Examining assumptions about the need for teachers to transform subject matter into pedagogical forms accessible to students

Scheiner, Thorsten

Examining assumptions about the need for teachers to transform subject matter into pedagogical forms accessible to students

Thorsten Scheiner

Institute for Learning Sciences and Teacher Education, Australian Catholic University, Australia;
thorsten.scheiner@acu.edu.au

This paper explores fundamental assumptions about the notion of transforming subject matter, which is widely regarded as a central practice of teacher work and a crucial feature of teacher knowledge. First, the notion of transforming subject matter and the ways in which it has been taken up in discourses on teacher knowledge are discussed. Second, fundamental but mostly implicit assumptions are explored and challenged, including the individual teacher as the locus of transformation, the possessor of the knowledge in question and the gatekeeper who provides students access to subject matter content. Finally, these widely held assumptions are problematised against the background of French and German traditions of didactics. These traditions see the ability to transform subject matter not as a characteristic of the individual teacher, but of social and cultural systems that are institutionally contextualised and oriented towards normative conceptions of education.

Keywords: Didactic transposition, elementarisation, pedagogical content knowledge, pedagogical transformation, subject matter content.

Introduction

It would be fair to say that Shulman's (1986, 1987) work on teacher knowledge has been a major driving force in promoting teaching as a profession, particularly in the English-speaking educational research community. Shulman (1986, 1987) provided the impetus for the view of teaching as a profession by asserting that teachers have a specialised knowledge base that differs from other professionals. Of particular importance was Shulman's (1986) introduction of the construct of pedagogical content knowledge, which refers to a specialised kind of content knowledge that goes beyond subject matter knowledge per se and encompasses subject matter knowledge for teaching. Pedagogical content knowledge, according to Shulman (1986), includes "the most powerful analogies, illustrations, examples, explanations, and demonstrations – in a word, the ways of representing and formulating the subject that makes it comprehensible to others" (p. 9).

It is these ways of representing and formulating of the subject matter content – the transformation of subject matter in ways comprehensible to students – that Shulman (1987) conceived as the core task of teaching and the defining feature of pedagogical content knowledge. Teachers must transform subject content into pedagogical forms, such as examples, representations, and instructional tasks, which make the content accessible to pupils. Guided by this orientation, Shulman (1987) defined pedagogical content knowledge as "the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organised, represented, and adapted to diverse interest and abilities of learners, and presented for instruction" (p. 8).

While the construct of pedagogical content knowledge has received wide attention and has been the subject of numerous examinations (e.g. Abell 2008; Bromme 1995; Cochran et al. 1993; Depaepe et

al. 2013; Gess-Newsome & Lederman 1999; Hashweh 2013; McEwan & Bull 1991), the underlying notion that teachers necessarily transform subject content into pedagogical forms has, for the most part, been taken-for-granted. Indeed, the notion of transforming subject matter has often been used implicitly instead of explicitly thematised in educational research, and thus, has hardly been the subject of debate and hence remained beyond the scrutiny of critical reflection (see Deng 2007).

This paper examines the notion of transforming subject matter by identifying and questioning theoretical underpinnings that have not been discussed in any substantial way. Such examination is particularly relevant in the field of teacher knowledge, where the vast majority of the literature has reproduced and reinforced the basic assumptions in Shulman's path-defining contributions.

On the notion of transforming subject matter and its context

The notion of transforming subject matter came to light in Shulman and his colleagues' research program *Knowledge Growth in Teaching* (e.g. Grossman et al. 1989; Shulman 1986, 1987; Wilson et al. 1987), which studied the interaction of content knowledge and pedagogical development among novice school teachers of different disciplines. The primary focus of this research program was on how novice schoolteachers adapt their content knowledge of an academic discipline so that it becomes suitable for classroom teaching. The fundamental assumption was that subject matter contents "must be transformed in some manner if they are to be taught" (Shulman 1987, p. 16). It is this transformation of subject matter into pedagogical forms accessible for students that has been taken as the central intellectual task of teaching and that became the defining principle for pedagogical content knowledge. In arguing for a knowledge base of teaching, Shulman (1987) claimed that

> the key to distinguishing the knowledge base of teaching lies at the intersection of content and pedagogy, in the capacity of a teacher to *transform* the content knowledge he or she possesses into forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented by the students. (p. 15, italics added)

The notion of transforming subject matter has sparked wide interest in the English-speaking education research community after Shulman (1986, 1987) introduced it as the defining premise for pedagogical content knowledge. The notion of transforming subject matter content has been described and interpreted in multiple ways. For instance, Gudmundsdottir (1991) described this transformation process as a 'reorganisation' of content knowledge that derives from a disciplinary orientation, and Grossman et al. (1989) defined it as a 'translation' of subject matter knowledge into instructional representations. Marks (1990), on the other hand, portrayed it as a process of 'reinterpretation' that means, "the content is examined for its structure and significance, then transformed as necessary to make it comprehensible and compelling to a particular group of learners" (p. 7).

Common to these considerations is the view that the transformation of content knowledge into a form of knowledge "that is appropriate for students and specific to the task of teaching" (Grossman et al. 1989, p. 32) is seen as a means and an end in itself. However, such considerations can hardly be regarded as new from the point of view of several European traditions of didactics, especially the French and German traditions of didactics. Questions of preparing subject content are described in these traditions yet as part of didactic theories and broader educational considerations, not as

characteristics of teacher cognition. For example, in the French tradition of didactics (*didactique*), it has long been known that disciplinary subject content cannot be directly adopted as content for teaching. The notion of didactic transposition (*transposition didactique*) refers to the processes that take place from the moment it is decided that some scholarly body of knowledge should be taught, to the moment this body of knowledge is taught in educational settings such as school classrooms and learned by a group of students (Chevallard 1985). The taught knowledge, however, is not a reproduction of scholarly knowledge, but originates from it and is shaped by various institutional and cultural forces that may vary in time and space. In the German tradition of didactics (*Didaktik*), on the other hand, the preparation of subject matter for teaching was not only about making it accessible to students, but also about expanding its potential for the personal and cultural formation and maturation of students. An important approach in this tradition is the didactic analysis (Klafki 1958), in which subject matter is examined for its exemplary significance and its present and future relevance for students, in addition to its accessibility.

Though different in their suggested practices, these traditions share the idea that disciplinary subject matter needs to be structurally modified in ways teachable by the teacher and learnable by the students.

On the fundamental assumptions about the notion of transforming subject matter

For Shulman (1986, 1987), the bridging from the disciplinary subject matter teachers acquired in college or university to the content they teach in school is the central issue that novice teachers have to face. The key to this bridging is the transformation of the disciplinary subject matter knowledge a teacher possesses into pedagogical forms accessible to students – a transformation assumed to be engineered by the individual teacher. The teacher's own content knowledge of the academic discipline is the matter or substance of transformation, and the teacher's orientation to the structure of the discipline and the structure of students' minds (including their prior knowledge) is the foundation for the restructuring of content knowledge for pedagogical purposes.

On this view, the subject matter content knowledge taught in school is a pedagogical and personal revision of the disciplinary content knowledge of the teacher. How well this pedagogically revised content knowledge fits or connects with students' prior knowledge, then, determines whether students have access to the knowledge at stake. Consider, as a case in point, Shulman and Quinlan's (1996) retrospection on the research program *Knowledge Growth in Teaching*:

> The central feature of this research program was the argument that excellent teachers transform their own content knowledge into pedagogical representations that connect with prior knowledge and dispositions of learners. The effectiveness of these representations depends on their fidelity to the essential feature of the subject matter and to the prior knowledge of the learners. The capacity to teach […] is highly dependent on […] how well one understands ways of transforming the subject matter into pedagogically powerful representations. (p. 409)

On this view, the individual teacher is the locus of transformation. It is the teacher who possesses the content knowledge at stake and who controls the selection, sequencing, and pacing of what knowledge is learned and how it is learned. Such assumptions rely on a teacher-direct view of the

teaching-learning process, in which learning is directed and modelled by the teacher. Figure 1 illustrates the simplicity of which this view operates from within the didactic triangle, focusing the attention on the teacher–subject-matter edge of the didactic triangle.
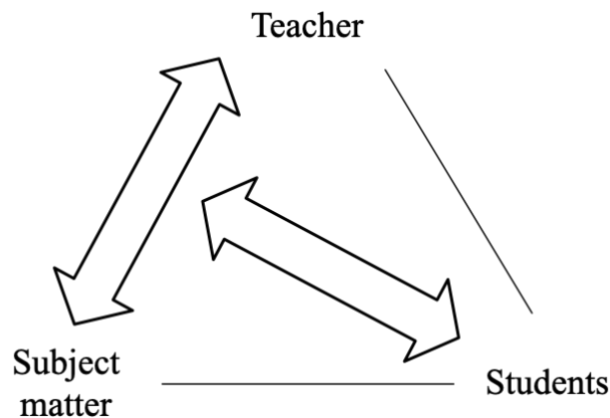

Figure 1: Shulman's view of the transformation of subject matter

For Shulman, it is the individual teacher who *structures* the subject matter content; *represents* it in the form of analogies, demonstrations, examples, metaphors, and so forth; *adapts* these representations to students' general characteristics; and *tailors* the adaptations to those specific individuals or group of students to whom the subject matter will be taught in the classroom (Shulman 1987, pp. 16–17). Through structuring, representing, adapting, and tailoring of subject matter, the teacher identifies and creates ways of representing and reformulating content knowledge that makes it comprehensible for students.

According to this view, the decision of what knowledge (and how knowledge) is acquired is made through the authority of the individual teacher, as the possessor or owner of the knowledge at stake. That is, the teacher controls what is learned and holds the criteria for what forms of knowledge are valued. This view, however, is problematic as the choice of which forms of knowledge are valued becomes a question of whose forms of knowledge are valued, leaving unexamined the *problématique* that any issue of 'what knowledge' is indeed an issue of 'whose knowledge' (see Moore 2009). Knowledge, consequently, is reduced to those who hold it or gain access to it, and those who have it or get it are in power. The teacher is positioned in the locus of power – as the knowledgeable who grants students access to the content knowledge in question. What students have access to are the pedagogically and personally revised forms of the content knowledge the teacher possesses. This understanding is problematic as it prevents realisation that the knowledge students have access to might not necessarily be 'powerful knowledge', which is deemed critical for responsible citizenship in a society (Young & Muller 2013). It might instead be 'knowledge of the powerful', which reinforces the interest of those previously educated within a system built on that understanding.

What the French and German traditions of didactics set apart from the notion of transforming subject matter

The notion of transforming subject matter reflects certain premises of the French and German traditions of didactics. One of the commonalities of these approaches and traditions is that they

consider the content knowledge of an academic discipline to be an essential point of departure for transformation or transposition. Another commonality is the idea that such content knowledge is to be transformed or transposed in some ways to be accessible for students. These traditions differ fundamentally, however, in regard to their theoretical underpinnings. First, in Shulman view, the individual teacher is the locus of transformation, and transformation is seen as an internal process that takes place in the mind of the teacher. In the French and German traditions, however, didactic transposition is institutionally contextualised and culturally shaped and directed towards normative conceptions of education.

Second, the unit of analysis, in Shulman approach, is the individual teacher and her or his mental processes, and the capacity of transformation is a key characteristic of teacher expertise. How well a teacher transforms her or his personal content knowledge into forms that fit or connect with students' prior knowledge and dispositions defines whether students have access to the knowledge in question. Access for students is, thus, a pedagogical and psychological matter. In the French and German tradition, however, the unit of analysis goes well beyond the individual teacher. It includes how social, cultural, and political contexts shape and frame the work of teachers. Knowledge is institutionally contextualised and actualises in social practices and cultural activities, such as teaching. The issue of student access is as much a social, cultural, and political one as it is an epistemological, cognitive, and didactic one. In the following, the theoretical principles and foundations of the French and German traditions and their implications are discussed in more detail.

Transformation of subject matter content knowledge, in Shulman's view, is something engineered by the individual teacher. Chevallard (1985), the initiator of the French tradition of didactic transposition, however, portrayed transposition as socially and culturally produced. Didactic transposition describes the inevitable processes of change by which scholarly knowledge as it is produced by scholars, for instance, is transformed through various negotiations to knowledge to be taught that is socially considered as important and, as such, officially prescribed by the curriculum. Over different elaborations according to various circumstances, this knowledge is then transformed to knowledge as it is actually taught by teachers in their classrooms, and eventually to knowledge as it is actually learned by students. The theory of didactic transposition accounts for the various constraints the diverse agents in the transposition process are subject to, and it attempts to reveal the 'transparency illusion' of those who think of transformation of subject matter as something deliberately chosen (see Bosch & Gascón 2006).

The activity of transposition does not belong to any individual but involves groups of people who interact with one another, including disciplinary experts, education researchers, curriculum developers, and teachers, among others. These groups of people belong to what is called the *noosphère*, the sphere of those who think about education, an intermediary between the education system and society (Chevallard 1985).

The capacity of transformation is, in this view, a property not of a single teacher, but of social and cultural systems that enable the development of subject matter knowledge in social institutions and the organised and institutionalised preparation of subject matter for students. This tradition acknowledges institutions at the source of knowledge and highlights the fact that what is taught at

school originates in other institutions and is a result of complex processes of negotiations among different actors involved in the process of didactic transposition (Chevallard 1992).

The process of didactic transposition, thus, underlines the 'institutional relativity of knowledge' and situates didactic phenomena at an institutional level, beyond individual characteristics of the institutions' subjects (Bosch & Gascón 2006). What is taught at school has to be legitimised by external entities that guarantee the social value and epistemological significance, as well as the cultural relevance of the subject matter content (Chevallard 1992).

Similarly, subject matter content, in the German tradition of didactics, is selected based on normative criteria according to its educational value for promoting and actualising *Bildung* – that is, the personal and cultural formation and maturation of students (von Humboldt 1795/1960). Via didactic analysis, the role, meaning and importance of the subject content in contributing to general educational aims are to be explored and questioned (Klafki 1958). The selection of subject matter content is, thus, a selection of aims, goals, and values of education in a given society. What content knowledge is valued and what is worth teaching are not left to be decided by the individual teacher but are based on formal criteria developed in the interplay of cultural-historical traditions and current societal needs.

For subject matter content to become educative, it needs to be 'elementarised' (*elementarisiert*) that is, concentrated, intensified, or abstracted to what has fundamental relevance for students (Klafki 1954). Elementarising does not simply mean a simplification of subject matter content, but a magnification of educational content (*Bildungsinhalt*) for opening or unlocking the educational substance (*Bildungsgehalt*) of the subject matter content.

Conclusion

The introduction of pedagogical content knowledge in the English-speaking community has re-introduced the centrality of subject matter content into the teaching equation, a centrality well-known and well-established in several European traditions of didactics. This paper in no way undermines Shulman's efforts in bringing the subject matter to the forefront in discourses of teaching, teacher knowledge, and teacher education. Instead, this paper has examined fundamental assumptions underlying the notion of transforming subject matter as introduced by Shulman in light of the French and German traditions of didactics. The fundamental differences between Shulman's lines of thinking and these European traditions of didactics are not in the focus, in the instructional process itself, but in their theoretical principles and foundations.

Transforming subject matter content, for Shulman, has been seen as a central characteristic of an effective teacher, a process that takes place in the teacher's mind. It is the individual teacher that is the locus of transformation, the possessor of the content knowledge at stake, and the gatekeeper for granting students access to the subject matter content. Such an understanding has largely derived from cognitivism and the individualisation of the teacher in engineering the transformation. That is, questions of core practices of teacher work and issues of access have been mostly psychologised, with little or no account of broader social, cultural, and political aspects of education. In the process of individualising the transformation process, any serious sense of social structures and the cultural

and political forces that shape and form the transformation of subject matter for educational purposes have generally been disregarded.

The French and German traditions of didactics, on the other hand, are based on social and cultural aspects of education, and on tradition and history. Processes of transposition or elementarisation in these traditions are socially and culturally constructed, institutionally contextualised and directed towards normative conceptions of education. The capacity of transformation of subject matter content, thus, is not a property of an individual teacher, but of social and cultural systems that organise ways of preparing subject matter content for students, in which certain kinds and forms of knowing are valued based on history and tradition, as well as on societal needs and cultural practices. Rather than an end state, the didactic transposition and elementarisation are continuously driven by unrelenting negotiations – balancing different interests and concerns of a given society.

The unit of analysis, thus, goes well beyond the individual teacher and includes the cultural and institutional contexts that shape how transformation unfolds in any given community and institution. Such considerations reveal that ways of transformation always reproduce social arrangements of power and privilege that need to be carefully examined and questioned. This may be of particular importance as the reliance on the individual teacher as the locus of transformation and the possessor of knowledge in Shulman's account perpetuates an educational system that favours the interests and concerns of those who already control intellectual and thus curricular legitimacy.

References

Abell, S. K. (2008). Twenty years later: Does pedagogical content knowledge remain a useful idea? *International Journal of Science Education*, *30*(10), 1405–1416.

Bosch, M., & Gascón, J. (2006). Twenty-five years of the didactic transposition. *ICMI Bulletin*, *58*, 51–65.

Bromme, R. (1995). What exactly is 'pedagogical content knowledge'? Critical remarks concerning a fruitful research programme. In S. Hopmann & K. Riquarts (Eds.), *Didaktik and/or curriculum. IPN Schriftenreihe* (Vol. 147, pp. 205–216). IPN.

Chevallard, Y. (1985). *La transposition didactique. Du savoir savant au savoir enseigné*. La Pensée Sauvage.

Chevallard, Y. (1992). Concepts fondamentaux de la didactique: Perspectives apportées par une perspective anthropologique. *Recherches en Didactique des Mathématiques*, *12*(1), 73–112.

Cochran, K. F., DeRuiter, J. A., & King, R. A. (1993). Pedagogical content knowing: An integrative model for teacher preparation. *Journal of Teacher Education, 44*(4), 263–272.

Deng, Z. (2007). Transforming the subject matter: Examining the intellectual roots of pedagogical content knowledge. *Curriculum Inquiry*, *37*(3), 279–295.

Depaepe, F., Verschaffel, L., & Kelchtermans, G. (2013). Pedagogical content knowledge: a systematic review of the way in which the concept has pervaded mathematics educational research. *Teaching and Teacher Education*, *34*(1), 12–25.

Gess-Newsome, J., & Lederman, N. G. (Eds.). (1999). *Examining pedagogical content knowledge*. Kluwer.

Grossman, P. L., Wilson, S. M., & Shulman, L. S. (1989). Teachers of substance: subject matter knowledge for teaching. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 23–36). Pergamon.

Gudmundsdottir, S. (1991). Ways of seeing are ways of knowing. The pedagogical content knowledge of an expert English teacher. *Journal of Curriculum Studies*, *23*(5), 409–421.

Hashweh, M. (2005). Teacher pedagogical constructions: a reconfiguration of pedagogical content knowledge. *Teachers and Teaching*, *11*(3), 273–292.

Klafki, W. (1954). *Das pädagogische Problem des Elementaren und die Theorie der kategorialen Bildung*. Beltz.

Klafki, W. (1958). Didaktische Analyse als Kern der Unterrichtsvorbereitung. *Die Deutsche Schule*, *50*(1), 450–471.

Marks, R. (1990). Pedagogical content knowledge: From a mathematical case to a modified conception. *Journal of Teacher Education*, *41*(3), 3–11.

McEwan, H., & Bull, B. (1991). The pedagogic nature of subject matter knowledge. *American Educational Research Journal*, *28*(2), 316–334.

Meredith, A. (1995). Terry's learning: some limitations of Shulman's pedagogical content knowledge. *Cambridge Journal of Education*, *25*(2), 175–187.

Moore, R. (2009). *Towards the sociology of truth*. Continuum.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15*(2), 4–14.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, *57*(1), 1–23.

Shulman, L. S., & Quinlan, K. M. (1996). The comparative psychology of school subjects. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 399–422). Macmillan.

von Humboldt, W. (1795/1960). Theorie der Bildung des Menschen. In A. Flitner & K. Giel (Eds.), *Werke in fünf Bänden: Vol. 1. Schriften zur Anthropologie und Geschichte* (pp. 234–240). Wissenschaftliche Buchgesellschaft.

Wilson, S. M., Shulman, L. S., & Richert, A. E. (1987). "150 different ways" of knowing: representations of knowledge in teaching. In J. Calderhead (Ed.), *Exploring teachers' thinking* (pp. 104–123). Cassell.

Young, M., & Muller, J. (2013). On the powers of powerful knowledge. *Review of Education*, *1*(3), 229–250.