

# Trainers' beliefs about knowledge and learning – A pilot study

## Sarah Müller

A graduate in business education and a member of the academic staff in the field of Occupational and Business Education at the Carl von Ossietzky University of Oldenburg

## Dr Karin Rebmann

Professor of Occupational and Business Education at the Institute for Business Administration and Business Education at the Carl von Ossietzky University of Oldenburg

## Elisabeth Liebsch

A graduate in business education with a scholarship from the Anna Magull Foundation at the Carl von Ossietzky University of Oldenburg.

### Keywords

Pilot project, tacit knowledge, training personnel, training research, vocational qualification, working experience

### SUMMARY

**Epistemological beliefs are personal beliefs about knowledge and the acquisition of knowledge. As subjective theories about knowledge and learning, they have the function of directing and controlling actions and are, therefore, highly relevant to teaching and learning processes. Numerous empirical studies focus on the epistemological beliefs of students; the beliefs of teachers and business training personnel have so far been neglected. This contribution presents the results of a pilot study conducted with 52 business trainers. Using a questionnaire (*Epistemic Belief Inventory*), epistemological beliefs were recorded and evaluated by factor analysis. Four dimensions of knowledge and learning could be empirically demonstrated: speed and control of learning processes and source and structure/certainty of knowledge. The degree of markedness or development of the dimensions is generally in the mean area. However, significant differences can be demonstrated between people at the start of their careers and older trainers.**

## Introduction

Since the mid 1950s, empirical studies have dealt with the subject of epistemological beliefs. The terms used in English-language works, such as personal epistemology, epistemological beliefs or theories, ways of knowing or epistemic cognition, can be defined as 'individuals' beliefs about the nature of knowledge and the processes of knowing' (Hofer and Pintrich, 1997, p. 117). As far as semantics is concerned, the term 'epistemological belief' is inextricably linked with the term 'knowledge' or 'cognition' (Greek *ἐπιστήμη*). It concerns the nature of knowledge and the subjective criteria for the truth of knowledge. The individual is faced with an epistemic problem, when he asks himself: How can I say that I know something when even experts cannot agree on it? Are the opinions of experts better than my own opinions? Can I ever know something with absolute certainty?

Epistemological beliefs are, therefore, always personal and consequently also subjective. This raises the question of the connection with subjective theories. Subjective theories can be considered as a person's set of assumptions, motives, suppositions, ideas and cognitions related to his view of himself and the world (Christmann, Groeben and Schreier, 1999, p. 138). Behind this lies the idea that each individual develops psychological knowledge and assumptions about, and has experience of, how other people act, what they perceive, think, feel and intend to do, why they do it and what the consequences will be (Dann, 1994). Whereas subjective theories are general systems of belief, epistemological beliefs relate to specific beliefs, i.e. about knowledge and the acquisition of knowledge. They include a student's basic assumptions about 'the criteria for knowledge and learning, the limits of learning, the degree of certainty provided by a certain level of knowledge and how learning and the acquisition of knowledge function in general' (Drechsel, 2001, p. 40).

These personal beliefs or assumptions about knowledge and the acquisition of knowledge have a direct influence on understanding, problem-solving, learning and behaviour (Hofer and Pintrich, 2002; Schommer, 1994a; Dann, 1994; Groeben et al., 1988). However, the individual is not necessarily aware of them. Furthermore, empirical and theoretical works about epistemological beliefs point out that these beliefs are subject to a process of development. In doing so, it is assumed that this process is influenced by personal experience, enculturation, upbringing and schooling (Anderson, 1984; Jehng, Johnson and Anderson, 1993; King et al., 1983; Pratt, 1992; Schommer,

1993a). Examination of subjective theories suggests that formal education and professional socialisation contribute to the development of these theories (Dann, 1994; Füglistner et al., 1983). At the start of the development process, the individual has a dualistic opinion, a black-and-white view of the world (Perry, 1999, p. 10, p. 66 et seq.; Schommer, 1994a, p. 26 et seq.). Knowledge is seen as right or wrong and authority figures know the answers. In the course of development, the individual notices that there are even conflicts of opinion between authority figures. In the search for the one right answer, he discovers that there are various points of view (diversity) and that each belief can be supported. His own opinion is no longer of lesser value, but just as valid and worth supporting as other opinions. Later, the individual realises that knowledge must always be seen in context (relativism). A highly sophisticated position has been attained in the well-advanced process of development when you realise that there are many possibilities with regard to knowledge and that you have to actively decide on one.

### **Meaning of epistemological beliefs in the professional work of teachers**

Knowledge about students' epistemological beliefs gives teachers the chance to gain an insight into their learning processes and motivation (see Buehl and Alexander, 2001, p. 385). Consequently, students' epistemological beliefs give teachers an important starting point to encourage their pupils and trainees to learn – both at school and at work (Köller, Baumert and Neubrand, 2000).

But for the professional work of teachers it is not only the students' epistemological beliefs which should be taken into account but also the epistemological beliefs of the teachers themselves. Students experience all aspects of the teachers' teaching concepts; learning is not only influenced by these personal beliefs but also by the teaching and learning methods used (see Pratt, 1992, p. 217). Various empirical studies conclude that there is a connection between the personal beliefs of a teacher and his or her teaching approach. It is assumed that the teachers' epistemological beliefs – often unconscious – control their actions in lessons or in business training situations. Thus, they form a 'didactic frame of reference' which influences teaching decisions and therefore shapes the course of the lesson or training session (Helmke, 2003, p. 52).

It can be established that research into teachers' epistemological beliefs is important not only to understand the students but also to enable the teachers to help their students (see Schommer-Aikins, 2002, p. 108). To teach effectively, it is necessary to have an in-depth

understanding of the factors promoting the learning process. This includes knowledge of personal beliefs about knowledge and learning (see Boulton-Lewis, 1994, p. 387 et seq.). Nevertheless, there are very few studies on the epistemological beliefs of teachers (e.g. see Seifried 2006 on subjective theories of business teachers). In particular, training personnel have so far been completely neglected. Furthermore, if we consider that the concept of epistemological beliefs changes over time this gives rise to another question, which is given hardly any consideration in research: the changes experienced by teachers with increasing professional socialisation.

## Theories and models concerning epistemological beliefs

Most of the available theories and models concerning epistemological beliefs concur with the description of epistemological beliefs as subjective concepts about knowledge and the acquisition of knowledge. Taken together, they assume that peoples' beliefs change and become more complex over the course of time. However, apart from this basic consensus, there are significant differences in the description of the construct. The theories can be differentiated according to whether they are based on domain-specific or domain-general beliefs and whether they are based on a one-dimensional or multi-dimensional model.

### **Domain-specific vs. domain-general models**

With regard to the domain specificity of epistemological beliefs, various positions can be identified: one hypothesis states that epistemological beliefs are completely or largely independent of knowledge domains (Moore, 2002; Perry, 1970; Schommer-Aikins, 2002). Another hypothesis assumes that there is a domain specificity according to which individuals in different domains or specialist areas may have different epistemological beliefs (Hofer and Pintrich, 1997). Another view, which has hardly been researched yet, is that there is a core area of domain-general beliefs which are complemented by domain-specific beliefs (Trautwein, Lüdtke and Beyer, 2004). Depending on the knowledge domain, various dimensions of epistemological belief can be activated (Hammer and Elby, 2002).

More recent empirical studies put forward the hypothesis that individuals not only have general, i.e. domain-general, epistemological beliefs but also domain-specific beliefs (Buehl, Alexander and

Murphy, 2002; de Corte, Op't Eynde and Verschaffel, 2002; Trautwein, Lüdtke and Beyer, 2004). However, it is not yet clear how these assumed different levels interact with each other (Hofer, 2000).

### **One-dimensional vs. multidimensional models**

The so-called one-dimensional models are based on typical stages of development. Higher stages of development can be characterised by increasing sophistication and more complex ideas. Whereas the one-dimensional models assume that epistemological beliefs are one-dimensional (Baxter Magolda, 2002; Belenky et al., 1997; Boyes and Chandler, 1992; King and Kitchener, 2002; Perry, 1970), the multidimensional models assume that epistemological beliefs can be divided into several dimensions and that the markedness in the individual dimensions can develop independently of each other. This means that changes in one dimension are not necessarily accompanied by changes in other dimensions (Jehng, Johnson and Anderson, 1993; Kuhn, 1991; Pintrich, 2002; Schommer, 1994a, 1994b; Schraw, Bendixen and Dunkle, 2002). They also assume (e.g. in contrast to Perry) that there can be recursive developments in one or even all dimensions which are not aimed at a particular final development (Schommer-Aikins, 2002, p. 110 et seq.). Current studies suggest a multidimensional structure of epistemological beliefs (Buehl and Alexander, 2006; Conley et al., 2004; Hofer, 2004; Schommer-Aikins and Easter, 2006).

A well-researched, empirical, multidimensional concept is available from Schommer (1990, 1994a, 1994b; Schommer-Aikins, 2002). Her concept of epistemological beliefs consists of five dimensions concerning the nature of knowledge and the acquisition of knowledge. These dimensions are referred to as (1) source, (2) certainty and (3) structure of knowledge and (4) control and (5) speed of knowledge acquisition. In her model, Schommer presents the direct inter-relatedness of knowledge and knowledge acquisition. Dimensions 1 to 3 concern the nature of knowledge, Dimensions 4 and 5 concern the learning process.

Each of these dimensions is taken to be a continuum from an extremely naive to a sophisticated, i.e. well-developed, belief and this continuum is used to illustrate the assumed process of development (Duell and Schommer-Aikins, 2001; Schommer, 1990, 1993b, 1994b). Therefore, Dimension (4), control of learning processes, is seen as a continuum from 'the ability to learn is fixed at birth' to 'the ability to learn is acquired through experience'. Dimension (5), speed of knowledge acquisition, extends from the naive view that 'learning is a process which succeeds on an ad hoc

basis or not at all' to the sophisticated view that 'learning is a gradual process'. The extreme positions of the continuum of Dimension (3), structure of knowledge, which are also presented as a naive position on the one hand and a sophisticated position on the other, can be formulated as follows: 'Knowledge is simply structured and consists of isolated components' and 'Knowledge is complex and interrelated'. Dimension (2), certainty of knowledge, has a continuum from 'Knowledge is absolute and stable over time' to 'Knowledge is subject to a constant process of development'. Although Dimension (1), source of knowledge, could not be empirically demonstrated by Schommer, a continuum was defined extending from the naive view 'there is one omniscient authority to impart knowledge' to the sophisticated position 'Knowledge is acquired through subjective and objective experience'.

## Empirical study

### Questions

Research into teaching and learning has, in recent years, become more focused on the concept of epistemological beliefs and has revealed connections with scholastic and academic learning. Whereas intensive research has been done into the epistemologies of students, the question of the epistemological beliefs developed by teachers and, in particular, business training personnel has so far been largely neglected. Consequently, there are no studies providing information on the type and number of trainers' beliefs about the nature and acquisition of knowledge. In other words, which epistemological beliefs trainers have and how they are shaped. It is also unclear whether and to what extent trainers' epistemologies change in the course of professional socialisation. However, there is definite consensus in the scientific community on the significance of these research questions (Boulton-Lewis, 1994; Bruce and Gerber, 1995; Buehl and Alexander, 2001; Köller, Baumert and Neubrand, 2000).

This study deals with the following questions:

1. What beliefs do business trainers have about knowledge and the acquisition of knowledge?
2. Do trainers' beliefs about knowledge and the acquisition of knowledge differ depending on their personal data?
3. How do trainers' epistemologies change in the course of professional socialisation?

By means of an explorative pilot study on the epistemological beliefs of business training personnel, the following text should provide some initial answers to the questions raised above.

## **Methodical approach**

### *Sample*

52 business trainers from firms in the Weser-Ems region took part in this pilot study. Here 'trainers' means all people directly involved in business training. They included 29 men (56.9 %) and 22 women (43.1 %). One person did not indicate their sex. The age of the trainers ranged from 20 to 59. On average, they were around 40 years of age ( $M = 39.5$ ;  $SD = 10.47$ ). With regard to school-leaving qualifications, the picture was as follows: 29 trainers (56.9 %) had a secondary school certificate and 22 had an advanced technical certificate or advanced level certificates (43.1 %). Of the 48 trainers who gave details of their vocational training, only five (10.4 %) did not complete any vocational training. It is notable that, with only two exceptions, all trainers surveyed are working in their trained occupations.

### *Survey tool*

The questionnaire by Schraw, Bendixen and Dunkle (2002) was used to record the trainers' general, i.e. domain-general, epistemological beliefs. This EBI (Epistemic Belief Inventory) is based on a multi-dimensional structure of epistemological beliefs. The questionnaire should be used to illustrate the five adopted dimensions: control of learning processes, speed of knowledge acquisition, structure of knowledge, certainty of knowledge, source of knowledge. The EBI consists of 28 items presenting statements on knowledge and the acquisition of knowledge. The EBI was translated into German for the purposes of data collection with only minor changes to the wording, as the questionnaire was originally developed for students. For example, the term 'student' was replaced by 'trainee' and 'professor' by 'trainer'. The translation had to be revalidated by means of factor analysis. Like the original version, a 5-stage Likert scale was used whereby a cross was marked against a person's level of agreement with statements on knowledge and the acquisition of knowledge. 1 stands for 'strongly disagree' and 5 for 'strongly agree'.

### *Procedure*

Data was collected on site at the firms. The participating trainers received identical instructions; there was no time limit for the completion of the questionnaires. The completion of the questionnaire took about 15 minutes. The trainers voluntarily took part in the survey without any expense allowance. The rate of response was 100 %. The data was collected in June and July 2006.

### **Results and interpretation**

The translation of the questionnaire into German and the minor modifications to the wording of the items required revalidation by means of factor analysis. Based on the multidimensionality of epistemological beliefs, the factor analysis was performed with Varimax rotation (uncorrelated, independent factors). The screeplot produced initial indications of the existence of five factors. Like Schraw, Bendixen and Dunkle (2002), the absolute factor loadings should be over .30. Items without loadings and items with multiple loadings were gradually removed. 16 items were finally included in the factor solution. The solution with five factors was confirmed (intrinsic value > 1.3). They explain 62.72 % of the variance. As only four of the five recorded factors indicate satisfactory test values, the following statements only relate to these four factors. These fully reflect the five dimensions adopted by Schommer: 'speed of knowledge acquisition' ( $\alpha = .88$ ), 'control of learning processes' ( $\alpha = .74$ ), 'source of knowledge' ( $\alpha = .64$ ) and 'structure/certainty of knowledge' ( $\alpha = .61$ ). The dimensions, 'structure of knowledge' and 'certainty of knowledge', are shown in a joint factor in this study.

The high level of consistency between the structure of items obtained and the original literature is notable (see Schraw, Bendixen and Dunkle, 2002) and this has also been replicated in other empirical studies with this German translation of the EBI (e.g. see Pfenich, 2007).

Table 1 below shows the four factors, factor loadings of the items, intrinsic values and Cronbach's alpha.



Table 1. **EBI Factor structure**

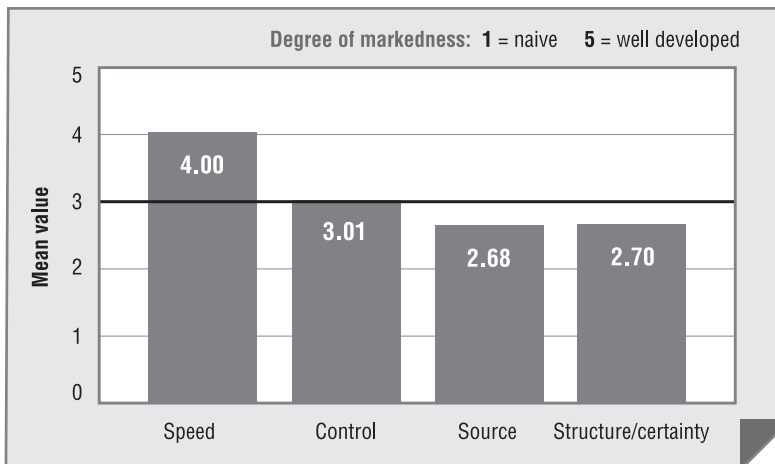
Factor 1.	<b>Speed of knowledge acquisition (intrinsic value = 5.12; <math>\alpha</math> = .88)</b>
	<ul style="list-style-type: none"> <li>• It is a waste of time working on problems you cannot solve quickly. (.83)</li> <li>• If you do not understand a subject when you first work through it, there is not much point in working through it again. (.75)</li> <li>• If you do not understand a subject immediately, you will probably never understand it. (.70)</li> </ul>
Factor 2.	<b>Control of learning processes (intrinsic value = 2.74; <math>\alpha</math> = .74)</b>
	<ul style="list-style-type: none"> <li>• Intelligent people are born that way. (.75)</li> <li>• Too many theories only complicate things. (.73)</li> <li>• If you spend too much time on a problem you will very probably end up confused. (.71)</li> <li>• The truth is a matter of opinion. (.64)</li> </ul>
Factor 3.	<b>Source of knowledge (intrinsic value = 2.21; <math>\alpha</math> = .64)</b>
	<ul style="list-style-type: none"> <li>• Students should always question the knowledge imparted to them by teachers. (.74)</li> <li>• If a lecturer presents a subject, I rely on the presentation being correct. (.69)</li> <li>• Trainees should always follow the trainers' technical instructions. (.66)</li> <li>• Students do not need to question knowledge which appears in text-books. (.59)</li> </ul>
Factor 4.	<b>Structure/certainty of knowledge (intrinsic value = 1.78; <math>\alpha</math> = .61)</b>
	<ul style="list-style-type: none"> <li>• Most things worth knowing are easy to understand. (.78)</li> <li>• The best ideas are usually the simplest. (.68)</li> <li>• Theories valid today will continue to be valid in the future. (.62)</li> </ul>

It is notable that two of the adopted dimensions come together in one factor of epistemological beliefs. Schommer declared that structure and certainty were separate factors. In this pilot study, however, structure and certainty of knowledge form one joint factor. This clustering was also confirmed in other empirical studies (Hofer, 2000; Qian and Alvermann, 1995). These results imply a possible close relationship between these two dimensions.

These results can be used to provide initial answers to the first research question about which beliefs business trainers have about knowledge and the acquisition of knowledge. Four dimensions of epistemological beliefs could be identified: speed of knowledge acquisition, control of learning processes, source of knowledge and

structure/certainty of knowledge. Using the empirical data, it is also possible to establish how developed the trainers' beliefs are. In other words: do they tend towards a naive position or are their beliefs about knowledge and the acquisition of knowledge highly developed, i.e. sophisticated? The items were recoded to make them easier to read so that a high level of agreement reflects a highly developed belief. Figure 1 below shows the trainers' mean values in the four established dimensions.

Figure 1. **Mean values for the four dimensions of epistemological beliefs**



It is clear that the beliefs of the trainers surveyed about knowledge and the acquisition of knowledge are in the mean area. Particularly in the speed dimension, they tend towards a well-developed position ( $M = 4.0$ ;  $SD = 0.95$ ), i.e. the trainers mostly tend towards the opinion that learning is a gradual process. Only a few of the trainers surveyed were of the opinion that learning is a quick process which either succeeds immediately or not at all. Therefore, 21.2 % of the trainers can be allocated to the most sophisticated position ( $M = 5$ ) and only about 8 % ( $M = 1.67$ ) tend towards a more naive position.

With regard to the dimension, control of learning processes, the trainers achieved a mean value of 3.01 ( $SD = 0.81$ ). Their belief is in the mean area. It can, therefore, be assumed that they are of the opinion that certain abilities and talents are fixed at birth, but that each individual has the chance to play an active role in the structuring of learning processes. 51.9 % of the trainers achieved a below-average value (up to and including 3) and 48.1 % are above average.

The dimensions, source and structure/certainty of knowledge, are equally developed. The trainers achieved an average value of 2.68 (SD = 0.63) or 2.70 (SD = 0.65). The beliefs lie in the lower to mid development area, i.e. with regard to source of knowledge, the trainers are mostly of the opinion that there are authorities on knowledge. The statement that knowledge can also be acquired through subjective and objective experiences (well-developed belief) consequently only meets with a limited amount of agreement. Furthermore, with regard to structure/certainty of knowledge, they are of the belief that knowledge partly consists of facts and is partly interrelated, that it is partly certain and is also subject to a process of development.

With regard to the second research question, the trainers' beliefs about knowledge and the acquisition of knowledge were examined to see if a distinction could be made between them in relation to their personal data. To do this, the mean values of the dimensions were examined for significant differences using the Kruskal-Wallis test.

A significant mean value difference in the dimension, source of knowledge, could only be determined in the four age groups (20-30 years old; 31-40 years old; 41-50 years old; 51-60 years old) ( $\chi^2 = 10.72$ ;  $df = 3$ ;  $p < .05$ ). To pinpoint which of the age groups differ in particular, the U test according to Mann and Whitney was performed in pairs. This produced the result that Age Group 2 (31-40 years old) differs significantly from Age Group 3 (41-50 years old) ( $p < .01$ ) and Age Group 4 (51-60 years old) ( $p < .05$ ). Figure 2 below shows the mean values of the four age groups in the dimension, source of knowledge. It can be seen that, with increasing age, the trainers have more naive beliefs about the dimension, source of knowledge. They tend to believe more in authorities on knowledge and are less of the opinion that knowledge is acquired through experience. It is also astonishing that the highest mean value, from the 31-40 year old age group, at 3.10 is just about average. Overall, it can, therefore, be said that the beliefs of the surveyed trainers with regard to the dimension, source of knowledge, tend towards a more naive level of development.

The third research question was concerned with a possible change in trainers' epistemological beliefs with increasing professional socialisation. Figure 3 shows the degree of development in epistemological beliefs for different numbers of years of professional experience.

Figure 2. Mean values for the age groups for the source dimension

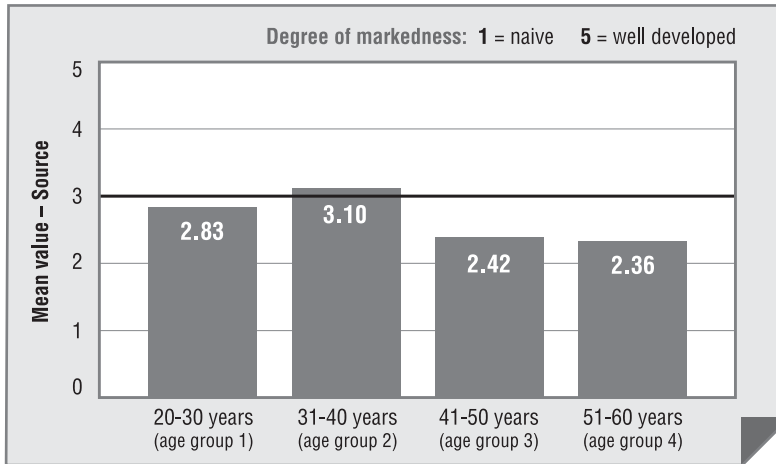


Figure 3. Development of the dimensions of epistemological beliefs with increasing professional socialisation

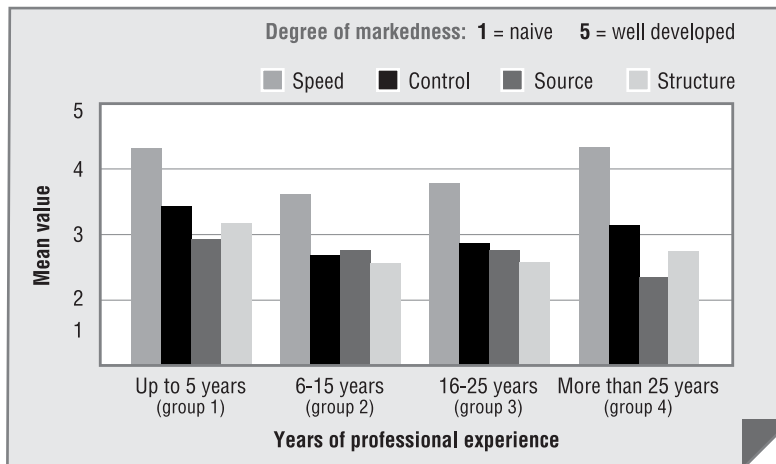


Figure 3 clearly shows a development in epistemological beliefs. The assumption that epistemological beliefs are subject to a process of development, i.e. they change with increasing professional socialisation, could be confirmed using empirical data. All four dimensions initially regress: in the transition from the first group (up to 5 years of professional experience) to the next (6-15 years of professional experience), the degree of markedness declines in all four dimensions of epistemological beliefs towards a more naive position.

Then, with increasing professional socialisation, an upward trend can be seen: the beliefs continue to develop, they become more sophisticated. Only the dimension, source of knowledge, behaves inversely. In this case, with increasing professional socialisation, there is a regression towards more naive beliefs.

The result for the dimension, speed of knowledge acquisition, is notable. In each phase of professional socialisation, the mean value is at a well-developed level. Consequently, the trainers surveyed all believe that learning is a gradual process which does not happen in an ad hoc way. If you consider their role as trainers in this respect, this belief can only be welcomed. It can be assumed that the trainers give their trainees time to grasp things and do not expect them to learn quickly. However, it has to be clarified whether this belief has become established in their roles as trainers based on their experience with trainees or whether other factors have had an influence.

Then, with the help of the U test according to Mann and Whitney, comparisons were made in pairs to check whether the mean values of the four groups differed significantly in the dimensions. It can be established that there are only significant differences between the four groups for different years of professional experience with regard to the dimensions, source and structure/certainty of knowledge. In this respect, Group 1 containing the people at the start of their careers (up to 5 years of professional experience) is in stark contrast, with regard to the dimension structure/certainty, to Group 2 (6-15 years of professional experience) and Group 3 (16-25 years of professional experience). Consequently, it can be assumed that the belief that knowledge tends to be complex, relative and interrelated (sophisticated belief), lessens with increasing professional experience, knowledge is simply structured and certain (more naive conviction).

With regard to the dimension source of knowledge, Group 4, in particular, (more than 25 years of professional experience) stands out: it differs significantly from Group 1 (up to 5 years of professional experience) and Group 2 (6-15 years of professional experience). Whilst the trainers with more than 25 years of professional experience believe in authorities on knowledge (more naive belief), the younger trainers tend more towards the opinion that there are authorities on knowledge but that knowledge can also be acquired through experience (more sophisticated belief).

Overall, it can be said that the people at the start of their careers tend towards optimistic, more sophisticated epistemological beliefs than trainers with many years of professional experience. As no longitudinal data was collected in this pilot study, future studies should

examine whether this development confirms the hypothesis of a possible recursivity of epistemological beliefs or whether it is possible that the degree of markedness in beliefs of the older generation of trainers has not changed over the course of their professional socialisation.

## Summary and outlook

The significance of epistemological beliefs in teaching and learning processes has been confirmed in numerous empirical studies. However, studies to date have mainly focused on pupils and students and thus on the role of epistemological beliefs in learning processes. Teachers, and therefore especially business training personnel, have so far tended to be neglected. There are no studies providing information on the type and number of trainers' beliefs about knowledge and the acquisition of knowledge. It has so far been unclear which epistemological beliefs trainers even have and how they are shaped.

This pilot study used a questionnaire to collect business trainers' beliefs about knowledge and the acquisition of knowledge. With regard to the research questions formulated at the start, the following results can be recorded:

1. What beliefs do business trainers have about knowledge and the acquisition of knowledge?
  - Using a factor analysis, four dimensions of epistemological beliefs could be identified: speed of knowledge acquisition, control of learning processes, source of knowledge and structure/certainty of knowledge. This result confirms previous studies based on a multidimensionality of these personal beliefs.
  - Furthermore, it can be recorded that the epistemological beliefs of the trainers surveyed are in the mean area of development. Only the speed dimension is more marked, i.e. the trainers are of the sophisticated belief that learning is a gradual process.
2. Do the trainers differ in their beliefs about knowledge and the acquisition of knowledge?
  - The trainers' epistemological beliefs can be classed as homogeneous. There are only significant differences between the age groups with regard to the dimension, source of knowledge. For all other personal data collected, no significant differences could be established in the dimensions of epistemological beliefs.

3. How do trainers' epistemologies change during the course of professional socialisation?

- The empirical data indicates a process of development of epistemological beliefs. Therefore, people at the start of their careers tend to have optimistic, more sophisticated beliefs and, with increasing professional experience, the trainers' beliefs become more pessimistic and more naive. The difference in the degree of markedness of the dimensions confirms the hypothesis that they are independent of each other, i.e. they do not have to develop synchronously and even recursive developments are possible.

With regard to the theoretical concept of epistemological beliefs, the results of this pilot study allow the following aspects to be summarised: firstly, the multidimensionality assumed in current studies could also be confirmed in this empirical study. Consequently, independent dimensions of epistemological beliefs can be demonstrated which have developed to a varying degree. Furthermore, however, the five dimensions claimed by Schommer to be independent facets of personal beliefs about knowledge and the acquisition of knowledge could not be replicated. Rather, a clustering of the dimensions, structure of knowledge and certainty of knowledge, could be demonstrated, which indicates a possible close connection between them for the sample of trainers. Further studies must examine whether this clustering is stable for other samples. The hypothesis that epistemological beliefs are subject to a process of development could also be proven with the empirical data.

In addition to aspects of conceptual clarification of the construct of epistemological beliefs, important implications for the education of trainers can be drawn from this study. As was already clear at the start, epistemological beliefs are particularly relevant to research into teaching and learning, they have a direct function in directing and controlling actions. In particular, trainers' beliefs are of great interest, as initial empirical studies have been able to demonstrate that students' beliefs about knowledge and learning are strongly influenced by the teaching styles and beliefs of teachers (e.g. see Buelens, Clement and Clarebout, 2002; Hofer, 2004). An objective for the professionalisation of training practice must, therefore, be to encourage the trainers' beliefs about knowledge and the acquisition of knowledge. For example, using the results of the study, training modules can be developed and provided, which thematise the significance of and findings about epistemological beliefs in order to structure business teaching and learning processes. Furthermore, on the basis of the results, handouts can be developed for

trainers which, taking epistemological beliefs into account, support the structure of business teaching and learning processes. Recommendations can also be submitted to the chambers showing how the results can be included in the preparatory seminars for trainer aptitude tests.

Finally, it has to be said that there is a need for much more research into the epistemological beliefs of business trainers. The results obtained in this pilot study are to be examined in later studies. Another challenge for empirical research is to examine the effects of epistemological beliefs on trainers' behaviour in teaching situations. In addition, further research can be done on how the domain-specific epistemological beliefs of trainers are shaped and their relationship with broad, domain-general beliefs about knowledge and knowledge acquisition.

## Bibliography

- Anderson, R.C. Some reflections on the acquisition of knowledge. *Educational Researcher*, 1984, 13, p. 5-10.
- Baxter Magolda, M.B. Epistemological Reflection. In: B. K. Hofer; P. R. Pintrich (eds.). *Personal Epistemology*. Mahwah, NJ: Erlbaum, 2002, p. 89-102.
- Belenky, M.F. et al. *Women's ways of knowing: The Development of Self, Voice, and Mind*. New York: Basic Books, 1997.
- Boulton-Lewis, G. Tertiary students' knowledge of their own learning and a SOLO Taxonomy. *Higher Education*, 1994, 28, p. 387-402.
- Boyes, M.; Chandler, M.J. Cognitive development, epistemic doubt, and identity formation in adolescence. *Journal of Youth and Adolescence*, 1992, 21, p. 277-304.
- Bruce, C.; Gerber, R. Towards university lecturers' conceptions of student learning. *Higher Education*, 1995, 29, p. 443-458.
- Buehl, M.M.; Alexander, P.A. Beliefs About Academic Knowledge. *Educational Psychology Review*, 2001, 13, p. 385-418.
- Buehl, M.M.; Alexander, P. A. Examining the dual nature of epistemological beliefs. *International Journal of Educational Research*, 2006, 45, p. 28-42.
- Buehl, M.M.; Alexander, P. A. & Murphy, P. K. Beliefs about Schooled Knowledge: Domain Specific or Domain General? *Contemporary Educational Psychology*, 2002, 27, p. 415-449.
- Buelens, H.; Clement, M.; Clarebout, G.. University assistants' conceptions of knowledge, learning and instruction. *Research in Education*, 2002, 67, p. 44-57.



- Christmann, U.; Groeben, N.; Schreier, M. Subjektive Theorien – Rekonstruktion und Dialog-Konsens. *SPIEL*, 1999, 18, p. 138-154.
- Conley, A.M. et al. Changes in epistemological beliefs in elementary science students. *Contemporary Educational Psychology*, 2004, 29, p. 186-204.
- Dann, H.-D. Pädagogisches Verstehen. In: K. Reusser (ed.). *Verstehen: psychologischer Prozeß und didaktische Analyse*. Bern: Huber, 1994, p. 163-182.
- De Corte, E.; Op't Eynde, P.; Verschaffel, L. 'Knowing what to believe': The relevance of students' mathematical beliefs. In: B. K. Hofer; P. R. Pintrich (eds.). *Personal Epistemology*. Mahwah, NJ: Erlbaum, 2002, p. 297-320.
- Drechsel, B. *Subjektive Lernbegriffe und Interesse am Thema Lernen bei angehenden Lehrpersonen*. Münster: Waxmann, 2001.
- Duell, O.K.; Schommer-Aikins, M. Measures of People's Beliefs About Knowledge and Learning. *Educational Psychology Review*, 2001, 13, p. 419-449.
- Füglister, P. et al. Alltagstheorien von Lehrern. *Bildungsforschung und Bildungspraxis*, 1983, 5, p. 47-58.
- Groeben, N. et al. *Das Forschungsprogramm Subjektive Theorien*. Tübingen: Francke, 1988.
- Hammer, D.; Elby, A. On the Form of Epistemic Belief Change. In: B. K. Hofer; P. R. Pintrich (Eds.). *Personal Epistemology*. Mahwah: Erlbaum, 2002, p. 169-190.
- Helmke, A. *Unterrichtsqualität – erfassen, bewerten, verbessern*. Seelze: Kallmeyer, 2003.
- Hofer, B. K. Dimensionality and disciplinary differences in personal epistemology. *Contemporary Educational Psychology*, 2000, 25, p. 378-405.
- Hofer, B.K. Exploring the dimensions of personal epistemology in differing classroom contexts: Student interpretations during the first year of college. *Contemporary Educational Psychology*, 2004, 29, p. 129-163.
- Hofer, B. K.; Pintrich, P. R. The Development of Epistemological Theories. *Review of Educational Research*, 1997, 67, p. 88-140.
- Hofer, B. K.; Pintrich, P. R. (Eds.). *Personal epistemology. The psychology of beliefs about knowledge and knowing*. Mahwah, NJ: Erlbaum, 2002 .
- Jehng, J.-C. J.; Johnson, S. D.; Anderson, R. C. Schooling and Students' Epistemological Beliefs about Learning. *Contemporary educational psychology*, 1993, 18, p. 23-35.

- King, P. M. et al. The Justification of Beliefs in Young Adults. *Human development*, 1983, 26, p. 106-116.
- King, P. M.; Kitchener, K. S. The Reflective Judgment Model. In: B. K. Hofer; P. R. Pintrich (eds.). *Personal Epistemology*. Mahwah, NJ: Erlbaum, 2002, p. 37-61.
- Köller, O.; Baumert, J.; Neubrand, J. Epistemologische Überzeugungen und Fachverständnis im Mathematik- und Physikunterricht. In: J. Baumert; W. Bos; R. Lehmann (Ed.). *TIMSS/III Dritte Internationale Mathematik- und Naturwissenschaftsstudie* (Volume 2). Opladen: Leske + Budrich, 2000, p. 229-269.
- Kuhn, D. *The skills of argument*. Cambridge: Cambridge University Press, 1991.
- Moore, W. S. Understanding learning in a Postmodern World. In: B. K. Hofer; P. R. Pintrich (Eds.). *Personal Epistemology*. Mahwah, NJ: Erlbaum, 2002, p. 17-36.
- Perry, W. G. *Forms of intellectual and ethical development in college years: A scheme*. New York: Holt, Rinehart & Winston, 1970.
- Perry, W. G. *Forms of Intellectual and Ethical Development in the College Years. A Scheme*. San Francisco: Jossey-Bass, 1999.
- Pfennich, D. (2007). Überprüfung der psychometrischen Gütekriterien dreier Instrumente zur Erfassung epistemologischer Überzeugungen. Unpublished dissertation, University of Graz.
- Pintrich, P. R. Future Challenges and Directions for Theory and Research on Personal Epistemology. In: B. K. Hofer; P. R. Pintrich (eds.). *Personal Epistemology*. Mahwah, NJ: Erlbaum, 2002, p. 389-414.
- Pratt, D. D. Conceptions of teaching. *Adult Education Quarterly*, 1992, 42, p. 203-220.
- Qian, G.; Alvermann, D. E. The role of epistemological beliefs and learned helplessness in secondary school students' learning from science text. *Journal of Educational Psychology*, 1995, 87, p. 282-292.
- Schommer, M. Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology*, 1990, 82, p. 498-504.
- Schommer, M. (a) Comparisons of beliefs about the nature of knowledge and learning among postsecondary students. *Research in Higher Education*, 1993, 34, p. 355-370.
- Schommer, M. (b) Epistemological Development and Academic Performance Among Secondary Students. *Journal of Educational Psychology*, 1993, 85, p. 406-411.
- Schommer, M. (a) An Emerging Conceptualization of Epistemological Beliefs and Their Role in Learning. In: R. Garner; P. A. Alexander

- (eds.). *Beliefs About Text And Instruction With Text*. Hillsdale: Erlbaum, 1994, p. 26-40.
- Schommer, M. (b) Synthesizing Epistemological Belief Research. *Educational Psychology Review*, 1994, 6, p. 293-319.
- Schommer-Aikins, M. An Evolving Theoretical Framework for an Epistemological Belief System. In: B. K. Hofer; P. R. Pintrich (eds.). *Personal Epistemology*. Mahwah, NJ: Erlbaum, 2002, p. 103-118.
- Schommer-Aikins, M.; Easter, M. Ways of Knowing and Epistemological Beliefs: Combined effect on academic performance. *Educational Psychology*, 2006, 26, p. 411-423.
- Schraw, G.; Bendixen, L. D.; Dunkle, M. E. Development and Validation of the Epistemic Belief Inventory (EBI). In: B. K. Hofer; P. R. Pintrich (eds.). *Personal Epistemology*. Mahwah, NJ: Erlbaum, 2002, p. 261-275.
- Seifried, J. Überzeugungen von (angehenden) Handelslehrern. In: J. Seifried; J. Abel (ed.). *Empirische Lehrerbildungsforschung – Stand und Perspektiven*. Münster: Waxmann, 2006, p. 109-127.
- Trautwein, U.; Lüdtke, O.; Beyer, B. Rauchen ist tödlich, Computerspiele machen aggressiv? Allgemeine und theorienspezifische epistemologische Überzeugungen bei Studierenden unterschiedlicher Fachrichtungen. *Zeitschrift für Pädagogische Psychologie*, 2004, 18, p. 187-199.