews, this type of situation is a new experience around what the belief is about, and the comprehension/interpretation of this situation can be described within the same theoretical framework.

Regarding methodology, an important implication from the presented theory is that research cannot directly assume that beliefs are context independent or robust, that is; the ontological aspects must be reflected in methodology. For example, you have to think about what proofs there are for robustness or context-independence (if these aspects are of importance in your study) for the types of beliefs and persons you are studying, and adjust your methodology accordingly.

Because of the context-dependence, I suggest, similarly to Hammer and Elby (2002), an increased use of more naturalistic observations. If you are interested in beliefs about X, you could study situations where people relate to, use, or discuss X in some way. For example, for epistemological beliefs, you can study situations when persons need to make some kind of judgment about knowledge, such as when children determine how they know something⁷. However, these types of situations might be inaccessible, in which case you need to create such situations. I have already described a hesitation towards using questionnaires as such a creation of situation, mainly because you then seem to assume that there is a more general, context-independent belief. It could be that this is true for many of the persons taking a questionnaire and that the analyses and conclusions drawn, about the group, from such investigations therefore are relevant, but to analyze these types of results on an individual level seems very uncertain. It is not an easy task how to take into account a possible unconsciousness, context-dependence, or other property of belief for one specific person, but a first step is to study these different aspects of belief more in-depth before trying to draw conclusions about how belief can be seen as a variable affecting other types of variables.

Finally, the analyses in the present paper have been limited to a cognitive perspective, by primarily discussing aspects of mental objects and processes. Thereafter a big problem is how to examine these mental constructs. Even if I have discussed some aspects of methodology, this has not been in focus but more used as a method to trigger a discussion of important aspects of ontology. For a more in-depth discussion of methodology we need to problemize communication and discourse since you often ask questions and/or listen to what people say in attempts to examine beliefs, and it is naïve to think that discourse is a direct reflection of mental objects and processes, or as Potter (2003, p. 792) describes it:

We are not in a situation where there is discourse analysis and non-discourse analysis. Rather there is analysis that is highlighting and attending to the role of that discourse and analysis which is ignoring it.

An important next step is therefore to analyze relationships between the ontology of beliefs and research methodology, in particular regarding discourse.

⁷ Hammer & Elby (2002, p. 178) have described different types of such judgments, for example that children determine that they know something because one of their parents has told them so (knowledge as “propagated stuff”) or because they have figured it out (i.e., inferring or developing from other knowledge - knowledge as “fabricated stuff”).

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