THE CURIOUS AFFAIR OF PEDAGOGICAL CONTENT KNOWLEDGE

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Abstract: *This paper attempts to find the core of pedagogical content knowledge by analysing the central concepts of the teaching-studying-learning process. The various relations between these concepts – teacher, student, content – lead to possible explanations about the nature of pedagogical content knowledge. The role of practice, empirical and normative sides, and personal practical theories are the essential features in understanding pedagogical content knowledge. And its dependence on the curriculum raises the question of latency as its theoretical existence. Moreover, this paper discusses the connection of pedagogical content knowledge to the German fachdidaktik as well as its relation to the French didactiques. The increasing use of pedagogical content knowledge may likely show the way to a more heterogeneous usage of this concept in the future.*

Key words: *pedagogical content knowledge, teaching-studying-learning process, German fachdidaktik, French didactiques*

To begin with …

Once upon a time I, among others, was celebrating the retirement of a kindergarten teacher at the University of Gothenburg, Sweden. She was a lively person, and many lovely stories and anecdotes were told during the evening. In one of them, a well-known professor of mathematics was once visiting a kindergarten and observing an incident of mathematics teaching. Not entirely satisfied with the event, he asked the teacher how many credit points she had in mathematics studies. The teacher replied with lightning speed, saying "At least as many as my dear professor has in teaching small children".

The cornerstones of the teaching-studying-learning process

Content is one of the fundamental concepts in the teaching-studying-learning process. It is quite common to present the cornerstones of this process, in addition to content, as comprising of a teacher and a student. To avoid misunderstandings, one should note that, although such models present the student as a singular concept, the question focuses on a group of students studying at the same time. Between these concepts takes place a complex interaction (Klingberg, 1995; Kansanen, 2003). With the help of the didactic triangle, we can also describe the role of these basic concepts and characterise their mutual relations. Emphasising their reciprocal positions can highlight their importance and meaning (Paschen, 1979; Diederich, 1988; Künzli, 1998; Hopmann, 2007).

Every relation between the cornerstones has its special meaning. The relation between the teacher and the student is a pedagogical relation (Klafki, 1970, pp. 55-65) and necessary from a young person's point of view; it aims to draw out the person's best. It is also interactive in nature, and a student cannot be forced into it. Nor is it a permanent relation, but one which the young person gradually grows out of, developing into independence. This relation gradually takes shape as the development of the young person brings with it different perspectives. This relation between the teacher and the student cannot be primary because the reason for its existence comes from the reasons for participating in the teaching-studying-learning process. As a secondary relation, however, it is of paramount importance. If it is unbalanced, it can ruin the entire communication in the interaction. We can say that it is a necessary condition for a fruitful instructional process.

The student's relation to the subjects, or more generally to the content, is the key to understanding the instructional process. The content is generally defined in the curriculum as subjects and other content. Learning and other desirable changes, or more generally, the defined development of a student's personality, is the primary purpose of the teaching-studying-learning process. Thus we can say that the consequences – learning included – form the most essential aspect of the relation between the student and the content. A student's task is to study the content defined in the curriculum. Although we at the moment emphasise a personal approach to the studying and finding of one's own means to achieving instructional aims and goals, the student is not left alone in the teaching-studying-learning process. It is the responsibility of the teacher to facilitate this activity in such a way that learning takes place optimally. This leads us to examine the position and meaning of the teacher in the instructional process.

Being a teacher means being an expert in teaching in some content area. Mastering the content or content knowledge is the basis of the relation between the teacher and the student in addition to the pedagogical relation. The teacher's tasks include developing the skill to mediate and facilitate a student's studying of the content. If the content knowledge is emphasised, the role of the teacher becomes that of a specialist of that particular content. For this reason, curricular knowledge and pedagogical knowledge are needed, according to the definitions of Shulman

(1986; 1987). Thus, helping the student in his/her studying to learn implies that the teacher has enough content knowledge, enjoys a positive relationship with the student, and uses pedagogical knowledge to present the content in such a way that the student will learn optimally. Speaking of German pedagogical language, it is the didactical relation that is needed for optimal learning (Klingberg, 1995; Kansanen, 2003). One important part in this interaction is pedagogical content knowledge.

It is common to define pedagogical content knowledge as an intersection between content knowledge and pedagogical knowledge (Shulman, 1986; 1987). This intersection, although important, is only a part of the teaching-studying-learning process. This is also the line of reasoning in Shulman's knowledge model. All parts of the instructional process build a totality, and all parts are constantly needed. Taking a certain element from this totality to be examined is possible only in research; in practice, all the parts interact all the time. For the teacher and the students, the entire process is continuous reality. In this article, however, pedagogical content knowledge is reflected upon as a special theme and analysed as a central point of view.

Theoretical viewpoints

Pedagogical content knowledge: latent or overt?

An interesting question is how independent a concept pedagogical content knowledge can be? It is self-evident that all pedagogical concepts form a network where all are connected to each other and where their unique variance is difficult to define. Content is one aspect of the instructional process. There can be no teaching-studying-learning process without content. Content can also take different kinds of expressions; in teaching, even method turns out to be a certain kind of content. Content is usually defined in the curriculum; consequently, it develops into pedagogical content when brought into the real instructional process.

A highly important issue is the general existence of pedagogical content knowledge. If the content is expressed in the curriculum as divided into different subject matters (as is often the case in universities, adult education, and in school), pedagogical content knowledge becomes evident while teaching. It is thus overt by nature. But, can we be certain of its existence before it is brought into the instructional process and defined in the curriculum? Some content e.g., mathematics, religion, languages, seems so evident that we no longer problematise its reality. On the other hand, it is relatively easy to present content not yet mentioned in the curriculum. That kind of content has, perhaps, been defined elsewhere, but not in the curriculum. Pedagogical content knowledge connected to such content could be characterised as latent by nature. Or could the content also be totally new, discovered in connection with a particular new invention, for example? In that case, pedagogical content knowledge becomes real when the

new content is incorporated into the curriculum. In the same way certain content could disappear when removed from the curriculum.

As a consequence, one could say, on condition, that pedagogical content knowledge is content-specific, that its existence depends on its position in the curriculum.

The problem of pedagogy

The definition of pedagogical content knowledge as an intersection of content knowledge and pedagogical knowledge is clear in principle. Nevertheless, it has aroused much discussion (e.g., Gudmundsdottir & Shulman, 1987; Grossman, 1990; McCaughtry, 2005; Ball, Thames & Phelps, 2008). If the definition is taken earnestly, we quite soon realise that both parts of the intersection are very large. The pedagogical mission in the instructional process is to get the students to learn as effectively and qualitatively well as possible. This challenge requires the entire pedagogy, not only pedagogical content knowledge. I suspect that there is a certain inconsistency in using the concepts pedagogy, general pedagogical knowledge, and pedagogical content knowledge. Even in his own writing, Shulman (1986; 1987) uses these alternatively or without distinguishing between them. Pedagogy is, usually for the teaching-studying-learning process, where all the elements of the instructional process are always taken into consideration. If we keep this point in our mind, pedagogical content knowledge is also the one and only element in this process. In Shulman's knowledge system, both general pedagogical knowledge and pedagogical content knowledge comprise two of the seven types of knowledge. When speaking of pedagogical content knowledge, however, pedagogy is constantly used instead of general pedagogical knowledge. Are they synonyms that can be used interchangeably?

In his first article (1986) on teacher knowledge, Shulman distinguishes "… among three categories of content knowledge: (a) subject matter content knowledge, (b) pedagogical content knowledge, and (c) curricular knowledge" (p. 9). Describing and defining pedagogical content knowledge is very scarce; it is a "subject matter for teaching" (p. 9) and "…the particular form of content knowledge that embodies the aspects of content most germane to its teachability" (p. 9). Further, he presents a general conception: "…the ways of representing and formulating the subject matter that make it comprehensible." (p. 9). Later, he mentions "students of different ages" (p. 9) and, further, student misconceptions (p. 10). In this context, general pedagogical knowledge or the concept of pedagogy is not mentioned at all. In a footnote (p. 14), however, Shulman mentions in passing "pedagogical knowledge for teaching" that is "terribly important", but its connection to pedagogy or general pedagogical knowledge in this context is unclear.

In his second article (1987), Shulman enumerates seven different types of knowledge. Significantly, he defines pedagogical content knowledge as "… the blending of content and pedagogy …" (p. 8). We suppose that, with pedagogy, he means general pedagogical knowledge. As a matter of fact, this indirectly indicates

a close connection to the German fachdidaktik, but it turns out that the broad concept of pedagogy is clearly unintended. There is, however, a certain seed for a broader understanding of pedagogical content knowledge because students are also mentioned and all the other categories of knowledge are dealt with in the same context. Caillot (2007, p. 127) presents an opposite example. He consciously rejects "pedagogy or some 'general didactics'" as too speculative a field of study.

If we look at the knowledge base presented by Shulman (1987), we find almost all the basic concepts used in pedagogy. If we begin with general concepts, we find curricular knowledge that connects the teacher's work with the curriculum. This is an important point that makes the process pedagogical (cf. Hinchliffe, 2001). The instructional process is thus placed inside the framework of the curriculum; the curriculum is the criterion for all that takes place in the instructional process. In close connection to this is Shulman's knowledge of contexts and of pedagogical aims, goals and purposes. Students are taken into account through the knowledge of learners. The remaining types of knowledge deal with central pedagogical concepts: general pedagogical knowledge, content knowledge, which refers to the teacher's understanding of the subject-matter, and finally, pedagogical content knowledge. These seven concepts of knowledge make it possible to construct a model, and Grossman (1990) has developed this idea further, presenting a hierarchical system of these knowledge concepts. However, if we look at the types of knowledge separately, as is done with pedagogical content knowledge, the text quite often contains many times broader aspects, although the writers do not say so. Values, for example, are an essential and inseparable factor of the instructional process (Gudmundsdottir, 1991; Kansanen, 2003).

My assumption is that there is a big difference when pedagogical content knowledge is considered from the viewpoint of the student or teacher. If the student is the focus, as in pedagogy in general, pedagogical knowledge is combined with all types of knowledge, not only with content knowledge. The content is developed with the goal that learning is optimal. Pedagogical knowledge is easily seen as pedagogy with all the types of knowledge. McCaughtry (2005) wants to broaden the concept of pedagogical content knowledge to include knowledge of the students. Strictly taken, McCaughtry's point of view is logical; according to Shulman's categories, there is a separate type of knowledge of learners. If we think of the meaning of pedagogy, however, this type of knowledge is already included in pedagogical content knowledge because pedagogy also contains the knowledge of the students. This reasoning leaves open the question of what is really meant by pedagogical knowledge or what is left to pedagogical knowledge if all other types of knowledge are removed from the system. Apparently the concept of pedagogical knowledge was not particularly clear in Shulman's knowledge system. The most problematic point hampering the analysis is the indistinctness between general pedagogical knowledge and pedagogy in general. McCaughtry (2005), in contrast, makes use of Dewey's claim to combine the child and the curriculum. That is to define, in a different way, what pedagogy is.

Further, if the teacher is at the focus when looking at pedagogical content

knowledge, the analysis is of a different kind. It then seems common that content is mainly analysed, and only for the teacher's use. The purpose seems to be to organise the content in such a way as to make it easy for the teacher to teach it to the students, and for the students to learn the content as easily as possible. This is happening, however, chiefly from the viewpoint of the teacher. The other types of knowledge in the system are not taken into consideration; the analysis concentrates, rather, on the structure, the method, or presentation order of the content. This seems to be the problem that Ball, Thames and Phelps (2008) deal with in their article. Their discussion continues to reflect on whether there are similarities and differences between different content or school subjects. A fruitful viewpoint, apparently, is that the problems of the content are dealt with by taking the expertise of the teacher into consideration and trying to identify the difficult parts of the subject matter and those paragraphs where mistakes are generally made. At least two problems from the content side follow: first, how is experience or wisdom of practice taken into account, and is there theoretical pedagogical content knowledge that could be tested empirically? In close connection to that is what the students are really learning. If the teacher resorts to pedagogical content knowledge in teaching, are the students learning the original content knowledge or the special pedagogical content knowledge that the teacher is applying?

Teacher knowledge

Ball, Thames and Phelps (2008) remark that pedagogical content knowledge lacks definition. It is also interesting to note that they view pedagogical content knowledge as a "bridge between knowledge and practice" (p. 389). In the amalgam of content and pedagogy, as Shulman would say (1987), the latter is represented by practice, not by general pedagogical knowledge or pedagogy. This is quite logical because pedagogical content knowledge is understood as teacher knowledge. It follows that it is the teachers who, through their own practice, wisdom of practice, develop a way of pedagogical content knowledge that they think is of use in the instructional process. It also follows that pedagogy in this case is understood as a practical viewpoint. Practice, on the other hand, means actions, thinking, reasoning, and making decisions.

Making decisions turns the nature of pedagogical content knowledge normative by nature. Taking a stand and deciding between alternatives requires personal beliefs; using pedagogical content knowledge is thus one type of teachers' pedagogical thinking (Kansanen, Tirri, Meri, Krokfors, Husu & Jyrhämä, 2000). Teaching is taking place according to the justifications behind the decisions when pedagogical content knowledge is developing in a teacher's mind. In other words it is personal practical knowledge (Levin & He, 2008), and the content of pedagogical content knowledge thus, perhaps, cannot be defined externally. Behind the justifications may be many kinds of reasons: rational, intuitive, and mixed, etc. The teacher's understanding of pedagogical content knowledge is, consequently, also tacit knowledge (Toom, 2006), and thus difficult to define as an object theory.

Understanding pedagogical content knowledge as personal and practical also makes it unique. It is thus every teacher's professional expertise. On the side of content knowledge it requires study of the subject matter; combining it with pedagogical expertise distinguishes the teacher as a pedagogue from a content expert. An interesting question is how much expertise is needed and with how little expertise it is possible to obtain good results? "Nothing is enough" is the answer when I ask a content expert. Is it, however, possible to find empirical evidence as an answer to this question? Unfortunately the issue remains empirically unresolved despite various attempts (e.g., Wilson, Floden & Ferrini-Mundy, 2001; Krauss, Brunner, Kunter, Baumert, Blum, Neubrand & Jordan, 2008). On the other hand, it is not difficult to find textbooks and guides full of teaching tips for various content knowledge. These are normative, of course, but as a rule they are based on empirical teaching experience; in that way, they have validity.

It seems safe to say that content knowledge is objective knowledge in a particular external form; it can be analysed and presented formally (text, pictures, tables, figures, etc.). The teacher creates a special version of this content knowledge in order to get the students to learn it as easily and effectively as possible. Every teacher gradually develops a personal understanding to realise this task, and the result of this development is pedagogical content knowledge. What the students are learning in this process is a personal conception of this content knowledge mediated via pedagogical content knowledge.

Pedagogical content knowledge is thus personal, based on practice, but it is possible, at least in principle, to present it in some external form and to become empirically tested in that way. It can further be investigated in different circumstances with different kinds of students. In this way, personal knowledge may become generalised knowledge shared with other teachers. In the same way, the theory of pedagogical content knowledge can be developed and further tested empirically.

Fragmentation of content knowledge for teaching

Ball, Thames and Phelps (2008) attempt to develop the definition of pedagogical content knowledge further and to find subcategories within it. In principle, this happens by dividing pedagogy in smaller parts, but also doing the same with content knowledge. The difficult point here is how to restrict ourselves to pedagogical content knowledge, and specifically, taking it to the letter, only to pedagogical content knowledge. If we bear in mind that pedagogical content knowledge is an amalgam of content knowledge and pedagogy, then other knowledge types must be kept out of this enterprise. It is possible, however, to emphasise content knowledge in such a way as to combine it also with other types of knowledge than pedagogical knowledge. Thus follows the expression of content knowledge for teaching.

First Ball, Thames and Phelps (2008) present two types of content knowledge: common content knowledge and specialised content knowledge. Their subject

matter is mathematics, and with 'common' they refer to such mathematical substance that is "not unique to teaching" (p. 399). This, I suppose, is mathematics as a discipline as it is taught at the universities, and as I understand it as content knowledge. Specialised content knowledge, on the other hand, "… is the mathematical knowledge and skill unique to teaching" (p. 400). What is difficult to understand is why call this with a new term when, I suppose, this is actually original pedagogical content knowledge. It is content knowledge combined with pedagogy where teaching is used in the place of pedagogy.

The next type is knowledge of content and students. Here, knowledge is combined with students and, using Shulman's own expression, with knowledge of learners. In this way, we encounter difficulties if our purpose is to restrict ourselves to content only. Content can be combined with any components of pedagogy or teaching: the problem here, however, is that the knowledge system contains a horizontal type of knowledge besides pedagogy, knowledge of learners. If we combine content with students, it is, according to the knowledge system, no longer a category of pedagogical content knowledge. As such, this new category is, without a doubt, fruitful. It indicates, however, that in the instructional process, all the elements of pedagogy are needed all the time. Pedagogical content knowledge is a theoretical concept that becomes active in practice; it can be investigated as such, but applying it in practice requires all the other elements of pedagogy (e.g., knowledge of students). Taking only knowledge of content and students is "the intersection of content and students" – in other words, mathematics and students. That is, however, just what a teacher needs in pedagogy, and when using this knowledge in teaching, it becomes more than pedagogical content knowledge. It becomes pedagogical content knowledge with knowledge of students. We note once again that Shulman also uses the category of knowledge of learners in connection with pedagogical content knowledge (1986, p. 9) and implies a more extensive area for it. It is difficult to know whether this use was intentional.

The last new category is knowledge of content and teaching. It seems that pedagogy has been compensated for with teaching. This is an interesting viewpoint and leads us to ask what we mean by teaching and how teaching and pedagogy are related. At once, one could say that teaching is action based on thinking and decisions, and presents activity to fulfil pedagogy in school according to the conditions of a curriculum. Further, it is closely connected with teachers and their decisions and actions. The focus is on teachers, as it is with pedagogical content knowledge also.

If we attempt to understand teaching more holistically, taking the students' decisions and actions into the same process and, most importantly, deal with them jointly, it is possible to enlarge the content knowledge to contain the entire instructional process where the basic conception is interaction (Kansanen, 1999). Then it is also possible to combine content knowledge with any aspect of the instructional process, that is, with teaching. Further, it is possible, particularly for research purposes, to define more precise concepts of content knowledge. In practice, these are parts of the pedagogy used to realise the aims and goals of the curriculum.

The analysis by Ball, Thames and Phelps (2008) clearly demonstrates how much benefit can result from developing the content side of the instructional process. The category of pedagogical content knowledge is so extensive that it easily becomes the same as pedagogy in general. In European and especially in German pedagogy, this is very often the result. An important question, however, is whether we look at the content from a research point of view or how the instructional process functions in reality. According to that viewpoint, the role of content has a different status and characteristics.

The extraordinary instance of teacher education

In teacher education, studying the content or subject matter creates additional problems. Student teachers often study subject matter in the departments of content knowledge (e.g., department of mathematics, religion, languages, etc). Many times these studies are separate and bear no connection to teacher education. Sometimes, studying content and how to teach it are connected in teacher education. In principle, the teacher educator is not an expert of the disciplinary content; rather, the responsibility of a teacher educator is only how to teach the content. It is often difficult, however, to differentiate between content knowledge and pedagogical content knowledge. Thus student teachers sometimes complain that the courses of pedagogical content knowledge are simply more courses of content knowledge by nature. Essential, however, is that it is precisely pedagogical content knowledge that is intended to be taught and studied in those teacher education courses. Consequently, pedagogical content knowledge comprises not only personal practical knowledge, but is the knowledge that the teacher educator attempts to mediate to the student teacher. The same occurs with textbooks and teaching guides, which contain pedagogical content knowledge, in addition to content knowledge.

Thus we can say, at least to some extent, pedagogical content knowledge is also formal knowledge and a possible object of studying. In fact, a book dealing with special content differs from a textbook written about the same topic.

The connection of pedagogical content knowledge to the German fachdidaktik and the incident of French *didactiques*

Various journals have to some extent discussed the similarities between pedagogical content knowledge and the German fachdidaktik (e.g., Gudmundsdottir & Grankvist, 1992; Bromme, 1995, Westbury, Hopmann & Riquarts, 2000; Blömeke & Paine, 2008; van Dijk & Kattmann, 2007; Kansanen, 2009). According to the well-known problem of translating the German *Didaktik*, Hopmann and Riquarts (1995) have in a way ceased to use didactics as a translation of *Didaktik*. Rather, they suggest a variation with a different spelling, 'didaktik', instead of didactics. They apparently intend to refer to the German *Didaktik* without the negative connotations of

didactics while using a term that is still close enough to the original to suggest the real nature of the term *Didaktik*. I attempt to follow Hopmann and Ricquarts (1995) in using fachdidaktik in the same way.

Although pedagogical content knowledge emerged as a new idea in the 1980s, Bullough Jr. (2001) presents its background and links it to the discussion about teacher education reform that took place about a hundred years ago. It dealt with the controversy between content knowledge and pedagogy, and in many ways resembles the present discussion. During the following years, the development of pedagogical content knowledge and fachdidaktik, however, progressed separately with only some occasional connections.

In Germany, fachdidaktik has traditionally been a research area of its own and, together with the general didaktik, has constituted the background science of teacher education. Fachdidaktik is also organised systematically (http://gfd.physik.rub.de/), and the separate research associations for fachdidaktik have a common umbrella organisation: *Gesellschaft für Fachdidaktik – Association for Fachdidaktik*. It consists, for the time being, of 22 associations representing different content areas or subject matters, one of which is the fachdidaktik of educational sciences. An interesting detail is that the organisation does not translate the term *Fachdidaktik* into English in its original German form. In the text dealing with the tasks of the organization at least the terms *subject didactics* and *subject-oriented didactics*, are used but not the term pedagogical content knowledge.

The relation of pedagogical content knowledge and fachdidaktik is a good example of problems when comparing educational research internationally. Part of them may be explained with broader societal issues and particularly with the differences between school systems. It also indicates how national by nature educational research still is. This concerns research on teaching and teacher education especially, though not so much educational psychology. The case of French *didactiques* is yet another good example.

The origin of French *didactiques* is apparently independent of the development of the German didaktik, which is particularly valid with regard to the fachdidaktik. Using this same basis, however, the term didaktik indicates its origin at large. French *didactiques* is comparative didaktik in nature (Caillot, 2007); different fachdidaktiks are compared to each other (cf. Shulman & Sherin, 2004). The expression in plural, the French *didactiques*, is intentional, and the singular form, *didactique*, refers to only one single subject matter.

The birth of the French *didactiques* coincides with the reform of the school system in the beginning of the 1960s. Caillot (2007) states that during this period, researchers, teacher educators and teachers came closer to each other, cultivating the opportunity for co-operation. It was the beginning of the comparative didaktik. Caillot presents three content areas as an example of this development: linguistics, mathematics, and physics together with chemistry. Researchers played the main role in this process, whereas the departments of education elected not to participate in it. According to the representatives of comparative didaktik, the majority of educational researchers "… were inspired by a libertarian philosophy

and ideology" (Caillot, 2007, s. 126) that appealed, among others, to Ivan Illich, and failed to consider the content of the curriculum earnestly. The new didacticians, on the contrary, emphasised the content, but had no pedagogical background.

The French *didactiques* emphasise the specificity of the subject matter in teaching. Various articles seem to exaggerate this specificity. In some examples concerning mathematics teaching (Sensevy, Schubauer-Leoni, Mercier, Ligozat, & Perrot, 2005), one can pose the question of whether the content is often mathematics. Respective content also appears in other subjects. Nevertheless, no general area of *didactiques* is sought. If there are similarities between subjects, it falls under comparative didaktik. It seems that some conscious aversion to general didaktik prevents other interpretations. Abstractly taken, comparative didaktik sounds almost the same as general didaktik; when dealing with teacher education, however, co-operation with colleagues representing the French *didactiques* and general didaktik or pedagogy could prove difficult.

Naturally, the limits between the general and the specific are porous and depend on how we view them. Many times we use quite common concepts; they are apparently needed before proceeding to the more specific parts. Thus, Tiberghien and Buty (2007) use concepts such as "knowledge to be taught", and "taught knowledge", and "scholastic time, didactical time and learning time". These are undoubtedly general and could be used in any content. According to Caillot (2007, p. 128), however, one problem is that when pedagogy builds large overall theories that cannot be falsified, *didactiques* attempt to develop a theoretical framework that can be tested. If general didaktik is not a proper concept, comparative didaktik leaves the results of this comparison open; perhaps we can then move on to the level of some kind of metafachdidaktik? Although something may be common to all subject matters, it is not, however, general didaktik. The connecting factor is still content; general didaktik deals with other general aspects of pedagogy.

Recapitulation

Although Lee S. Shulman claimed that content had been missing from the research on teaching, his claim had to be understood in such a way that a new line of research would be desirable. In pedagogy, a tension has always existed between subject matter and general pedagogical knowledge. It remains to be seen in the different roles the teachers play in schools, however. The older the students, the more content knowledge is needed. Dispute arises: how much expertise of content and how much pedagogical knowledge is required? And how are they combined? It is, however, a totally different aspect to examine this matter from the point of view of research than from the point of view of teaching in the classroom. In research, it is possible to view the parts separately without correlation to other parts. In practice, this is unrealistic. The problem in articles such as this present one is how to deal with both aspects together, while at the same time considering the results of recent empirical research.

The problem with pedagogical content knowledge is apparently that its area is

quite narrow; it requires other knowledge types to become real. Strictly speaking, after adding other knowledge elements to pedagogical content knowledge it is no longer the same. This seems to be the approach initially with Ball (2000), and most recently with Ball, Thames and Phelps (2008). In fact, they aim to explore the content from a larger perspective than pedagogical content knowledge. The expression is content knowledge for teaching. It happens by combining one or more types of knowledge with the content as well as with various point of views related to teaching. In this way, the perspective approaches the area and content of the entire pedagogy by means of which the teaching-studying-learning process is realised (e.g., Ball, 2000, p. 244). As such, it also comes quite close to the German fachdidaktik.

It may be that part of the differences in using similar concepts originates in languages that, to a great extent, are connected with their cultural origins. Proceeding to empirical investigations, perhaps, could shed light on such indistinctness. In empirical research, concepts must be operationalised; comparisons, at least, become clearer.

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