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How the Teacher’s Practical Theory Moves to Teaching Practice
A Literature Review and Conclusions

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Abstract
This conceptual study and literature review concerns the teacher cognition paradigm. The aim was to analyse the relationships between teachers’ static cognition (practical theory, script), dynamic cognition (agenda, interactive thinking) and teaching practice. The study asks the following question: How is a teacher’s practical theory – which is partly founded on educational theory as well – realised in teaching practice? Earlier empirical studies on the subject mostly have an analytical orientation, i.e., only a few aspects of the comprehensive phenomenon have been researched.

Existing research carried out between 1980 and 2009 shows that the relationship between a teacher’s cognition and his/her teaching practice is not a simple one: the basis of all teacher cognition – practical theory – transforms interactively in classroom processes. The more complex the conflict between the curricular objective and pupils’ actions in a teaching situation, the more essential it is for the teacher to use dynamic cognitions in order to realise her/his practical theory.

Keywords: teachers cognition, practical theory, interactive thinking, research methodology

Towards integration in educational research
It is well known that empirical research on teaching is divided into subgroups such as teacher cognition, process-product and student cognition. It is a problem from both practical and theoretical points of view that the study of teaching (i.e., even each subgroup) has been broken up into several micro perspectives. If the totality of teaching-learning is more than the sum of its elements, it will be necessary to examine the complex process by taking the totality of teaching into consideration, i.e. comprehending that the factors of teaching relate to each other in an interactive way. Such an integrative approach is supported and defended in a few philosophical and methodological papers concerning educational theories (Schoenfeld, 1999; Tellings, 2001), a systemic approach in empirical research (Salomon, 1991, 2006), the status of meta-analysis in research integration (Haig, 1991), and in some conceptual studies of teaching methods (e.g., Davis, 1999; Pitkäniemi, 2009).

Which kinds of empirical results are sensible to use in practice has been the subject of debate. Davis (1999) examines this in his article “Prescribing teaching methods”.

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He tries to show how some attempts to prescribe teaching methods are empty or incompatible with certain teachers. These prescriptions are usually offered as specific teaching recipes claiming that they are based on research evidence and, therefore, advisable to use in the classroom. However, because of action properties that are not merely physical, this is a matter of interpretation. This is how Davis (1999, 398) puts it:

“It would be quite a challenge to gather evidence for the efficacy of these ‘methods’. So much else might vary in complex ways. Many of these variations would be difficult to pin down and measure... A comprehensive identification of all the variables that might be important in an exercise of this kind would be very hard to achieve”.

Not all recipes are bad such as, for example, the higher order recommendation to use “open questions” as a guiding principle for a teacher in a particular classroom context. What are needed are principles that are more flexible, leaving room for a teacher decision. Integration sets new objectives also for empirical research, but in essence a study could be more complicated to conduct in terms of its empirical design as the number of variables could be too high.

Shuell (1996) crystallises the situation in this way, “We are still a long way from having an integrated theoretical perspective that provides an adequate unified view of the ways we think and act.” This refers quite clearly to the practice of education, how teachers can use educational science in their work. The various facets of the teaching-learning process need to be studied in a more integrated manner (Shuel, 1993, 1996). Salomon (1991, 2006) speaks about the “systemic” approach when he refers to studies in which many factors in the whole system are taken into consideration in one study (also see Day, Sammons & Gu 2008; Korthagen, 2010). When conducting a systemic research it is assumed that elements are interdependent, inseparable and even define each other in a transactional manner. One change in a system changes everything else and thus leads us to study patterns, not single variables. In the classroom each component, event or action has the potential to affect the unit as a whole. In contrast, what Salomon calls the analytic approach assumes that the discrete elements of educational phenomena can be isolated for study, without changing other elements. In summary, the conclusions for integration are supported from the points of view of practitioner and the validity of the research results.

**The research task**

We face two kinds of problems (which are connected with each other): The problem of the teacher’s cognition and action, and the problem of educational research. The teacher often ponders how to operate in the decision-making processes of teaching. For him or her the collection of research on teaching appears as a fragmented and sometimes even conflicting whole which it is difficult to adapt to practical teaching situations. In the context of educational research this means that we have not been able to create a valid picture of the totality of the phenomenon. In other words, plenty
of empirical (qualitative and statistical) studies are appearing, but the general view one acquires from them is confusing. The situation is not essentially improved by the fact that there are meta-analyses or review articles in journals and handbooks. Ultimately, research is interested in the totality of the phenomenon because, to be valid, science requires that a process be examined in all its aspects. In this research context, this means that we focus on the interactive and systemic essence of the teacher’s cognitive decision-making process.

How does the teacher make wise pedagogical decisions concerning teaching? What are those decision-making processes which lead the learner to work so that their learning will progress? The objective of this study is to look for those cognitive routes taken by the teacher in the teaching process to promote learning and to evaluate if these routes are ideal (supporting target-oriented learning) or of little use from the point of view of developing the learner’s cognition. In reality, this is a matter of degree since the supporting significance of the teacher’s action varies both between the different situations and between the pupils of the learner group. The methodological challenge of this study is how to identify those routes among qualitative studies conducted in the research tradition of teacher cognition. This study attempts to test a method which would use as its source material the central concepts and research results of existing empirical studies. The statistical technique of meta-analysis is familiar to most and is relatively well suited for a comparative evaluation of consistent operations, such as factors related to learning products (for example, Hattie 2009). In a study of extremely interactive and complex thinking processes – such as the teacher’s cognitive decision-making processes here – it is probably suitable to use the new and creative methodology which follows human processes better than a meta-analysis.

A tentative solution: The conceptual system describing the relationship between teachers’ practical theory and teaching practice

One can present a conceptual system to describe the relationships between teachers’ cognition and their teaching practice: (1) teachers’ practical theories; (2) teaching scripts; (3) operational agendas; and (4) interactive thinking. These concepts form a dynamic continuum which can be used to consider the interactional and mutual relations between the different concepts involved in teacher cognition. The system incorporates both the current research findings on teacher thinking and actions plus components of theoretical descriptions produced over the last three decades.

Practical theory is the most abstract cognition in a conceptual system. It refers to teachers’ complex sets of understanding which they actively use to shape and direct the work of teaching (Elbaz, 1983, p. 3). Practical theory/knowledge includes values, attitudes and beliefs, as well as the emotional and moral elements of teaching (Johnston, 1994, p. 75). This kind of knowledge is personal, related to context and content,
often tacit, and based on (reflection on) experience (Meijer, Verloop & Beijaard 1999, p. 60). It is oriented to practice and tested in practice. Therefore, practical theory is both a realistic and idealistic framework for teaching: the teacher always has some ideals and goals and they also want to achieve these in teaching. Practical theory is not the opposite of theoretical knowledge or scientifically gained knowledge. Assuming that teaching is not merely a practical skill, teachers’ practical theories encompass a great deal of theoretical knowledge which is adapted to relevant teaching situations. A conception of teaching based on a theoretical orientation is again increasingly being found to be relevant, though it is often found in combination with a reflection on practical experiences. It is important that theoretical principles and teachers’ expertise ideally interact with and refine each other in a process of continuous development (Beijaard & Verloop, 1996).

When teaching is characterised as a complex cognitive skill (e.g. Leinhartd & Greeno, 1986), the nature of the teachers’ knowledge systems are central. On the other hand, the characterisation of teaching as an improvisational performance (Yinger, 1987; Borko & Livingstone, 1989) is based on the suggestion that a teacher begins their lessons with an outline, or plan, of the instructional activity and the details are filled in during the lesson as the teacher responds to what the students know and can do (Borko & Livingstone, 1989).

A script is a more concrete cognition. It is an overall plan for teaching a particular concept. It contains loosely ordered sets of goals concerning what the students are to learn, activities and examples to be used in teaching to achieve these goals. It also most likely contains a compendium of students’ misconceptions or learning difficulties in particular areas. As seen from this definition, the concepts of script and pedagogical content knowledge (PCK) are almost synonymous. Both can be generally applied to many teaching situations/lessons, but where a script is tailored to the totality of a classroom lesson, PCK is special knowledge which a teacher can utilise in making a script in order to effectuate teaching. Teaching scripts develop out of teaching experience and arise from teachers’ cognitive processes of knowledge, reasoning and action (Irby, 1992, p. 631; Putnam, 1987, p. 40). Plans and scripts are very central to teaching, although they are flexibly applied with little cognitive effort in circumstances that arise in the classroom.

When teaching, a teacher moves through their script, gathering information from the student performance cues to make minor adjustments in the instruction. The cognition concept that actually determines the teacher’s action in the classroom is the agenda. The agenda is the teacher’s mental and operational “on-the-spot-plan” for a particular lesson. It serves as a cognitive road map that provides overall direction for lessons. As it is a dynamic construction, it changes during the course of a lesson as the teacher obtains new information or as goals are added and removed. The script determines the overall structure of the agenda, and students’ performance cues together with the teacher’s knowledge concerning their students dictate
minor adjustments to the agenda. Many items on the agenda are specified implicitly by the teacher’s knowledge, rather than being worked out explicitly. Therefore, the conscious planning activity of teachers reflects only a small fraction of the planning activity that actually characterises skilled teaching (Leinhardt & Greeno, 1986, p. 76; Putnam, 1986, p. 40).

When obtaining and interpreting student cues and making larger or smaller changes to written or mental plans, the teacher needs intuitions coupled with on-the-spot thinking and decision-making. The *interactive thoughts* involved are the teacher’s cognitions underlying their observable actions. They are characterised as split-second thoughts, integrative in nature, tied to the specific context (i.e., the lesson), and closely connected to the teacher’s knowledge and beliefs on one hand, and closely to classroom practice on the other (Meijer, Zanting & Verloop 2000, p. 6; also see Paterson, 2007; Schepens, Aelterman & van Keer 2007; Toom 2006).

**Theoretical and empirical study of teaching as a starting point for the methodology: Towards an integrative theory**

Only a few comprehensive and empirical studies have analysed the various aspects of teacher cognition and its effects on teaching practice, hence the functionality of the conceptual system presented above is also uncertain. On the contrary, several individual studies concern partial relations, i.e., studies in which the research orientation is more analytic than systemic (see Salomon, 1991, 2006). In the teacher cognition tradition, these studies are mostly based on qualitative methodology. The purpose of the present article is to apply the theoretical-conceptual method, which utilises the teacher cognition concepts presented earlier here, to the construction of conclusive statements (also see Pitkäniemi, 2000). Briefly, the method requires that when elaborating this conceptual system it is essential to use the findings of previous empirical studies. These studies at least illuminate possible relations and effects that exist between teacher cognition and teaching practice. However, the way this is achieved is not similar to statistical meta-analysis, i.e., collecting similar studies in order to build a model of average results (see Haig, 1991). On the contrary, the purpose is to prepare main statements, which also calls for researchers to be creative in connecting various conceptual and empirical elements to form a single totality.

It is impossible to describe in detail here the foundation and characteristics of the methodological principles (see Pitkäniemi, 2000). However, a list of the principles that play a pivotal role in the conceptual construction of the main conclusions is provided below.

a) The investigation should be comprehensive enough to project the phenomenon and its elements. The research focus is more systemic than analytic.

b) The purpose is to conceive the phenomenon of research more through “chains” and “networks” than by only analysing individual relations, correlations and descriptive information.
c) The connections between elements of the constructed statements are more tightly rational, functional and categorical than loosely “correlational”.

d) It is impossible to construct all the connections between the elements of the statement based on empirical investigations; it will also be essential to use reasoning and creative thinking.

e) When modelling connections, it is possible to employ both quantitative and qualitative empirical research.

f) The contradictive results obtained by previous research sometimes pose challenges to users of this methodology. One potential reason for the different results can be the context, which varies between studies. In these cases, it will be necessary to analyse every existing result in relation to a main statement.

g) Context requirements need to be moderate; it will be difficult to apply this methodology in a research context which is too specific and narrow, i.e. where the amount of empirical studies is too minimal.

h) Finally, according to the previous principles, it is essential to use conceptual analysis and empirical studies interactively. Hence, both of these as well as researchers’ creativity and expertise in the special research area will assist in formulating the main conclusions.

Both approaches – philosophical and empirical – have their own different strengths in educational science. Philosophical analysis can quite easily give a larger perspective of a phenomenon, while empirical approaches also try to check the functionality of ideas at the practical level. This testing is not always conducted in a reliable and competent way because real validity requires that the researcher first make a comprehensive design, and then collects and analyses data based on this. Such a problematic situation – the division of investigations into distinct research focuses without explicit co-operation – is quite typical of studies within the teacher cognition paradigm. Studies exist which analyse teacher cognition, but do not investigate how the cognition is realised, i.e. practical theories or beliefs in practice (see Levin & He, 2008; Chant, Heafner & Bennet, 2004). Marcos and Tillema (2006) are interested in the linkage between thought and action in actual teaching. Their review research indicates that often there is less of a focus on actual practice because of a lack of research methods that cover practice. It is essentially critical of the cognitive paradigm if research does not concentrate on professional performance itself but rather on teachers’ beliefs and their reflections on action.

The methodology used in this study is an alternative and complementary approach: generally, sometimes the need exists to join disparate studies together; this is the case in the present research context. This methodology has been applied here in the context of teacher cognition research, and especially in the modelling of the complex and interactive relationships between teacher cognition (practical theory) and teaching practice. The aim is to find some special a) ideal routes and b) problematic routes between practical theory and teaching practice. These consist of routes which gradually transfer modes of operation step-by-step from teacher cognition into action. According to the methodology, a collection of empirical findings and conclusions based on these are offered, and then statements are presented.
Empirical findings on teacher cognition research, and the main statements

Teacher cognition can be divided into a more static part (practical theory, scripts) and a more dynamic one (operational agendas, interactive thinking). One can call the former “static cognition” and the latter “cognition for action”. Static cognition means that the teacher can think and ponder about teaching and school learning after and/or before a lesson. Cognition for action powerfully represents dynamic and interactive thinking, which changes and develops under the influence of two basic forces: static cognition and the classroom/teaching environment. Previous research results concerning the relations between teacher cognition and classroom interaction are summarised next. These give a general view of the basic assumptions underlining the conceptual system. In the research to date several partial relations between the teacher cognition concepts have been reported. In some studies an emphasis has been placed on the relationship between practical theory and teaching practice. In addition, the criteria for a “qualified” practical theory have been described. Results concerning how teachers use their knowledge base in planning their teaching are presented. The application of their plans to fit demanding interactions while teaching is also central to the development of a tentative theory. An outline of conclusions which utilises the results of the empirical research and the concepts of teacher cognition research is presented in this study. These concepts function in a meaningful way at the systemic level; each one (practical theory, script, agenda, interactive thinking) has its own role in the examination of the relationship between teacher cognition and classroom reality.

Practical theory and teaching practice

In the conceptual system, practical theory is a basis for teaching practice and a reference point for the other cognition concepts: it describes and organises the teacher’s knowledge and beliefs. Teachers use complex practical theories and personal beliefs as a framework when planning, interacting and reflecting on teaching (Cornett 1990; Cornett et al. 1990; Gatbonton 1999; He & Levin 2008; Kosunen 1994; Marland & Osborne 1990; Mitchell & Marland 1989; Moallem 1998). The beliefs, images and mental models that teachers hold about teaching and learning exert important influences on teaching practices and the extent to which changes can be made and sustained (Appleton & Asoko 1996; Briscoe 1991; Cronin-Jones 1991; Johnston 1990; Holt-Reynolds 1999; McRobbie & Tobin 1997; Strauss et al. 2000; Thomas & McRobbie 1999; Tobin 1990; Tobin & Tippings 1996). A practical theory should be explicit because only then is it possible to evaluate it in relation to the aims and objectives of the curriculum and the school’s education policies. The development of practical theories and improving teaching practice presupposes the explication of implicit theories (Briscoe 1991; Cronin-Jones 1991; Cornett et al. 1990; Lyons et al. 1997; McRobbie & Tobin 1995; Munby & Russell 1990; Ritchie (1999; Ritchie et al. 1997; Van Driel et al. 1998). Further, in research contexts it is possible to make an implicit
theory explicit, and to analyse its profundness, extensiveness, multidimensionality, coherence and target orientation.

In the teacher education context, many findings underscore the importance of early field experiences bringing substantive feedback during the time student teachers are developing their skills (Melnick & Meister 2008). Discussions with colleagues and mentors are also essential. For example, asking questions after lessons, especially “why” questions, can be useful to elicit part of the mentors’ practical knowledge (Zanting, Verloop & Vermunt, 2003). Teachers who have changed their beliefs in a direction congruent with the aims of the recent educational reforms have quite often reported experimentation with colleagues’ teaching methods (Meirink, Meijer, Verloop & Bergen, 2009). These researchers conclude that teachers learn by exchanging ideas, experiences and teaching methods with colleagues in combination with experimentation in their own practice with alternative methods, and deliberative evaluation of this experimentation. In another study in the Netherlands, student teachers report they had been able to partially elicit their mentors’ practical knowledge (Zanting, Verloop & Vermunt, 2001). It was concluded that the use of two techniques, concept mapping and completing sentences, seemed relevant for student teachers’ learning processes. Researchers summarise that student teachers’ beliefs, mentor teachers’ practical knowledge, and scientific knowledge can be connected and critically elaborated on when these three sources are compared intentionally and systematically.

In teacher education it would be a challenge for student teachers to develop a cognitive lens for analysing teaching-learning processes. But, according to the tentative findings of Eilam and Poyas (2009), a study including an intervention period, this seems possible. Further, teacher education, including teaching practice, can support a student teacher’s pedagogical knowledge; i.e., student teachers’ practical knowledge evolves towards more pupil-oriented knowledge and towards the characteristics of practical knowledge that concentrate on pupil learning and understanding (Schepens et al. 2007). The findings of the study support the conclusion that student teachers in an innovative arrangement make more progress during teaching practice than student teachers in a traditional arrangement. In another study from the Netherlands, Buitink (2009) underlines the positive effects of school-based teacher education. The results show that all student teachers developed broad, well-structured practical theories that focused on pupils’ learning processes. Because the focus on pupils’ learning usually occurs later, teachers at this early stage are in a good phase of professional development: expert teachers are typically interested in pupils’ learning and how to support it. Buitink concludes that the organisation of the learning environment for student teachers will probably be essential: “...the institute lectures and the coaches in the schools agreed on the fact that developing a practical theory is important and that merely adaptation to everyday teaching practice had to be avoided” (p. 126).

Educational research and theoretical knowledge are central resources in developing appropriate practical theories and teaching practice (Even 1999; Kvernbekk 1999;
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Munro 1999; McRobbie & Tobin 1995). One critical question concerns how qualified mentors actually are; i.e., how well they can relate their explicated teacher knowledge to formal theories (see, Verloop, van Driel & Meijer, 2001). Empirical studies indicate that student teachers and in-service teachers utilise educational research as a source (Kennedy 2002; He & Levin 2008). To summarise, the challenge of teacher education is how to connect formal (theoretical) knowledge and practical teacher knowledge. It might be proposed that this needs co-operation between university teaching and practicing teaching at school (see Thiessen 2000, “practically relevant propositional knowledge” at university, and “propositionally interpreted practical knowledge” in schools, p. 530).

Another question is how can we care about the development of the practical theories of experienced teachers, and how experienced teachers would learn ideally (see Meirink, Meijer & Verloop, 2007; Zwart, Wubbels, Bergen & Bolhuis, 2007; Hoekstra, Beijaard, Brekelmans & Korthagen, 2007).

The practical theory of an experienced, expert teacher is usually in congruence with his/her teaching practice (Aaltonen 2003; Artzt & Armour-Thomas 1999; Marland & Osborne 1990; Mitchell & Marland 1989; Ritchie 1999). For example, an expert teacher will exhibit a real connection between teaching ideals and teaching practice. Expert teachers can predict their students’ achievement better than novices working in the same classroom (Berliner 2001). At least sometimes the instructional practice of a novice teacher has been found to be inconsistent with their expressed practical theory or pedagogical image (Artzt & Armour-Thomas 1999; Fung & Chow 2002; Mellado 1998; Pitkäniemi 1998; Smith 2007; Wilson et al. 1994), but some studies have indicated congruence as well (Ryan 2003; Sweeney 2003). Teachers who lean heavily on professional development possess an extensive and well-argued theory that consists of a wide variety of ideals for school education. The internal consistency of teachers’ practical theories is not always complete: dissonance exists by virtue of the dilemmas which arise from conflicting values and beliefs (Appleton & Asoko 1996; Briscoe 1991; Marland & Osborne 1990; Tobin 1990, 1993). In addition, the practical knowledge of some teachers is not as elaborate as others: teachers whose practical knowledge seems to be limited seldom think about their teaching and therefore lack a deep understanding of what is going on in their classroom, in their students’ minds, and in their students’ environments (Meijer et al. 1999).

Expert teachers are not necessarily better than novices, e.g. the VITAE results challenge the traditional stage theory which conceptualises teachers’ professional development from novice to expert (Day, Kington, Stobart & Sammons 2006; Gu & Day, 2007; Sammons, Day, Kington, Gu, Stobart & Smee 2007), and no evidence of a linear association between years of experience and teachers’ relative effectiveness has been found. Many teachers’ conceptions of teaching and learning are based on a narrow view, although they are very experienced. It could be argued that a teacher also needs stimuli for professional development other than factors inside her/his
Accordingly, my first main conclusion is that a teacher needs a tested and functional, i.e., a congruent, practical theory which at the same time is influenced by factors “outside her/his own classroom”. Stimuli for this development can come from resources such as educational research, mentors, colleagues, educational books and journals, and in-service teacher education.

a) Cases where there is no congruence between practical theory and teaching practice are problematic. For example, a teacher may have quite a modern conception of teaching and learning, yet this may not be apparent in her teaching. Non-congruence also exists when a teacher has no suitable pedagogical content knowledge for teaching or no profound subject matter knowledge. Pedagogical content knowledge with respect to various specific topics constitutes a vital element of a teacher’s knowledge base which enables them to teach specific topics effectively and flexibly in situations that are subjected to different contextual, situational and personal influences (Gudmundsdottir 1991; Gudmundsdottir & Shulman 1987; Hashweh 2005; Holt-Reynolds 1999; Van Driel et al. 1998). As well, several recent articles have described the interrelations between pedagogical content knowledge and emotional knowledge in teaching and learning (McCaughtry 2005; Zembylas 2007). Expert teachers have built up topic-related pedagogical content knowledge or scripts, which include stores of powerful explanations, demonstrations and examples for representing subject matter to students; novice teachers must develop these representations as part of the planning process for each lesson (Berliner 2001; Borko & Livingston 1989; Fernandez-Balboa & Stiehl 1995; Meijer et al. 2002; Putnam 1987; van Driel et al. 1998). Previous research has also shown that teaching experience can lead to growing pedagogical content knowledge; i.e., experienced teachers in general have a great deal of the specific knowledge which is peculiar to teaching professionals. However, these teachers will not develop a useful knowledge base for teaching if they are not receptive to new ideas and eager to learn a variety of new routes to support student learning. b) Therefore, the second problematic type is when there is congruence between practical theory and teaching practice, but at the same time the practical theory is not grounded in educational research and in the wide variety of educational/instructional objectives of the curriculum.

Script, agenda, interactive thinking and teaching practice

A teacher’s practical theory, which is static and develops slowly, is a basis but not an adequate framework for the high-quality teacher actions required in interactive teaching. Subsequently, it will be necessary to examine theory in relation to the dynamic part of cognition and the actions of a teacher. To produce high-quality teaching a teacher must transform her/his practical theory into actions. As presented above, ideal teacher action requires scripts and agendas which work in concert with a teacher’s practical
theory. The appropriate integration of the components of teacher knowledge is a crucial ingredient of teaching success (Borko & Livingston 1989; Brown & McIntyre 1993; Fernandez-Balboa & Stiehl 1995; Marks 1990; Meijer et al. 2000; Putnam 1987). In making a script, a teacher usually uses pedagogical content knowledge. Otherwise, inexperienced teachers must do more actual planning and construct analogies, examples or demonstrations to use in teaching (Hashweh 2005). The transforming of practical theory into ideal teaching practice also requires that the teacher takes account of the cues students offer during actual teaching. This will only be possible when the teacher has a wide variety of mental routes, such as mini-plans for teaching, images, and of course an innovative attitude to the development of teaching. Again we can conclude that ideal teacher action will be realised when a teacher’s script and agenda support the actualisation of teaching. However, this is not always possible. In very demanding teaching situations teachers need to respond to their students’ cues in order to choose another plan of action (agenda) and to sometimes make spontaneous decisions in order to cope with the teaching situation. According to the empirical findings, teachers apply their personal practical knowledge in making their interactive decisions. On the other hand, in the classroom teachers have been found to not always refer to their personal practical knowledge: only about half of the interactive decisions made were guided by pre-service, non-native ESL teachers’ personal practical knowledge (Tsang 2004). The eventual goal for ideal teachers is that they can match their actions with the best realisation of the educational aims. Expert and novice teachers have differences in tailoring their pre-developed plans: experts monitor student learning, adapt their lessons to student needs, change instructional strategies when necessary, and always move towards the attainment of their goals (Borko & Livingston 1989; Brown & McIntyre 1993; Cleary 1993; Irby 1992; Kosunen 1994; Marland & Osborne 1990; Mayer & Marland 1997; Moallem 1997; 1998; Putnam 1987; Sullivan & Leder 1992; Westerman 1991).

Therefore, the second main conclusion is that a teacher usually needs – in addition to practical theory and scripts – cognition for action, i.e., an agenda along with interactive thinking in order to realise ideal teaching. However, a teacher does not always use all of the cognition levels in teaching. In this case, a teacher’s theory, routines and mental plans are realised without minor or substantial modifications and, because the requirements for environmental hints are not challenging for the teacher, high-quality teaching can be implemented. Ideal teaching usually cannot proceed so easily: in a typical teaching situation the teacher cannot know beforehand exactly what previous knowledge the students in class have of a topic to be taught. This reality of teaching often makes it difficult to implement teaching according to the mental plans. But there are also situations in which the implementation of teaching according to teaching plans can seemingly lead to classroom processes where teachers and students work in an inappropriate way; i.e., what the students learn is not in accordance with the teaching aims.
It is therefore imperative that teacher-student interaction does not have this sort of information gap. This means, for example, that the teaching materials are suitable and fit the mental processes of the students so that they support their learning processes. On the other hand, minor conflicts or gaps can offer challenges for the development of student learning; the concept of teaching that is not always “easy” is put forward by McEwan (2001). In essence, the second main conclusion means that a teacher must always proportion the objective of instruction to the process properties of actual teaching and, while doing this, teachers have to work within the different levels of the cognition system. In many cases this means modifications or changes to the original teaching plans. But these changes of original plans do not mean that teachers must abandon the ideals of teaching. Actually, in the ideal case, the teacher must re-organise his/her mental plans to find alternative ways to achieve the original objective. While making these modifications, they construct a new schema. All of this mental work leads to an ideal case where teachers’ “cognition for action” can function better and hence they will encounter their students’ actual cognitions.

The following three options lead to problems in the area of “cognition for action”: a) problems will lead to more and more difficulties when there are no scripts and agendas; b) the constructed scripts and agendas do not contribute to teaching which is in harmony with the objectives of the teacher’s practical theory; and c) the teacher has valid scripts for teaching, but uses them in a mechanical and unidirectional way – the teacher does not take the actual “student cues” into consideration. Here the teacher does not know how to modify his/her teaching so that it can engender harmony between the instructional objectives and the plan of action. This situation is usually a consequence of having only a limited number of mental routes in teacher thinking. It could be argued that all of the problems mentioned above can lead to non-congruence between teachers’ practical theory and teaching practice. As a result, the teaching process is not in harmony with the curriculum because all cognition levels are not taken advantage of in instructional decision-making.

The main conclusions and their significance

In this study using principles of a methodology which combines the “empirical” and “conceptual”, it was possible to outline some main conclusions. The ideal relationship between teacher cognition and teaching practice can be presented in two main theses. The first asserts that there must be congruence between practical theory and actions in teaching processes. In addition, because practical theory forms the starting point of all congruence evaluations it must be based on a teacher’s multifaceted and in-depth internalisation of a curriculum and the key results of educational research. But how will this congruence be achieved? It is possible to derive the answer from the second main statement: Target-oriented teaching needs the involvement of all levels of the conceptual system, at least when it is undertaken in complex conditions.
The problem is how to transform the interpretation into the unique contexts of learners. This calls for a tailoring of the teaching process to the students so that the student-teacher encounter will be meaningful and thus promote student learning. The student is one of the most powerful factors to be taken into consideration in lesson planning and teaching practice. There is sometimes real harmony between the student and the instructional objectives. The teaching aims “are alive” in the real context of classroom interaction. On the other hand, it is not hard to discover temporary situations where the instructional aims and the practice of teaching make the encounter problematic. It is not “bad” teaching as such, but typically it is “a struggle” that takes place between the levels of ideal and reality. The profession of teaching is therefore quite complex and demanding.

Teaching is sometimes thought of as a “going forward” activity because it proceeds mainly according to teaching plans. Planning teaching at both the general and lesson levels is an essential part of the work of expert and novice teachers. The plans have a substantial effect on what happens in the teaching process, how the students work and the eventual quality of student learning. According to the conceptual system described above, practical theories and scripts make the teaching; i.e., they determine its structure and content. In one imaginative alternative the teacher may not need an agenda and his/her teaching proceeds as planned without any need to make changes in the activities. But sometimes this is impossible. If the teacher is skilful, they can make changes which are not only based on haphazard and intuitive decision-making, but are constructed using multi-faceted observations of classroom life, i.e., perceptions of student participation and work and conclusions drawn from his/her observations. Allegorically, this activity can be described through the concept of “reversing”. Later, a teacher will make a new plan for work, an agenda in order to again move “forward”.

Within the framework of educational philosophy, McEwan (1989, 1992) has examined the concept of teaching “as an interpretation of text”. This view corresponds quite well to the essence of the cognition system: the teacher must interpret the text so that the students become cognisant of the subject matter, i.e., they become capable of making interpretations. The starting point of McEwan’s conception is that there is always a “text” or content which asks for someone to make interpretations of the original text. The teacher can help students in this process, but eventually one of the main purposes of teaching is to help students make their own interpretations independently. However, the basic purpose of education can also be conceived in the opposite way, as McEwan (2001, 258) suggests in one of his essays:

“I wish to argue, however, that these two contrasting themes – making things easy and making things difficult – though they may seem contradictory, are essential to understanding educational processes. They represent, as it were, two essential parts of the same educational processes. The facilitator can only facilitate if the material is difficult, relative to the learner. It would be an unnecessary task to facilitate easy
material. Making the curriculum difficult, or more challenging, is the proper role of the teacher, in the latter case.”

The claim presented by McEwan thus offers insights into the aims and purposes of education and teaching. While the conceptual system presented in this paper does not make any claims with respect to these ultimate functions of teaching/education, it also does not conflict with this latter conception suggested by McEwan. The teacher also – and maybe especially – needs all of the cognition concepts (practical theory, script, agenda, and interactive thinking) when, as in McEwan’s words, they want to “present a challenge or offer the students an experience that disrupts their equilibrium and leads them to look at things more deeply (p. 265)”. McEwan’s essay reminds us of the multi-faceted goals of teaching: making things easy should not be its only function. On the contrary, an essential purpose of teaching is to present students with challenges, and with problems to solve, as well as inspire thoughtful discussions.

This kind of work in teaching also provides the students with models of how to acquire new knowledge, and hence the teaching process itself mediates a more realistic attitude to scientific knowledge than traditional, authority-based modes: there is no valid knowledge without research work done by a diligent individual. This aspect connects the process of constructing scientific knowledge and the educational process; it is important for the learner community that the criteria of scientific knowledge be discussed in teaching. It is in this way that the teaching process does not bring with it a gap between the learner audience and the audience of researchers.

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