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# Teacher Professional Development for Improving Quality of Teaching

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# Preface

Five years ago, we published the first results of our joint efforts to understand quality of teaching by searching for grouping of factors concerned with teacher behaviour in the classroom. Results reveal that teaching skills can be grouped into five types of teacher behaviour, which are clearly distinguishable and move gradually from skills associated with direct teaching to more advanced skills concerned with new teaching approaches and differentiation of teaching. Teachers exercising more advanced types of behaviour were found to have better student outcomes. A question that arises from our first study is whether stepwise development of types of teacher behaviour can be achieved and, if so, what type of programmes of teacher professional development should be offered in order to improve teacher effectiveness. To further elaborate on these issues, we investigated acquisition of teaching skills over time and examined critically research on teacher training and professional development. It was found that research on effective teaching was not systematically used in the development of programmes for teacher training and professional development. At the same time, researchers in the area of educational effectiveness have concentrated on identifying factors operating at different levels within the system but not on finding out how to improve the quality of teaching through teacher training and professional development programmes.

Each of us has experience in both teaching and teacher training, and we strive to promote quality of teaching by making use of the results of teacher effectiveness research in our courses. For this reason, two of us have developed a theoretical model that attempts to establish links between research and improvement. In this book, we elaborate further on this attempt by concentrating on how this theoretical model can be used to develop a dynamic approach to teacher training and professional development. We also present results of studies showing that this approach can help teachers improve their teaching skills and move gradually from simple to more complex types of teacher behaviour encompassing specific teacher competences.

For this purpose, the first part of this book provides a critical review of research on teacher training and professional development and illustrates the limitations of the main approaches to teacher development such as the competency-based and the holistic approach. It is argued that we may have to guard ourselves against narrowing

down the discussion to this classical dichotomy relating to content and develop an integrated approach to teacher professional development that will be focused on an improved way of grouping factors associated with teacher behaviour in the classroom. For this purpose, not only should reflection and understanding of practice be encouraged but research on teacher effectiveness should also be taken into account.

The second part of this book provides a critical review of research on teacher effectiveness. The main phases of this field of research are analysed. It is shown that teacher factors are presented as being in opposition to one another. Thus, an integrated approach to defining quality of teaching is adopted. Another significant limitation of this field of research is that the whole process of seeking to identify teacher effectiveness factors had no significant effect upon teacher training and professional development.

For this reason, in the third part of this book, it is advocated that teacher training and professional development should be focused on how to address the groupings of specific teacher factors associated with student learning and on how to help teachers improve their teaching skills. The use of an evidence-based and theory-driven approach to teacher training and professional development is also promoted. Specifically, we argue that the dynamic model of educational effectiveness can be used to establish such an integrated approach by combining research on teacher effectiveness with that on teacher training and professional development. The main characteristics of this dynamic integrated approach are also described. In addition, we refer to studies illustrating how this approach can be used in developing the policy and practice of teacher professional development, and we provide evidence supporting the validity of the theoretical framework upon which this approach is based. Moreover, experimental and longitudinal studies supporting the use of this approach for improvement purposes are presented.

This book concludes with a chapter which discusses the viability of the dynamic approach to teacher training and professional development and provides suggestion for the further development of our proposed approach. Implications for policy and practice are also drawn.

In the writing of this book, we received support from many colleagues, professionals in schools and our families. We would like to make a special mention of some of them. The research assistants in our research group, and especially our Ph.D. students, provided us with comments from the perspective of young researchers in the field of educational effectiveness and improvement. Evi Charalambous helped us in the production of the manuscript, and Sheila M. Hakin supported us in the process of linguistic editing. They did this not only from a strictly linguistic perspective but were also critical in helping us to clarify the meaning of this book. Finally, our three universities were supportive in facilitating our academic efforts to write this book. We would like to thank them all for their help, and we hope that they will be pleased with the final product. Of course, any mistakes that remain are ours.

As mentioned previously, this book is a report of the journey we have undertaken in studying teacher professional development by integrating research on teacher

training and professional development with research on educational effectiveness and the development of a dynamic approach. We welcome comments, criticisms and contributions to further development and research from readers with different perspectives on education. We hope that you will join us on our journey towards the establishment of an evidence-based and theory-driven approach to teacher training and professional development.





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# Part I

## Research on Teacher Training and Professional Development

The first part provides a critical review of research on teacher training and professional development. This field of research is shown to have been dominated by two different and rather opposing approaches: the competency-based approach and the reflective approach. These two approaches are described in Chaps. 2 and 3, respectively, and their strengths and weaknesses are discussed. In Chap. 4, it is argued that we may have to guard ourselves against narrowing down the discussion to this classical dichotomy related to content and develop an integrated approach to teacher professional development that will focus on improving the grouping of factors associated with teacher behaviour in the classroom. For this purpose, not only should reflection and understanding of practice be encouraged, but research on teacher effectiveness should also be taken into account.

# Chapter 1

## Towards the Development of a Dynamic Approach to Teacher Professional Development

### Introduction

Teacher training and professional development are considered essential mechanisms for enhancing teachers' content knowledge and developing their teaching practices in order to teach to high standards (Cohen & Hill, 2001; Darling-Hammond & McLaughlin, 1995; Smith & O'Day, 1991). Over the recent years, the demand for improved quality of teaching and learning and for increased accountability and higher academic standards has put issues related to effective professional development high on the agenda of educators, researchers and policy-makers. Professional development is usually used in a broad sense, frequently encompassing 'all types of learning undertaken by teachers beyond the point of their initial training' (Craft, 2000, p. 9). According to Guskey (2000), the term refers to those processes, actions and activities designed to enhance the professional knowledge, skills and attitudes of teachers so that they might, in turn, improve the learning of students.

Despite the recognition of its importance and the pressures emanating from high stakes accountability systems, most professional development opportunities remain fragmented, poorly aligned with curricula and inadequate to meet teachers' needs (Borko, 2004; Cohen & Hill, 2001; Corcoran & McDiarmid, 2000). In this context, each year, schools, districts and educational systems spend a considerable amount of money and resources on in-service seminars and other forms of professional development, which are intellectually superficial and do not take into account what we know about effective teaching and how teachers could better learn and implement such practices (Ball & Cohen, 1999; Kyriakides, Creemers & Antoniou, 2009; Putnam & Borko, 1997). At the same time, educational reform movements around the world are setting ambitious goals for student learning (Borko, 2004). However, although teachers generally support high standards in teaching and learning, many teachers are not prepared to implement teaching practices based on such standards (Cohen, 1990; Elmore & Burney, 1996; Elmore, Peterson & McCarthy, 1996; Grant, Peterson & Shojgreen-Downer, 1996; Sizer, 1992). This is exactly why there

is now more than ever the need to support and guide teachers to respond effectively to the growing demands of increased accountability and the need to raise student learning standards by developing effective professional development programmes that can promote change in classroom practices (Ball & Cohen, 1999; Fullan & Miles, 1992; Putnam & Borko, 1997; Spillane, 1999; Wilson & Berne, 1999).

Although researchers are beginning to examine the effects of professional development on teaching and learning, few studies have explicitly compared the effects of different approaches to professional development (Garet, Porter, Desimone, Birman, & Yoon, 2001). Thus, there is a clear need for new, systematic research on the effectiveness of alternative strategies in relation to professional development. This is also stressed by the USA National Research Council, supporting in a research review the need for more research studies to determine the efficacy of various types of professional development activities (Bransford, Brown, & Cocking, 1999). In this context, it is acknowledged that in the literature of teacher professional development, there exist a variety of views on the methodology, structure and philosophical perspectives of different approaches to teacher training and professional development and the role of teachers in the developmental process (Day, 1999; Hargreaves, 1994).

In particular, Zeichner (1983) was the first to identify and describe the four representative paradigms in teacher education and professional development. He defines paradigm as a 'matrix of beliefs and assumptions about the nature and purposes of schooling, teaching, teachers, and their education that gives shape to specific forms of practice in teacher education' (p. 3). The first is the traditional *craft paradigm*, an apprenticeship model, focusing on the accumulation of wisdom, based on the field experiences of teaching involving the trial and error of practitioners. The second paradigm is what Sprinthall, Reiman and Thies-Sprinthall (1996) call the *expanding the repertoire* paradigm. The focus of this approach is less on highly explicit and discrete instructional strategies and teaching skills and more on the acquisition of comprehensive instructional models of teaching, like direct instruction (knowledge transmitter model), inductive inquiry and interpersonal approaches to learning. Then, predominant in teacher education is the *competency-based paradigm* also known as the *expert paradigm*. Based on a technical production metaphor and positivistic epistemology, this paradigm focuses on mastery of knowledge and teaching skills identified by expert academics and university researchers. Finally, opposing the *competency-based paradigm* is the *inquiry-oriented paradigm*, also known as the *holistic or reflective paradigm*, which is more like a metaphor of liberation. This paradigm emphasises the development of teachers' capacity for reflective action through an examination of the moral and political implications of their teaching.

Other analytical frameworks also exist with underlying principles similar to the ones identified by Zeichner (1983). For example, Tanner and Tanner (1990) distinguish between a traditionalist and a progressive movement. The traditionalist movement is based on an economic model in which the function of education is conceived of as the transmission of the culture (a conception from which the academic tradition originated), which is assumed to remain unchanged and permanent.

From this perspective, the functions to be performed by teachers and the content to be transmitted to students are predetermined, and teaching is based on authority and discipline, which reminds us of the main principles of the competency-based approach (CBA). The progressive movement, a reaction to the traditional approach to education, has its origins in the emergence of science as a means to develop educational knowledge but also in the idea that people create and develop their own knowledge and culture and that education should serve the process of transforming society (Kliebard, 1986); this resonates with some of the elements of the holistic approach (HA) to teacher professional development.

The CBA has had a significant effect on teacher training and development from the 1980s onwards, both in terms of development needs (e.g. Further Education National Training Organization, 2001) and the methodology used in teacher training and professional development programmes (Brooks, 2002; Last & Chown, 1996). In this context, competences and standards for teachers can be found nowadays throughout the developed world (Christie & O'Brien, 2005). Such standards refer to competences expected at different stages of a teacher's career and provide a framework for the development of teacher professional development programmes. On the other hand, the dominant approach nowadays to teacher training and professional development is that of reflective practice (Golby & Viant, 2007). This approach refers to various practices, ranging from reflection as a component of skill and a means of fostering effective teaching to reflection as a heightening of one's awareness of social justice in educational practice. At the same time, the holistic nature of this approach refers to a certain vagueness in relation to the content of teacher reflection, which may include all skills, attitudes, perceptions, motivation and moral disposition associated with teaching and learning (Cruikshank & Metcalf, 1990; Feiman-Nemser, 1990). Thus, the next two chapters of this book describe the two dominant approaches to teacher professional development and elaborate on their strengths and weaknesses.

Nevertheless, many researchers in the field of teacher professional development are critical of the eclectic approach often reflected in teacher education programmes since elements of these traditions are combined in different ways (e.g. Donmoyer, 1996). Merging elements of different paradigms are also supported by Zeichner (1983) himself who argues that these traditions are not uniform, that they overlap and contain contradictions and tensions but that the principles that underlie them are helpful in analysing the implications for teacher education and teaching in general. Thus, in the fourth chapter of this book, we argue for the need to develop an integrated approach by merging elements of the two dominant approaches to teacher professional development in order to overcome their main weaknesses and enhance their potential to make a significant impact on teaching practices and student learning. In particular, it is argued that reflection needs to be predicated upon something to think about (Zeichner, 1993). That is, there must be content which is clearly related to teaching skills to address the needs of different groups of teachers, supported by validated theoretical frameworks. At the same time, teachers' critical reflection in relation to these teaching skills should be encouraged. Thus, both teacher experiences and critical reflection and the knowledge base of

educational effectiveness research (EER) revealing groupings of teaching skills, should constitute the major elements of teacher training and professional development programmes.

Apart from the philosophical perspectives and the methodology to be employed, in our efforts to develop an effective professional development programme, we also need to clarify that such programmes could have various targets related to teacher knowledge and practices. A useful schema to help us overview the variations of such knowledge and practices has been proposed by Shulman (1987), who identifies seven types of teacher knowledge: pedagogical knowledge, content knowledge, curriculum knowledge, pedagogical content knowledge, knowledge of learners and their characteristics, knowledge of educational contexts ranging from the workings of the groups or classroom, the governance and financing of school districts to the character of communities and cultures and finally, knowledge of educational ends, purposes, values and of the philosophical and historical bases of education. Among these categories, this book focuses on how we could effectively develop teachers' pedagogical knowledge. Pedagogical knowledge goes beyond knowledge of subject matter to that required for effective teaching. From this perspective, it relates to teacher behaviour in the classroom that can maximise student learning gains. This is important, as identifying specific practices, fundamental to supporting student learning, is at the heart of building an effective system for the professional training and development of teachers (Ball & Forzani, 2011).

However, a review of the literature reveals that, despite the amount of studies on teacher training and professional development, the vast majority of these seem to ignore the results of EER, which describes exactly how teacher factors and teaching skills contribute to student learning. Since every effort to train teachers inevitably refers to what an effective teacher is or how an effective teacher should behave in the classroom in order to maximise the learning potential of the students, we argue in this book that teacher professional development programmes should be linked to the results deriving from research on teacher effectiveness. This argument was put forward three decades ago but was not developed further, either for research or for policy purposes. Specifically, Gage (1978) claims that research on teacher professional development and on teacher effectiveness has been conducted separately and with little reference to one another. In addition, Katz and Raths (1984) support that very few investigators of training methods have rationalised the content of the professional development programmes by taking into consideration research on teaching effectiveness and very few have evaluated the impact on student learning of the teaching skills they developed. At the same time, researchers on teacher effectiveness have spent little time speculating about the methods that might be used to develop teaching skills that were found to be associated with student outcomes. Three decades after the publications by Gage (1978) and Katz and Raths (1984), very similar conclusions about research on teacher education were drawn by the AERA panel on research in teacher education (Cochran-Smith & Zeichner, 2005). This mutual isolation is particularly unfortunate for anyone attempting to draw implications for teacher education and professional development from research on educational effectiveness. It can be claimed that research on teacher training and



development should increasingly take into account the results of research on teacher effectiveness, addressing the skills and competencies that are found to contribute to student learning.

## **The Rationale of a Dynamic Approach to Teacher Professional Development**

This book supports the development of a dynamic approach to teacher education and professional development which could make a contribution towards merging the findings of EER with the initiatives to improve education in general and particularly teacher training and professional development. Since EER aims to identify factors associated with student achievement, we make use of the available knowledge base to identify those factors that are found to be associated with student achievement. Although there are many different approaches to learning, such as the direct active teaching approach (Joyce, Weil & Calhoun, 2000) and the new learning approach (Schoenfeld, 1998), which refer to different skills that teachers need to develop, the proposed dynamic approach is based on the assumption that an evidence-based approach to teacher training and professional development should be adopted. Rather than focusing on a specific approach to teaching, teacher training and teacher professional development should be concerned with developing those skills that are found to be associated with successful learning outcomes, irrespective of the approach from which they are derived.

The second essential characteristic of the dynamic approach has to do with the fact that teacher factors concerned with teacher behaviour in the classroom are related to each other. In this context, the concept of grouping of factors has been proposed (see Creemers & Kyriakides, 2008b) in an attempt to establish more comprehensive improvement strategies. Thus, teacher training and professional development should not be concerned with the development of isolated teaching skills but with different types of teacher behaviour that address specific groupings of teacher factors. Recent studies have revealed the types of behaviour that need to be developed and have been found to be associated with learning outcomes (Antoniou & Kyriakides, 2011; Kyriakides et al., 2009).

Thirdly, the dynamic approach takes into account the importance of recognising the fact that each teacher/group of teachers has specific needs in terms of improvement, implying that the content of the teacher training and professional development will vary accordingly. This suggests that teachers with the same profile (i.e. teaching experience, initial training qualifications, duties) may have different needs and priorities for improvement and may need to concentrate on working towards the development of different skills. In order to identify the priorities for teacher improvement, at the outset, data about teacher behaviour in the classroom should be collected and factors that need to be addressed and further developed should be identified.

Fourthly, it is acknowledged that teachers should be actively involved in their professional development courses and should have a clear understanding of how the

factors addressed will have an impact on student learning. For example, in training courses on improving classroom management, teachers need to understand that the factors addressed are related to the effective use of teaching time, which is always limited. Therefore, students' engagement, which determines learning outcomes, could be increased by improving teachers' skills associated with these factors. This implies that we should use the knowledge base of EER in order to design professional development programmes which aim to help teachers understand the importance of teacher factors and develop the skills associated with these factors. Specifically, the conceptual framework provided by the dynamic model of educational effectiveness (Creemers & Kyriakides, 2008b) is used for teacher improvement purposes. In this context, this book promotes the establishment of strategies for teacher professional development which place emphasis on the evidence stemming from theory and research. Thus, the value of a theory-driven approach to teacher training and professional development is stressed. The need to collect multiple data about the skills of teachers in order to identify their improvement priorities is also emphasised. In this way, it is argued that a theory-driven and evidence-based approach to teacher training and professional development should be established.

Fifthly, a distinctive feature of the dynamic model, which is used as the theoretical framework of the proposed dynamic approach to teacher training and professional development, is that it not only refers to factors that are important in explaining variation in educational effectiveness but also attempts to explain why these factors are important by integrating different theoretical orientations of effectiveness (Heck & Moriyama, 2010; Hofman, Hofman & Gray, 2010; Sammons, 2009). In this way, teachers could become aware of both the empirical support available related to the factors involved in their developmental programme and the way these factors operate within a conceptual framework. Through this approach, teachers are offered the opportunity to utilise in a flexible manner the existing knowledge base on effective teaching, adapt it to their specific needs and develop their own strategies and action plans for improvement. Thus, the dynamic approach is neither based on improvement prescriptions or predetermined requirements for teachers to follow in order to improve their skills nor on relying solely on teachers themselves to identify exclusively what can be done, and how, in order to improve the quality of their teaching. The dynamic approach provides teachers with the opportunity to identify their improvement needs and makes use of the available knowledge base in order to develop their action plans for the purpose of improving their teaching skills.

Sixthly, the dynamic approach supports the view that the advisory and research team, which is responsible for the coordination and the general provision of the developmental programme, has an important role in facilitating and supporting teachers in their efforts to develop and implement their action plans in their classrooms. Thus, it is not expected that teachers should make use of the available knowledge base of effective teaching to design their own action plans without discussing and exchanging views with the advisory and research team (A&RTeam) responsible for coordinating the developmental programme. This implies that the A&RTeam is expected not only to monitor or facilitate the training meetings but also to coach teachers in utilising the knowledge base of EER and support them

on a systematic basis. Another related crucial element of the dynamic approach is that the A&RTeam should also support teachers to establish formative evaluation mechanisms and collect data on the effectiveness of the programme throughout the improvement process.

Seventhly, monitoring the implementation of teacher action plans in classroom settings is an essential part of the dynamic approach to teacher professional development. During this procedure, teachers are expected continuously to develop and improve their action plans on the basis of the information collected through formative evaluation. Critical reflection on the implementation of the action plans is also an important aspect of formative evaluation. It is important to stress that critical reflection and collaboration with peers are important elements in all aspects of learning and throughout the improvement process. Thus, the dynamic approach seeks to initiate changes in educational practices by encouraging teachers systematically to reflect on their teaching practice and to work with other teachers throughout the whole curriculum in order to improve the effectiveness of existing practices and assist in the development of new ones, based on the grouping of factors included in the dynamic model of EER and their particular priorities for improvement. For example, teachers could be encouraged to keep their own reflective diaries in order to identify ways to improve their action plans. At the same time, the A&RTeam should help teachers collect additional data from other sources and test the internal validity of their evaluation mechanism by comparing such data. In this sense, the dynamic approach is also concerned with whether, and to what extent, teachers can develop their teaching skills and integrate them into a more self-consciously articulated model of classroom pedagogy.

Finally, the dynamic approach also refers to the importance of conducting summative evaluation in order to identify the impact of the developmental programme on the teaching skills of the participating teachers and on the learning outcomes of their students. Measuring the short- and the long- term impact of the dynamic approach described in this book is important since it could help us investigate the added value of using this rather than other approaches to teacher professional development, such as the CBA (Last & Chown, 1996; Robson, 1998; Whitty & Willmott, 1991) and the HA (Cornford, 2002; Korthagen, 2004). The results of summative evaluation are also important in relation to taking decisions as to whether some groups of teachers need to design new action plans in order to address new priorities for improvement. This implies that teachers should be continuously involved in improvement efforts in order to move from the initial stages to the more demanding stages of effective teaching.

The basic elements of the dynamic approach are presented in this book and empirical support for each of them is provided. In addition, experimental studies are also described, and the positive impact of utilising the dynamic approach on teaching skills and student learning outcomes is elaborated. Moreover, possibilities for broadening the scope of the dynamic approach are investigated through the description of research projects aiming to improve student assessment practices in particular and of those designed to compare the effectiveness of the proposed approach when this is provided internally (at the school level) rather than externally

(at the district or system levels). Finally, implications for the development of policy and the improvement of practice in relation to teacher professional development are drawn.

## **Aims and Outline of the Book**

### ***The Aims of the Book***

The main aim of this book is to describe the dynamic approach to teacher professional development which is based on the eight characteristics described above. This approach merges findings from research on teacher effectiveness with that on teacher training and professional development. For this reason, a critical review of research on teacher training and professional development is provided, which helps us identify the limitations of the main approaches to teacher development, such as the CBA and the HA. A dynamic perspective in relation to policy and practice in teacher training and professional development is also advocated. An essential element of this dynamic perspective is making use of validated theoretical models of teacher effectiveness to help teachers move gradually from simple to more complex types of teacher behaviour, which encompass specific teacher competences. For this purpose, a critical review of research on teacher effectiveness is provided, and the importance of using an integrated approach in defining quality of teaching is supported. It is also advocated that teacher training and professional development should be focused on how to address the grouping of specific teacher factors associated with student learning and how to help teachers improve their teaching skills. Beyond describing the dynamic approach to teacher professional development, we also refer to studies providing evidence supporting the view that this approach can have an impact on improving teacher effectiveness and student outcomes. Finally, suggestions for further development of this approach and for research on using this approach to teacher training and professional development are provided.

### ***The Nature and Structure of the Book***

This book is organised in three parts, and a summary of the main points of each part is provided at the end of this book. In the last chapter, the main conclusions emerging from this book are outlined and suggestions for further research are provided.

Part I provides a critical review of research on teacher training and professional development. It is shown that this field of research has been dominated by two different and rather opposing approaches: the CBA and the reflective approach. These two approaches are described in Chaps. 2 and 3, respectively, and their strengths and weaknesses are discussed. In Chap. 4, it is argued that we may have to guard ourselves against restricting the discussion to this classical dichotomy related

to content and develop an integrated approach to teacher professional development that will be focused on the improvement of grouping of factors associated with teacher behaviour in the classroom. For this purpose, not only should reflection and understanding of practice be encouraged, but research on teacher effectiveness should also be taken into account.

Part II provides a critical review of teacher effectiveness research (TER). The main phases of TER and their findings are presented in Chap. 5. It is shown that teacher factors are presented as being in opposition to one another. Thus, in Chap. 6, we refer to the main approaches to teaching, such as the direct teaching and mastery learning approaches and those associated with constructivism. In Chap. 7, it is shown that current models of educational effectiveness adopt an integrated approach in defining quality of teaching and refer to factors associated with student achievement irrespective of the fact that they belong to one or another teaching approach. It is finally argued that another significant limitation of this field of research is that the whole process of seeking to identify teacher effectiveness factors has had no significant effect upon teacher training and professional development. For this reason, the proposed dynamic approach to teacher training and professional development is elaborated in the third part of this book.

Part III advocates the use of an evidence-based and theory-driven approach to teacher training and professional development. Specifically, we argue that the dynamic model can be used to establish such an integrated approach, combining research findings on teacher effectiveness with those on teacher training and professional development. The main characteristics of this approach are described in Chap. 8. In Chap. 9, we present a study illustrating how the proposed approach can be used by policy-makers and practitioners in teacher training and professional development. This study also provides evidence for the impact that the dynamic approach can have on improving teaching skills and student learning outcomes. In Chap. 10, two projects investigating possible ways of expanding the dynamic approach are presented. The first project examines the extent to which the proposed approach can be used to improve not only teaching but also assessment practice, whereas the second investigates the added value of using the dynamic approach internally rather than externally.

In the final chapter of this book, suggestions for the development of this approach and for further research on using this approach for the purposes of teacher training and professional development are presented.

## Chapter 2

# Improvement of Teaching by Mastering Specific Competences: The Competency-Based Approach

### Introduction

In the first chapter, the importance of teacher professional development for improving student learning was emphasised, and issues related to the fact that most professional development opportunities remain fragmented, poorly aligned with curricula and inadequate to meet teachers' needs were mentioned. It has also been argued that teacher training and professional development should draw from TER, which aims to identify teaching skills associated with student outcomes. This point is further elaborated in the second part of this book, providing a critical review of TER. The first part reviews research on teacher training and professional development. It is shown that this field of research has been dominated by two different and rather opposing approaches: the CBA and the reflective approach. This chapter provides a description of the main characteristics of the CBA and elaborates on its main advantages and weaknesses.

The CBA, also referred to as performance-based teacher education and professional development, was spawned in the 1970s, supported by grants from federal, private and state sources in the USA and began to have some impact on European educational systems in the 1980s (Tuxworth, 1982). Since then, this approach, prompted by policy-makers and articulated in practice through national standards, has been a source of controversy and debate within the field of education and training (Ollin, 2002). Although the term itself is less frequently used in teacher professional development nowadays, the concept pervades practice. Many components of this approach have had a significant effect on teacher training and development from the 1980s onwards, both in terms of identifying development needs in relation to teaching standards (e.g. Further Education National Training Organisation, 2001; Further Education Unit, 1986) and the methodology used in teacher training and professional development programmes (Brooks, 2002; Last & Chown, 1996). In this context, competences and standards required of teachers can be found nowadays in many countries (Christie & O'Brien, 2005). Such standards

refer to competences expected of teachers at different stages in their careers and provide a framework for the development of teacher professional development programmes.

## Rationale and Background

In the 1980s, the growth of student-centred learning and the introduction of modularised, flexible curricula were accompanied by new systems of assessment and accreditation. Although systems using continuous assessment measured against specific criteria were already in use, as in the Technical Education Council qualifications introduced in the UK in the late 1970s, these ideas were further expanded. Systems of training, professional development and assessment, which involved a continuous monitoring of performance with a focus on an individual's capacity to implement effectively various skills and competences, gained increased prominence. As a result, many educational systems and related sub-sectors nowadays have established standards or competencies for the assessment of performance and consequently for the training and professional development of teachers (Trorey, 2002).

The foundation of the CBA is best exemplified by the work of Good and Brophy (1984) and Good (1979). An overall list of strategies and competences has been developed by experts in the field. Usually such strategies are highly explicit, for example, how to greet students, how to praise, how to review homework and how to ask higher-level questions. The information comes from outside the classroom, and the rationale is that research has shown positive effects on student achievement when one or more such strategies are employed (Rosenshine, 1987b, p. 90). In this context, the basic assumptions of all the variations of this approach are as follows: there is a core of information and skills that expert and professional teacher educators have developed in terms of independent and isolated teaching skills. This knowledge base forms the framework for training and professional development programmes within a variable time frame, for example, short- or long-term workshops. There is also variation in the nature of the skills and processes to be acquired, from a single discrete concrete activity, such as the use of a 5-second pause in questioning, to the development of a comprehensive model for classroom management. However, as Sprinthall, Reiman, and Thies-Sprinthall (1996) argue, in spite of such differences, the overall premise is that teachers (student teachers, beginners and experienced teachers) need expert advice to improve their teaching practice.

From this perspective, we consider that one of the theoretical bases for the development of the CBA derives from research on teacher effectiveness related to the *process-product model*. Between the 1960s and 1980s, this research led to the identification of a range of behaviours which are positively associated with student achievement (Borich, 1992; Brophy & Good, 1986; Doyle, 1986; Evertson & Anderson, 1980; Galton, 1987; Muijs & Reynolds, 1999; Reynolds, Creemers, Hopkins, Stoll & Bollen, 1996). The findings, many of which have been validated



experimentally (e.g. Griffin & Barnes, 1986), relate to specific teaching skills, such as the quantity and pacing of instruction. Based on this skill, the amount of knowledge acquired is linked to opportunity to learn, and achievement is maximised when teachers emphasise academic instruction as a major part of their own role, expect their students to achieve the curricular aims and allocate available time to curriculum-related activities (Brophy & Evertson, 1976). Another significant factor associated with student achievement is related to consistent success. To learn efficiently, students must be engaged in activities that are appropriate in terms of level of difficulty and suited to their current achievement levels and needs (Bennett, Desforges, Cockburn & Wilkinson, 1984; Stallings, 1985). Effective teachers expect all students to be able to succeed, and their positive expectations should be transmitted to students (Muijs & Reynolds, 2000).

In addition, research on the *process-product model* has provided support for the importance of the classroom environment in raising student achievement. Thus, effective teachers are expected to organise and manage the classroom environment as an efficient learning environment and thereby to maximise engagement rates (Creemers & Reezigt, 1996). Key indicators of effective classroom management include good preparation of the classroom and establishment of rules and procedures at the beginning of year, smoothness and momentum in lesson pacing, consistent accountability procedures, clarity about when and how can students get help and what options are available when they finish a task. The classroom environment should not be only businesslike but also provide a supportive atmosphere for the students (Walberg, 1986).

Moreover, specific skills, identified by the *process-product* model as having an impact on student achievement, are related to the actual teaching process. For example, it was argued that students achieve more in classes where they spend most of their time being taught or supervised by their teachers rather than when working on their own (Brophy & Good, 1986). Another skill was related to classroom discourse. Most teacher talks are academic rather than managerial or procedural, and much of it involves asking questions and giving feedback as opposed to extended lecturing (Cazden, 1986). Teaching skills related to the form and quality of teaching were also identified, in particular the need for effective teachers to structure their lessons by beginning with an overview and/or a review of objectives, outlining the content to be covered, signalling transitions between lesson parts and calling attention to, and reviewing the, main ideas at the end. Effective teachers should also ask a wide range of questions (soliciting) and attempt to involve pupils in class discussion. In addition, effective teachers should be able to communicate clearly and directly with their students without wandering, speaking above students' levels of comprehension or using speech patterns that impair the clarity of what is being taught (Smith & Land, 1981).

In this context, it has been argued that teacher training and professional development should concentrate on specific skills, namely, those mentioned above, which have been identified as ones which have an impact on student achievement. Moreover, there is support for the view that teachers should gradually acquire those skills by targeting them one at a time. Thus, the CBA aims to train teachers in each



of these specific skills by developing particular modules of instruction for each one—segment of effective teaching. This argument has been further supported by developments in the field of cognitive psychology and particularly cognitive load theory (CLT).

Thus, it can be argued that another main theoretical basis for the development of the CBA derives from CLT. CLT is an internationally well-known and widespread theory, which builds upon an information-processing view of cognition in defining long-term and working memory as the main structures of human cognitive architecture (Sweller, 2004; Sweller, van Merriënboer, & Paas, 1998). CLT is based on one major assumption: a human being's working memory has only a limited capacity. When learning, human beings allocate most of their cognitive resources to this activity, and in many cases, it is the instructional format which causes overload. Consequently, the basic idea is to reduce such external load to specific skills and elements of knowledge in order to make available more capacity for actual learning.

CLT can emerge from three different sources (Bannert, 2002). The first one is called 'intrinsic cognitive load' (ICL) and is connected with the nature of the material to be learned. High ICL occurs in the case of high-element interactivity and when learners do not yet have sufficient command over appropriate schemata. The second source is called 'extraneous cognitive load' (ECL) and has its roots in poorly designed instructional materials. Such ECL does not contribute to learning—instead it reduces working memory capacity for learning. Without proper support (in the form of detailed, step-by-step explanations, richly annotated diagrams, etc.), novice learners might struggle more than necessary with the new material, thereby experiencing high ECL. Yet many of the instructional formats that reduce ECL for novices increase it for experts. This is because the supportive information—so beneficial for novices—is superfluous for experts (Kalyuga, Chandler, Tuovinen & Sweller, 2001). Hence, ECL is minimised when the instructional support provided matches to the learners' prior knowledge. The third source is referred to as 'germane cognitive load' (GCL); it occurs when free working memory capacity is used for deeper construction and automation of schemata.

Since its conception nearly two decades ago, CLT has been recognised by many educational researchers as a useful framework for exploring the effectiveness of various instructional formats (for a retrospective review, see Sweller et al., 1998). The widespread use of CLT as a basis for experimental studies has aided the theory's validation and allowed new insights to be generated. Today, CLT provides a rich and multifaceted description of the interplay occurring between instruction and learner during the learning process. As such, the theory is a source of valuable guidance in the development of effective instructional design. According to CLT, presenting information in such a way that cognitive load falls within the limitations of working memory can improve speed and accuracy of understanding and facilitate deep understanding of information content. Thus, the theory provides guidelines for the design of effective instruction and stands as the theoretical framework of the CBA to teacher professional development.

## Definition and Main Characteristics

Based on the rationale elaborated in the previous section, competency-based professional development refers to an educational movement that advocates defining educational goals in terms of precise measurable description of the knowledge, skills and behaviours teachers should possess at the end of a course of study (Guskey, 2005). The apparent official interest in linking teacher training and professional development to the achievement of certain specified and isolated competences has initiated a flurry of activity on the part of various educational systems, agencies and institutions with the aim of exploring the potential of competency-based approaches to teacher improvement. However, no consensus has yet emerged about the meaning of ‘competences’ or the specific competences that should be engendered by initial teacher education or teacher professional development courses.

Finding a single definition for ‘competency’ is problematic since there are so many. Competency-based training has been described as ‘a bandwagon in search of a definition’ (Spady, 1977), and much the same applies to ‘competency-based teacher education’ today. According to Bunda and Sanders (1979), generally there are two types of competencies. One definition conceives of competence as a hypothetical construct, while the second refers to a standard of performance, either implicitly or explicitly. The first type of competency has much in common with constructs, such as ‘skill’, ‘achievement’ and ‘intelligence’. ‘Competency’ when used in this way fits into certain conceptual frameworks. When curriculum specialists talk of ‘collecting lists of competencies’, they are using the term to refer to a construct. However, the breadth of the construct definition varies greatly: in some cases, competency encompasses a broader meaning than the word ‘skills’ and refers to a combination of cognitive, affective and psychomotor skills. Other individuals use competency as synonymous with ‘behavioural objective’, which is generally a restrictive definition of a skill. As for the second type of competence, which refers to a standard of performance, either implicitly or explicitly, the term closely parallels definitions of mastery or criterion levels of performance.

Likewise, Whitty and Willmott (1991) argue that in the training courses they examined, the term ‘competence’ is less than explicit about what it is meant to convey. Nevertheless, they identify two major definitions of a competence: one referring to the ability to perform a task satisfactorily (in which the task and the criteria of success are clearly defined) and a wider one in which competence encompasses intellectual, cognitive and attitudinal dimensions, as well as performance. The competences specified in some courses are the minimum or threshold ones necessary to perform particular teaching activities, and, in others, they are those which are characteristic of the ‘good or effective teacher’. More generally, there are differing views about whether a competence is something that is either a specific achievement or, alternatively, a dimension of performance necessary for performing at different levels. For the purposes of this book, the word ‘competency’ is used in the broad sense, referring to knowledge, attitudes, skills and behaviours that facilitate intellectual, social, emotional and physical growth in children (Weber, 1972). The basic

concepts of this approach, as recognised by several researchers (e.g. Delker, 1990; Foyster, 1990; Norton, 1987), are simple and straightforward:

1. *Programme requirements are derived from, and based on, the practice of effective teachers:* Rather than systematically studying disciplines such as psychology and mathematics, the CBA is based on, and organised around, conceptualisations of 'best practices' in teaching. This implies that such programmes consider what teachers should know, be able to do and to accomplish, with graduation requirements based on such outcomes. In addition, the competencies comprising the content of the programme are carefully selected to suit the tasks that teachers perform daily and which were found to be related to student achievement.
2. *Requirements are stated as competencies:* Requirements describe what the student must demonstrate for successful completion of the programme. Such requirements employ observable actions (using objectives such as 'use', 'organise', 'sequence learning'), while avoiding non-observable ones, such as 'understand' and 'perceive'. What teachers know about teaching seems less important than their ability to teach and to bring about change in their pupils.
3. *Instruction and assessment are specifically related to competencies:* Competencies are defined prior to programme implementation and are made known to learners. The major criterion for including content and activities in a specific instructional programme is the extent to which this will contribute to the demonstration of programme competencies. Instruction not directly linked to competencies is eliminated. Assessment of student teachers is also based exclusively on programme competencies and takes the participant's knowledge and attitudes into account but requires actual performance of the competency as the primary source of evidence.
4. *Learner progress is determined by demonstration of competencies:* In traditional courses, a student excelling in one phase of the course can compensate for weaknesses in other phases, ultimately earning a pass grade. With the CBA, students are expected to meet at least the minimum standards for each and every competency required in the programme. Evaluation in traditional courses typically involves administering knowledge-based tests: while such assessments can certainly be used in competency-based programmes to measure mastery of information, the primary focus is on measuring mastery of skills. Thomson (1991) reports that the decision to recognise a performance as satisfactory by demonstration of competence should be the basis for the success of a competency-based programme. Moreover, Foyster (1990) argues that assessment in competency-based programmes must be criterion-referenced, with the criterion being the competencies upon which the programme is based. Likewise, Richards (1985) indicates that simulation and work sample performance tests should include a checklist or some type of rating scale. Moreover, Norton (1987) believes that participants in a competency-based training programme should learn in an environment that replicates or simulates the work place. Similarly, Richards, in writing about performance testing, indicates that assessment of skills requires tests using simulations (e.g. models and role plays) or work samples (i.e. performing actual tasks under controlled conditions in either a laboratory or

class setting). Thus, evaluation of skills is considered to be an integral part of teaching and an important element of all competency-based programmes. Based on the evaluation results, a decision is made as to whether the trainee has mastered the specific skills and thus can proceed to the next teaching module. The satisfactory completion of training is based on achievement of all specified competencies.

5. In addition to the essential elements of this approach, there are other implied and related characteristics: (a) *instruction is individualised and personalised*: this implies that the participating teachers are expected to follow their own pacing and the participants' knowledge and skills are assessed as they enter the programme so that those with satisfactory knowledge and skills may bypass training in the competencies already attained; (b) *the learning experience of the student is guided by feedback*: in relation to the previous characteristic, and as a result of the evaluation process, each participant should receive individual feedback based on his/her performance, which highlights areas for further improvement; (c) *the programme as a whole is systematic*, which implies that there is a schedule of meetings to be followed and material to be covered; and (d) *instruction is modularised*, which implies that usually detailed training material has been developed to target the selected competencies, which is structured by reference to isolated skills (modules) that need to be addressed one at a time. A course may be classified as competency-based, but unless specific competency-based materials and training approaches (e.g. learning guides and checklists) are designed to be used as part of the programme, it is unlikely that the resulting course will be truly competency-based.

## Using the CBA for Developing Educational Policy

The CBA has several implications for policy on, and practice in, teacher professional development. At present, all over the world, many attempts are being made to establish lists of competencies (or standards of teaching), something that seems to be strongly supported by policy-makers (Becker, Kennedy, & Hundesmarck, 2003). As mentioned earlier in this chapter, although the term itself is less frequently used nowadays, the concept pervades practice. Thus, many characteristics of the CBA still have a significant effect on teacher training and development, both in terms of identifying development needs (e.g. Further Education National Training Organisation, 2001; Further Education Unit, 1986, 1990; DfEE, 2000) and the methodology used in teacher training and professional development programmes (Brooks, 2002; Last & Chown, 1996; Wynne & Stringer, 1997). In particular, based on the principles of this approach, professional standards for teachers have been developed in relation to teacher education and professional development programme accreditation and implementation. Such professional standards have been developed on the assumption that it is possible to define what teachers should know and, most importantly, be able to do. The objective is to strengthen the teaching profession,

raise its standards and eventually enhance the quality of student learning by redesigning teacher licensing and accountability requirements and engaging teachers in on-going professional development. The argument that competencies should form the basis for the standards of the teaching profession and those of teacher preparation and professional development is also aligned with the curricular reforms at teacher education institutions and universities outlined in the Bologna Treaty.

The literature on standards-based reform is for the most part descriptive, rhetorical and logical since the movement is still at an early stage in many places. Many expository essays on the value and challenges of developing national standards have been written (e.g. Darling-Hammond, 1999; Darling-Hammond, Wise, & Klein, 1999; Kaplan & Edelfelt, 1996; Kearns & Harvey, 2000; Lockwood, 1998; Ravitch, 1995; Resnick & Wirt, 1996; Tucker & Coddling, 1998), as well as implementation plans and guides for educators (e.g. Doyle & Pimentel, 1997; Foriska, 1998; Marzano & Kendall, 1998; Mitchell, Willis & Crawford, 1995; Solomon, 1998). In this context, educational policy in several countries places a growing emphasis on issues related to the following: definition of general statements and competences that apply to all teachers, acquisition of specified essential knowledge and skills, application of the same standards of performance to all teachers, elimination of differences between the aims of teacher education programmes and finally, performance and practical skills rather than theoretical knowledge (Delandshere & Arens, 2001).

For example, in the UK, Circular 24/89 (DES, 1989b) contains exit criteria for certain activities in courses of initial teacher education, while a similar list has been circulated to local education authorities engaged in the training of licensed teachers (DES, 1989a). As Whitty and Willmott (1991) argue, the NCC document on initial training has tried to bring these together (NCC, 1991). The introduction of such standards or competences is designed to inform the initial training and continuing professional development of staff involved in teaching and learning and to assist in the development of institution-based activities, such as recruitment, appraisal and the identification of training needs (see, e.g. FENTO, 1999). In another example, the Department for Education and Employment in England (DfEE) (now Department for Education) has produced a consultation document on professional development, referring to qualities that a good teacher should possess (DfEE, 2000). These qualities were based on the research, commissioned from Hay/McBer (2000), in which from a systematic gathering of a wide range of evidence they provide a 'model of effective performance'. This consists of 16 characteristics split into five groups which are concerned with professionalism, capacity to think analytically and conceptually about teaching, planning and setting expectations, leadership qualities and the capacity to relate to others, all of which are in line with the national standards determined by the British government (Pring, 2002). This description also provides the basis for the assessment of teachers as they progress through the main professional grades, the new 'performance threshold' and into the advanced skills teacher grade and then onwards to positions of senior management and leadership. As Odden and Kelley (1997) argue, the CBA makes sense if, following systematic teacher

appraisal, there are opportunities for teachers to obtain the professional competencies necessary to perform according to the predefined standards.

In the United States, the standards-based reform is a national education reform movement that is in accordance with the competency-based movement and follows the argument that if the curriculum is clearly defined and if high performance standards are set and monitored by external assessment, instructional practices will improve and student achievement will be enhanced. For example, like similar previous documents (e.g. MACTEQT, 1994; NPQTL, 1996), the National Standards and Guidelines for Initial Teacher Education report, *Preparing a Profession* (ACDE, 1998) and, in Australia, the National Reference Group for Teacher Standards Quality and Professionalism (2003) provide a comprehensive account of the range of skills, knowledge and values required of teachers.

It is also acknowledged that different governments have adopted different approaches to moving forward in their standards agenda. In some countries (e.g. Canada and England), new regulatory frameworks were introduced with minimal consultation with teachers, while in others (such as the Netherlands), a consensus-building approach was adopted rather than a regulatory one (Moon, 2007). In the Netherlands, in particular, an effort has been made to involve teachers to a substantial extent in the standard-setting exercise, using as the basis a set of competencies relevant to interpersonal communication, social and moral values, teaching subjects and methods and organisational abilities. This framework also distinguishes four different contexts in which teachers play these roles: with students, with colleagues, within their environment and with themselves (Storey, 2006). The Scottish framework of competencies has proved particularly relevant, as it addresses the same themes that were identified as problematic in the context of education in the Western Balkans (Zgaga, 2006, p. 17). The Scottish list consisting of 48 competences pertain to four areas of competence: (a) subject matter and content of teaching; (b) classroom competencies (organisation, teaching, learning and assessment); (c) school and the education system and (d) values and attributes related to professionalism (The Scottish Office, 1998).

In conclusion, we could argue that in many countries, government-set 'standards', conceived of as 'what teachers should know and be able to do' (Libman & Zuzovsky, 2006, p. 37), have largely affected programmes of teacher preparation and professional development, leading them to focus on the competencies teachers need in practice. However, as mentioned in the previous section describing the weakness of the CBA, usually there are too many standards relating to teaching skills to be covered in any standards-based professional development programme. As Gore and Morrison (2001) point out, such lists of desirable attributes can be overwhelming, both for the teacher educators who are to produce such graduates and for the teachers participating in such programmes, who are to acquire and/or develop further these competencies. Comprehending and synthesising lists of over 100 attributes and translating those into planning and practice often prove unwieldy to the extent that teacher educators and their students tend to focus on only a section of the list, governed by what they already know and value.



Most importantly, very few studies have been conducted which examine the meaning and quality of the professional teaching standards adopted by educational policy around the globe or which investigate the quality of their use (Delandshere & Arens, 2001). From this perspective, concerns about the issue of competencies as a basis for teacher education and professional development have been raised, prompted by questions about teacher quality in light of new student demands, the changed nature of the knowledge needed by teachers and the balance between accountability and professional autonomy (Cowen, 2002; Day, 2002; Wubbels, 1995).

Another limitation regarding the development of professional teaching standards is related to the process whereby such standards are developed. The primary task is to define a set of standards in a particular licensure or certification area derived from the 'knowledge base' of teaching. Yet these standards are generally produced without careful review or reading of research on teaching and without systematic recording and analysis of the practical or theoretical knowledge or experiences that educators bring to the discussion. Most of the work is based on oral conversations about beliefs concerning what teachers should know. Without an articulated theory of teaching and a validated knowledge base on the basis of which standards could be formulated, most standards are not readily interpretable (Delandshere & Arens, 2001).

Moreover, another weakness of the standards is related to their uniformity, irrespective of teachers' priorities in terms of improvement and professional needs. The elimination of differences in the way teaching is represented or understood is also reductionist, particularly in light of the uncertainty about the impact of these teaching practices on student learning. As Cohen (1995) points out, different and equally rigorous sets of standards are possible 'just as different but equally rigorous approaches to inquiry coexist within all disciplines and professional fields' (p. 755).

Especially in relation to teacher professional autonomy, it is argued that the way governments have attempted to 'regulate' the issue of teacher quality has provoked a good deal of controversy in many places (Day, 2002; Elbaz, 1992; Lasky, 2005; Libman & Zuzovsky, 2006; O'Connor, 2008). Questions have been raised about the possible role of governments in relation to quality control, suggesting almost universal practices when setting 'standards' or 'benchmarks', including determining what characteristics teachers should possess (Cowen, 2002; Harris, 1997; Libman & Zuzovsky, 2006; Storey, 2006). In this context, campaigns for more governmental control over curricula, assessments and teacher standards have been criticised for bringing about the practice of 'teaching to the test' and for jeopardising teachers' professional autonomy and opportunities to exercise discretionary judgement, as well as for endangering the moral and social values essential to teachers' identities (Day, 2002, p. 683). As Wubbels (1995) argues, to avoid these sorts of pitfall in external standard-setting, it is paramount that professional groups set the requirements for group membership and are the primary source of the standards defined as professional competencies. This is especially true given the number of studies that conclude that reforms which do not coincide with teachers' perceptions of their professional identity are likely to fail (Beijaard, Verloop & Vermunt, 2000; Day, 2002; Lasky, 2005; Verloop, Van Driel & Meijer, 2001).

On the other hand, the holistic approach to teacher professional development based on the social reconstructionist tradition does not seem to have played a role in the definition of professional teaching standards. The idea that teachers are aware of the ‘social and political implications of their actions and the context in which they work, to see how their everyday choices as teachers are necessarily joined to issues of social continuity and changes’ (Zeichner, 1993, p. 7) is for the most part absent from professional teaching standards. Here, again, the use of pre-determined standards to evaluate teaching performance in all contexts appears incompatible with the view that teachers are critical change agents responsible for moving towards a more just and humane society. In addition, one central dilemma of such proposals, indeed of many standards frameworks, remains the tendency to raise issues concerning the overall quality of teaching separately from questions addressing social justice, each of which are heralded as primary virtues for teacher education.

## **Strengths and Weaknesses**

Despite the fact that the CBA was initiated as the most effective approach to prepare and develop teachers and was nominally employed for several years, it was criticised as a mechanistic approach (Houston, 1988). Although the term itself is less frequently used in teacher professional development nowadays, the concept pervades practice. This is mainly due to the appeal of the CBA in its emphasis on pragmatism in determining the content of teacher education programmes, its potential for improvement through research and its systematic approach to preparing and developing teachers. This section provides an overview of the main strengths and weaknesses of this approach.

### ***Strengths and Advantages***

The rationale supporting this approach is its reliance on objectives specified in advance and known to the learner. It assumes that human beings are goal-oriented and that they are more likely to achieve such goals and objectives when overt actions are taken to achieve them. According to De Landsheere (1988), definite advantages of this approach are the functional learning, the clarity of objectives, the easy use modular individualised instruction and the more objective evaluation. As a consequence, the CBA serves as an agent of change, and it improves teaching and learning (Docking, 1994). Since competency-based approaches to teaching and assessment offer teachers an opportunity to revitalise their education and training programmes, quality of assessment can be improved, and the quality of teaching and students’ learning will be enhanced by the clear specification of expected outcomes and the continuous feedback that competency-based assessment can offer.

A number of studies have described the advantages that the CBA can bring to both initial teacher training and professional development (Brooks, 2002). These studies



highlight the clarity associated with competences, the clear statements they provide regarding the skills that need to be demonstrated, the criteria used for assessment and the recognition given to prior achievement (e.g. Last & Chown, 1996; Whitty & Willmott, 1991). It has also been argued that they can contribute to making professional practice in education more transparent and clarify the expertise that is required of teachers (Hodkinson, 1995). As Robson (1998) argues, this could help to delineate further the boundaries of teachers' job and, as a result, emphasise the professional nature of work in schools. Another advantage of the CBA is that the focus is on the success of each participant. As Watson (1990) states, the CBA 'appears especially useful in training situations where trainees have to attain a small number of specific and job-related competencies' (p. 18). According to Norton (1987), the CBA has several advantages which, among others, are that participants achieve competencies required in the performance of their jobs, participants build confidence as they succeed in mastering specific competencies, participants receive a transcript or list of the competencies they have achieved, training time is used more efficiently and effectively as the trainer is a facilitator of learning as opposed to a provider of information, more training time is devoted to working with participants individually or in small groups as opposed to presenting lectures and finally, more training time is devoted to evaluating each participant's ability to perform essential job skills.

Several researchers have studied the CBA in several domains, such as vocational training (Chyung, Stepich, & Cox, 2006; Jackson et al., 2007; Jang & Kim, 2004; Jorgensen, 2005; Kaslow, 2004; Mulder, Weigel, & Collins, 2007), information technology (Caniels 2004; Chang, 2006, 2007; Sampson, Karampiperis & Fytros, 2007) and general education (Baines & Stanley, 2006; Biemans, Nieuwenhuis, Poell, Mulder & Wesselink, 2005). Supovitz, Mayer and Kahle (2000) studied the effects of intensive, standards-based professional development on science teachers in Ohio. They found that teachers became more positive about instructional reforms and more likely to use inquiry-centred pedagogy as a result of participating in intensive, standards-based professional development.

An important meta-analysis of research in the CBA was conducted by Gliessman, Pugh, Dowden, and Hutchins (1988). Their analysis was related to the identification of variables influencing the acquisition of explicit and generic teaching skills, in particular questioning skills. The variables identified through an analysis of 26 studies were classified under three general categories: (1) method of training, (2) characteristics of trainees and (3) characteristics of the training setting. Methods of training included instruction and instruction followed by practice. Instruction-based approaches involved comprehension, demonstration and analysis of the targeted skill in the case of questioning. Instruction with practice approaches included opportunities for practice, with feedback on the targeted skills. The results of the study were somewhat surprising since the hypothesis that training incorporating both instructional and practice methods (i.e. instruction/practice) results in a significantly greater mean effect size than training based on instructional methods alone, was not supported. Also the hypothesis concerning temporal variables, namely, that more extended general and specific training times result in a significantly greater mean

effect size, was not supported. However, the major hypothesis that training results in a significant difference between the means of experimental and control groups, was confirmed.

### *Weaknesses and Limitations*

As mentioned earlier in this chapter, despite the fact that the CBA was promoted as the most effective approach to prepare and develop teachers and was nominally employed for several years, it was criticised in relation to a number of issues by several researchers (e.g. Carr, 1993; Cowen, 2002; Houston, 1988; Humes, 1995; Korthagen, 2004; Stephens, Tonnessen & Kyriacou, 2004). In particular, to ensure sufficient validity and reliability in the assessment of the teachers, the long detailed lists of skills which were formulated gradually, resulted in a kind of fragmentation of the teacher's role. Thus, it was becoming increasingly apparent that this view of teaching took insufficient account of the fact that a good teacher cannot simply be described in terms of isolated competences, which can be learned in a number of training sessions. In addition, these long lists proved to be extremely unwieldy in practice. The main point is that there are too many isolated skills, which cannot be covered thoroughly no matter how long the training programme is, while at the same time doubts have been raised about the validity, reliability and practicality of such lists of individual competences.

A similar issue is reported by Wragg (1993) in relation to the Leverhulme primary project. In this project, the research team concentrated on skills, such as management of pupils' behaviour and work, questioning and explaining, and on teacher subject knowledge. As the author argues, the issue of teacher competence raises several important questions, one of the most significant of which is related to the extent to which these skills should be learned in part or as a whole. The extreme partial-learning stance is taken by some supporters of competency-based teacher education who believe that teaching can be atomised into hundreds of discrete mini-actions which can be systematically learned and appraised. At the heart of these concerns is a belief that teaching cannot be deconstructed into a number of discrete and separately identifiable parts in the form of competence statements, and indeed many researchers question whether it is actually possible to describe the qualities of good teachers in terms of isolated competencies (e.g. Barnett, 1994; Hyland, 1994). As Korthagen (2004) argues, trying to put the essential qualities of a good teacher into words is a difficult undertaking. In expressing his concerns about such fragmentation, Halliday (1996) claims that no series of statements can allow for the multitude of reactions, interactions and behaviours typical of every teaching encounter. Similarly, Lyle (1996) warns of hastening 'the transition from teaching as a profession to teaching as a set of technical competences' (p. 11).

In addition, the rather mechanistic procedure for implementing the prescribed directions for each kind of teaching behaviour does not allow the critical and creative thinking of teachers to be expanded nor is this taken into consideration in

the delivery of such programmes. Much of the literature focuses on the narrowness of its approach and its failure to address certain important aspects of professional practice, such as theoretical knowledge and understanding (e.g. Ashworth, 1992), the ethical principles which underpin practice (Chown, 1996) and the ability to make autonomous and pragmatic judgements (Chown, 1996; Elliot, 1996). As Chown argues, 'The CBA seems unable to cope with the fact that a vital part of teaching is the complex process through which teachers draw on different types of knowledge from a range of domains and decide what to do in rapidly changing unpredictable circumstances' (p. 143).

Although promoting specific competences through the CBA is often associated with rhetoric about greater teacher professionalism, misgivings have been expressed about the effects of those competences expressed as standards on professional autonomy and their limited range. For example, Tickle (2001), writing about the original English induction standards, was concerned that they reflected too narrow a view of teacher expertise and that their use would lead to induction and professional development becoming assessment- rather than development-led. For Stephens et al. (2004, p. 113), the CBA 'fails to take account of what Duncan (1998) calls the messy kind of wisdom: teacher knowledge that can only be acquired in practice and through personal experimentation'. It is argued that lecturers and education managers should be entitled to a more professional and academic training if they are to deal effectively with the increasingly complex situations they face. From this perspective, there has been a shift from an emphasis on the courses taken to a 'results-oriented' conception of education in which observable performances and practical knowledge are valued (Delandshere & Arens, 2001, p. 557). There is an assumption here that theoretical knowledge is a prerequisite of performance and that all important knowledge can be evidenced through performance or activity. Equating knowledge and performance seems to assume that knowledge is always enacted, thereby devaluing those forms of knowledge that are not; it also disregards the activities that one engages in to develop knowledge, which, in the case of teaching, are the activities that inform us most about how and why knowledge develops. This shift to performance has the potential to focus on the most visible aspects of teaching but not necessarily the most important ones (Delandshere & Arens, 2001).

The failure of competency-based qualifications to engage with these more complex aspects of teaching has largely been explained, according to Elliot (1996), by their 'pre-occupation with observable phenomena' (p. 21) and the assumption that all knowledge can be observed and assessed while in use. As Sprinthall et al. (1996) argue, because the CBA is drawn from behavioural psychology and the cognitive load theory, there is little consideration given to change in teacher cognitions or the cognitive developmental dispositions of the teachers in training. Instead, the assumption is linear and quantitative. Teach each skill as effectively as possible and the teachers will follow and incorporate the skill in their teaching.

Furthermore, the specific educational context or the professional priorities and needs of the participating teachers are not taken into consideration, something that may reduce the interest and affect the will and the efforts of the participants to engage in their improvement plans. As Lowyck (1978, p. 215) stresses, 'Teaching

behavior can only be understood and improved when the original context of the specific teaching behavior is included in the interpretation'. A similar argument has been raised by Trorey (2002). She argues that national priorities for teacher development, expressed as isolated teaching competences, create many tensions as they may imply that the specific developmental needs of a school or teachers remain unaddressed. As Brooks (2002) argues, 'There is little evidence that professional development programs were consistently successful in ensuring that both individual and institutional needs were met' (p. 36).

It has also been argued that in addition to failing to capture the complexity of the teachers' work, competency-based training and qualifications have served to push forward system and/or institutional objectives at the expense of the individual needs of the staff. Taking this argument further, Edwards and Usher (1994) suggest that competency-based professional development programmes are a way of imposing self-discipline and self-regulation on individuals so that they conform to what is required. Similarly, Bathmaker (2000) argues that competences stated as standards 'might offer an easy way to meet institutional monitoring and assessment requirements[...]but fail to stimulate the development of imaginative and creative professionals who can be flexible and responsive in a rapidly changing environment' (p. 19). In the same line of argument, issues related to the erosion of teachers' professional autonomy may also be raised. Although policy documents (e.g. DfEE, 2000) state that teachers and schools are best placed to know what development activities could meet their particular needs and raise standards of teaching and learning in their school, such professional responsibility is confined to the means of achieving the outcomes, to the isolated skills and competences and not to the deliberation over the educational values and purposes themselves. As Faulkner, Freedland and Fisher (1999) argue, there was to be, and is, little scope for professional judgement in the establishment of standards or targets as the main responsibility lies in the hand of central government and policy-makers, irrespective of individual teacher needs. Patrick, Forde and McPhee (2003) argue that by conceptualising teaching in simplistic terms as a set of measurable outcomes, the framework of teacher professional development could undermine the autonomy and professionalism which it claims to enhance. On the other hand, others argue that detailed analysis of the relevant skills and competences and the related evaluation systems enhances rather than diminishes the professional nature and stature of teachers (e.g. Odden & Kelley, 1997). The competent teacher might be said to be more professional than the incompetent one, but at the same time this might be a rather limited notion of what it means to be a professional. Likewise, others see in a framework of standards both a potential threat to the autonomy of teachers and also an opportunity to re-professionalise (e.g. Storey & Hutchinson, 2001).

Beyond the discussion relating to the opportunities and strengths and despite the extensive rhetoric, publications and discussions concerning the CBA, almost no basic definitive research has been conducted to prove or disprove its effectiveness. Certainly, short-term research has shown that student achievement does improve, as a meta-analysis by Walberg (1986) has documented. However, the long-term results are less positive. Richardson and Anders (1994) note that there is a real paucity of

research on the follow-up effects of the competency-based training. According to Sprinthall et al. (1996), the best-known programme using the CBA has been the Madeline Hunter approach, which includes a series of highly explicit steps in the classroom. Even though the training was comprehensive, expensive and focused on a relatively small number of teachers, the results suggested extremely modest outcomes in terms of student achievement. Although Hunter has always maintained the need for teacher flexibility with regard to how the methods are applied in the classroom, yet the training itself may not encourage such teacher flexibility. In this context, given the growing official interest in competency-based approaches, those responsible for teacher training and professional development can expect to come under increasing pressure to explore the extent to which the use of competences can enhance the effectiveness of teacher education and the overall quality of teaching. However, the advantages of using the CBA still remain to be proven. There is certainly insufficient experience to date to justify the national imposition of any particular approach, but there is considerable scope for further exploration and evaluation of the range of approaches that are currently being developed (Whitty & Willmott, 1991). Today, the factors influencing quality of teaching require sufficient levels of skill, understanding, flexibility and reflection on the part of teachers, which go far beyond the rudimentary CBA and training in isolated teaching skills in teacher training and professional development programmes (Wragg, 1993). Thus, the next chapter describes the holistic or reflective approach to teacher training and professional development, which often claims to be the very antithesis of the CBA to teacher training and professional development.

## Chapter 3

# Improvement of Teaching Through Critical Reflection: The Holistic Approach

### Introduction

The dominant approach to teacher training and professional development nowadays is that of holistic or reflective practice (Golby & Viant, 2007). Teacher educators have been preoccupied by what Smyth (1992) calls an ‘inexplicable wave of enthusiasm’ (p. 268) for reflective approaches. Fifty years after Dewey’s differentiation between *routine action* and *reflective action*, the terms ‘reflection’, ‘reflective practice’ and ‘reflective practitioners’ abound in the literature of teacher education and professional development (see Admiraal & Wubbels, 2005; Birmingham, 2004; Loughran, 2002; Rodgers, 2002). This approach has also been described as a reaction against more centralised policy perspectives in teacher training and professional development, which regard teachers as technicians, a view promoted by the CBA (Copeland, 1991) described in the previous chapter. The term has been used to refer to widely differing practices, ranging from reflection as a component of skill and a means of fostering effective teaching to reflection as a heightening of awareness of social justice in educational practice. At the same time, the holistic nature of this approach refers to the rather general, or even vague, content of teacher reflection, which may include all skills, attitudes, perceptions, motivation and moral disposition related to teaching and learning (Cruickshank & Metcalf, 1990; Feiman-Nemser, 1990). This chapter provides an overview of the HA to teacher training and professional development and discusses its main strengths and weaknesses.

### Rationale and Background

As long as 80 years ago, Dewey (1933) commented on the need to differentiate between *routine action* and *reflective action*. He defined reflective action as the ‘active, persistent and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further consequences to

which it leads' (p. 9). Since that time, two books by Schon have led to a resurgence of interest in reflection, *The Reflective Practitioner* (1983) and *Educating the Reflective Practitioner* (1987) which have had a significant effect on mainstream educators' thinking about reflection. In his first book, Schon argues for a new epistemology of practice where professional growth, competence and artistry are framed by an individual's ability to *reflect-in-action*, which refers to individuals thinking about what they are doing while they are doing it. However, the question of how to promote this approach was left unanswered until the publication of his second book. As Sprinthal, Reiman, and Thies-Sprinthal (1996) comment, Schon looked at professional schools, such as architecture, music and counselling institutions, to explore how guided reflection forms the mainstay of these professional programmes. The dialogue between the instructor and the student in a reflective practicum constitutes, as he argues, the necessary exemplar for a new epistemology of practice. Yet few studies exist in the Schon genre. Only Mackinnon (1987), working with pre-service teachers, developed a set of criteria for detecting Schon's *reflection-in-action* during student teachers' supervisions.

The second important line of inquiry that has contributed to interest in teacher thinking and reflection has been the work of cognitive developmentalists. Theorists such as Erikson (1982), Piaget (1972) and King and Kitchener (1994) describe the fundamental cognitive and affective processes that children, adolescents and adults employ as they construct meaning from experience. Most studies of this approach support the general finding that human beings have an intrinsic need to be professionally and personally competent and that competence will grow through qualitatively distinct stages when there is positive interaction in a supportive environment (Berliner, 1994; White, 1959). The studies also demonstrate that teachers will vary in their capacity, readiness and inclination to engage in reflection activities. For example, concrete teachers at conformity levels may be opposed to engaging in any coaching or guided reflection activity that encourages them to revisit and improve their teaching practices. On the other hand, a teacher at the autonomous level may be open to Schon's *intermediate zone of practice* (Schon, 1987, p. 6).

The third body of literature comes from the information-processing line of inquiry. Cognitive theorists, using the computer as their basic model, have developed a theory of learning and memory, called information processing. In this model, teacher cognition is conceptualised as representing a linear continuum from less to greater cognitive complexity. It is important to note that such a model does not connote a stage conceptualisation or that such conceptual development goes through an invariant sequence of cognitive transformations. Instead, the model gives more attention to specific cognitive processes, such as how an individual inputs, stores and retrieves information. Although most of the work on the model has by far focused on the process of student learning (Pintrich, Marx & Boyle, 1993), it can be applied to adults in general and specifically, to the development of cognition in teachers.

So far, the major effort in this area has focused on cognitive information processing and teacher planning (Clark & Yinger, 1987). This approach, which derives from the teacher as decision-maker, has charted the actual planning systems employed by



teachers with different amounts of experience. Thus, according to Royer, Cisero and Carlo (1993), there are some differences between the novice and the expert teacher planner in terms of metacognition. In this context, a number of educational psychologists, such as Berliner (1986, 1992), have begun to examine differences in how beginning teachers and experienced teachers practise their profession. Their work draws heavily on information processing, describing how the cumulative experiences of teaching allow expert teachers to cluster understandings of the teaching and learning process and to retrieve information more quickly.

## Definition and Main Characteristics

Influenced mainly by these three lines of inquiry, a number of teacher educators have written extensively on the topic, and reflection has been advanced as an ideal in numerous teacher education and professional development programmes. Clift, Houston and Pugach (1990) have summarised a number of teacher education and professional development programmes that feature reflection, and Tom (1985) has mapped out some of the crucial parameters of an inquiry-oriented approach to teacher education. Likewise, Calderhead (1989) has examined the various definitions of reflective teaching and argued that teacher development, teacher knowledge and the context of teacher learning have great potential in terms of extending our understanding of the role of reflection in teacher education and professional development. In addition, Korthagen (1988), drawing on the developmental model, suggests that teachers differ in their learning orientation. Some with an internal orientation, view learning and reflection as an exciting and self-guided process. They readily examine their own practice. Others with external orientations, require a high degree of structure from instructors and conform to peers' views of teaching.

However, despite the extensive writing on the HA and the importance of reflection for teacher improvement, defining what actually constitutes reflective teaching or reflective practice is fraught with difficulty, and this major problem of definition has been recognised for some very considerable period of time (see Calderhead, 1989; Hatton & Smith, 1995; Tom, 1985). While the concept of reflection in education is not new and much of the writing about reflection employs the work of Dewey (1933) as a reference point (e.g., Adler, 1990, 1991; Calderhead, 1989; Farrah, 1988; Gilson, 1989), the vague nature of the concept, as expressed in Dewey's writing, has not been resolved. As Cornford (2002) argues, the ideals or purposes of reflection in education are as manifold as the term itself: development of self-monitoring teachers, teachers as experimenters, teachers as researchers, teachers as inquirers, etc. An analysis of the literature reveals a plethora of words associated with the concept of reflection, each of which, as Adler (1990, 1991) suggests, is embedded in and reflects a different discourse (see Smith & Hatton, 1992a for a full analysis of these terms). At base, it is not always clear whether reflection is conceptualised as an exclusively cognitive activity (as a special type of thinking) or what exactly constitutes its relationship to ongoing, past or future events (Ottesen, 2007).



The concept has been described in several ways, drawing variously upon the writing of Dewey (1933) on modes of reasoning, Schon (1983) on professional thinking, Stenhouse (1975) on teachers as researchers, recent theories of cognition in cognitive science (see Borko, 1988) and critical theory (see Elliot, 1987).

The definitions of reflective teaching, as mentioned above, have varied both in terms of their conception of the nature of reflective activity and, most importantly, on the content on which teachers are expected to reflect (see Calderhead, 1989). For example, Schon's (1983) notion of *reflection-in-action* refers to the ways in which professionals identify and solve problems through the consideration of alternative modes of framing or viewing a professional situation or problem. It describes the problem-finding and problem-solving processes involved in professional action. On the other hand, Zeichner and Liston (1987) take a broader view of reflection, derived largely from the *philosophy of action*, as the active, persistent and careful consideration by teachers of the origins, purposes and consequences of their actions.

Different conceptions and definitions of holistic or reflective practice seem to have channelled teacher educators into drawing upon specific areas of research to inform their ideas of reflection and also to provide methods, such as narratives and journal writing, stimulated recall, action research and ethnographies that might be transposed from a research to a practice setting. For example, the *Maryland Reflective Teacher Education Program*, described by McCaleb, Borko, and Arends (1992), views reflection primarily in terms of evaluation skills and draws on research on teaching, and especially teacher thinking, in the programme as a means of increasing teachers' repertoire of concepts that can be used in analysis and evaluation. Ross, Johnson and Smith's (1992) account of the *Florida Reflective Teacher Education Program*, on the other hand, views reflection in terms of personal and professional growth and adopts a series of processes to promote teachers' examination of their own educational values and beliefs.

In terms of the strategies used to implement and stimulate the holistic or reflective approach, either in initial or in-service teacher training, five broad approaches can be identified (Smith & Hatton, 1992a). These include action research (Gore & Zeichner, 1991; Ross, 1989; Smith & Lovatt, 1991; Sparks-Langer & Colton, 1991); case studies of students, teachers, classrooms and schools (Ross, 1989; Sparks, 1991; Zeichner, 1986); field experiences and practicums (Sparks-Langer & Colton, 1991; Zeichner, 1986); microteaching (Cruickshank, 1985); and other tasks, including the development of curriculum units and their implementation (Ben-Peretz, 1984; Beyer, 1984; Smith, 1991a, 1991b; Zeichner, 1986). All of these approaches generally comprise the reflective strategies of observation, analysis, interpretation and decision-making (Duckworth, 1987; Richardson, 1989; Zeichner & Liston, 1987).

In addition, Zeichner (1987) has reviewed instructional strategies that can be employed in pre-service teacher education and in-service professional development programmes to enhance teacher reflection. Among such strategies are action research, ethnography, writing, supervisory approaches and curriculum analysis and development. In practice, these approaches usually involve making use of reading and rereading of journal writing, observation notes, transcribed conversations,

videotaped analyses, self-regulations, etc. In particular, journal writing is commonly used to attempt to facilitate reflection. Such writing is by its definition and structure *reflective-on-action* and is more likely to exhibit characteristics of the genre of reflection utilised by teachers. There are still issues, however, related to the audience of the writing and the degree to which it is private or public, which also confound its usefulness as evidence for reflection. Moreover, the analysis of, and discussion on, critical incidents is also a useful element of reflective practices. A critical incident is not an extreme case but any professional experience which offers significant meaning (e.g. a discussion with a student, a meeting with parents).

According to Chater (2007), all strategies, practices and activities of a reflective practitioner could be categorised into the micro-, the meso- and the macro-levels: the micro-level includes those characteristics that function at classroom level and have an impact on the school (i.e. playgrounds, corridors), the meso-level includes those that operate at the school level but can impact upon other schools in a consortium, community or region and the macro-level includes those that operate at regional and national levels, where they influence schools and classrooms. At the micro-level (i.e. reflective practice in a teacher's mind as it affects classrooms and schools), reflective teachers could perform frequent and thoughtful self-evaluation on the quality and the process of their own teaching. Of course, evaluation is not always a self-contained activity. In a collaborative, critical-friend model of evaluation, Campbell, Kyriakides, Muijs and Robinson (2004) suggest that peers can challenge and support each other through listening, asking questions, articulating each other's beliefs and aspirations about teaching and giving feedback. In doing this, Smyth (1991, p. 13) recommends the use of the following four questions: (a) *Describe*: What do I do? (b) *Inform*: What does this description mean? (c) *Confront*: How did I come to be like this? (d) *Reconstruct*: How might I do things differently? Based on the above strategies and activities, teacher training and professional development involves more than just the acquisition of the theory of teaching. Implicit or explicit in all the writings that focus upon reflective teaching (other than the extreme position of theorists concerned solely with the personal development of the individual) is the idea that increased reflection will translate into action and result in improvement in teaching and learning (Cornford, 2002).

There is a general support for the view that teachers' beliefs about teaching which are based on previous experience and perceptions of education have a significant influence on learning to teach and improvement in teaching (Cole & Knowles, 1993; Elliot & Calderhead, 1995). Existing knowledge, experience and beliefs need to be recognised and challenged in order to support teachers in reconstructing and developing themselves appropriately in the light of new ideas and experiences. Challenging teachers' constructs of teaching is an ongoing process of moving their learning on throughout their professional development. Thus, it is argued that it is in the nature of reflective practice that the context, as defined by the learning needs of teachers, other professionals, pupils and their families, must be taken into consideration as it is one of the decisive factors contributing to the quality of reflective practice.

## Using the HA for Developing Educational Policy

Over recent years, the demands to improve quality of teaching and learning and to increase accountability have put professional development high on the agenda of policy-makers in many countries. As has been described in the previous chapter, professional standards of teaching have been developed and promoted by policy-makers and governments, referring to what teachers should know and be able to do in terms of specific skills and competences. In this context, approaches such as the CBA have largely affected the development of professional teaching standards and of related teacher preparation and professional development programmes. However, many have criticised the focus on teacher competencies and professional standards which were perceived as policies which privileged those instrumental aspects of teaching that can be subjected to tests concerning their immediate use and applicability (Cowen, 2002). It is argued that the development of professional standards of teaching has underestimated the aims and values underlying teaching, leaving little room for an individual to personally interpret his/her role as a teacher or the specific demands and conditions of a given situation (Van Huizen, Van Oers & Wubbels, 2005). Questions have also been raised about the possible role of governments in terms of quality control, suggesting an almost universal practice of setting ‘standards’ or ‘benchmarks’, including determination of which characteristics effective teachers should possess (Cowen, 2002; Harris, 1997; Libman & Zuzovsky, 2006; Storey, 2006). Thus, policy developments based on competency-based teacher education and professional development have been criticised as ‘technicist’ and as ultimately leading to teachers’ deprofessionalisation and deskilling (Harris, 1997), as has been elaborated in the previous chapter.

Such kinds of criticism have promoted the development of alternative ways of thinking about developing policy concerning teacher professional development. Educators and researchers have promoted a broader conceptualisation of teacher training and professional development, based on the principles of the HA. They argue that teacher education and professional development must equip teachers with much more than an ability to use particular teaching skills and knowledge. Teacher training requires a deeper understanding of the historical, political and economic context of a particular education system and teachers’ comprehension that might not necessarily manifest itself in an observable, immediately assessable way. As mentioned before in this chapter, reflective practice has been advocated because of its ability to assist teachers reinterpret and reframe their experiences from a different perspective and participate consciously and creatively in their own growth and development (Munby & Russell, 1990). As Day (2002) argues, the humanist tradition of viewing education as being of intrinsic value and having ‘core moral purposes’ is central to teachers’ motivation, commitment and effectiveness. He argues that this tradition, which is fundamental to teacher identity, is being challenged by the new results-driven technical culture of teaching focused on classroom management, subject knowledge and pupil test results (pp. 682–684).

In this context, we could argue that there is an ongoing debate primarily in relation to the aims and content of teacher training and professional development. Where policy-makers and some researchers generally focus on the importance of outcomes in terms of competencies and professional teaching standards, educators and some other researchers equally emphasise the more personal, moral and ethical characteristics of teaching (e.g., Tickle, 1999), which in turn could help to raise teaching standards through reflection. This assumption of course needs to be empirically tested through systematic research, before reaching any conclusions related to the potential of the reflective approach to raising standards, as many have questioned the association between this paradigm's theory and practice, as explained in the following section.

Nevertheless, policy and practice in some educational systems have made some steps towards incorporating the principles of the HA in teacher professional development, without necessarily moving completely away from the standards agenda. For example, in the Netherlands, a consensus-building approach rather than a regulatory one has been adopted in developing standards of teaching by involving teachers to a substantial extent in the standard-setting exercise based on a set of competencies relevant to interpersonal communication, social and moral values, teaching subjects and methods and organisational abilities (Moon, 2007).

In addition, there is a growing emphasis on school-based professional development, which enables practitioners to analyse, discuss, evaluate and change their own practice by adopting an analytical approach and encourages them to appraise the moral and ethical factors implicit in classroom practices, including the critical examination of their own beliefs about good teaching. In addition, it encourages teachers to take greater responsibility for their own professional growth and to seek ways of acquiring some degree of professional autonomy. For example, several policy documents in the UK (e.g. DFEE, 2000) state that teachers and schools are best placed to know what development activities could best meet their particular needs and raise standards of teaching and learning in their schools. Such statements seem to acknowledge that in practice, teachers are able to consider new initiatives on their individual merits, particularly in relation to their benefits in the classroom (Corkindale & Trorey, 2002). Teachers have turned away from competency-based or holistic professional development approaches, which are not seen to have ready relevance to, and application in, the classroom and they are not geared to teachers' needs, priorities for improvement and other contextual parameters deriving from their schools and classrooms (Ayes, Dinham & Sawyer, 2000; Dinham, Brennan, Collier, Deece & Mulford, 2000). Thus, based on the HA, teacher professional development in many schools focuses on providing time and opportunities for teachers to become actively engaged in meaningful discussion and to set their own improvement agenda based on their particular needs and context (Loucks-Horsley, Hewson, Love & Stiles, 1998). In this sense, an important implication of the HA for policy and practice is related to the extent to which teachers participating in teacher professional development programmes are given professional empowerment and autonomy (Corkindale & Trorey, 2002).

In addition, elements of the HA have also provided support for the development of related educational policies, such as that promoting lifelong learning, which have been upheld by national governments and the EU, particularly over the last decade. The term recognises that learning is not confined only to teacher professional development programmes but also takes place throughout school life and in a range of situations. From this perspective, learning can no longer be divided into a place and time to acquire knowledge and a place and time to apply the knowledge acquired (Fischer, 2000). Instead, teacher learning can be seen as something that takes place on an ongoing basis in the course of daily interactions with other colleagues and with the school and teacher environment. In this context, aspects of the HA, as acts of teacher liberation, empowerment and autonomy, have been widely emphasised. This is important as, in pursuit of externally imposed targets, professional judgement has been increasingly limited to deciding upon the most efficient means of achieving those targets set by the system, without taking into consideration the individual teacher needs and priorities for improvement or the context of the teacher workplace (i.e. characteristics of community, school and classroom).

However, despite the important policy implications of the HA, especially in relation to teacher engagement, empowerment and autonomy, there are also limitations that educators, researchers and policy-makers need to consider in formulating any kind of policy proposals. In particular, it should be acknowledged that teachers develop routines in order to survive in their classrooms, and they do not naturally systematically reflect on the quality of their work. This is due to the fact that they do not always have the time to do so (Campbell & Neill, 1994) or because questioning of the existing teaching practice can be threatening to self-esteem, especially when organisational cultures are not supportive (Clark & Yinger, 1977). Moreover, even when teachers are willing to engage in reflective activities, the depth and breadth of reflection varies greatly among teachers, depending on the context and on their proclivity for reflection. This is partly due to the fact that relatively few teachers have been trained properly to engage in critical reflection and analyse their own classroom practice in a systematic way or to study the practice of others (Wragg, 1993). For example, the results of a study by Huang (2008) showed that teacher reflection content was mostly at the level of reporting what occurred, rather than that of analysing. Teachers need to improve themselves in order to become critical and reflective teachers, and indeed teacher training and professional development programmes should provide opportunities to promote such reflective skills.

In addition, in relation to the content of teachers' reflection, relying only on teachers' experiences can be limiting in terms of their development (Britzman, 1991), since there appears to be little, if any, evidence from the published literature that assisting teachers to become reflective without providing them with a valid framework to meet their personal needs and priorities for improvement necessarily makes their practice more effective (Smith & Hatton, 1992b). Likewise, many studies stress the need for the provision of a well-researched and theory-based framework to guide the content of reflection (Bierman, Nix, Greenberg, Blair & Domitrovich, 2008; Buczynski & Hansen, 2010; Domitrovich et al., 2009; Yoon, Garet, Birman & Jacobson, 2007). Future policy directions need to take into consideration that one

of the main critiques of the HA is that it lacks a grounded theory on the basis of which specific teaching skills could be developed. As Calderhead (1993) argues, many reflective teacher education and professional development programmes appear in fact to draw upon fairly narrow conceptions of both research and practice. On the other hand, the use of competence statements or standards is not a panacea for teacher training and development (Evans, 1993), nor should it be dismissed out of hand. The construction of a hierarchy of competence acquisition needs to pay particularly close attention to the demands made by practical teaching, as any teacher professional development programme is of little value if it fails to improve teacher effectiveness (Kyriakides, Creemers & Antoniou, 2009). Nevertheless, if the professional standards drawn upon the basis of validated theoretical models of teacher effectiveness are used as the foundation for dialogue and intelligent reflection rather than as a set of demanding criteria for success, it will enhance the ability of teacher training and professional development to make a significant contribution to the quality of teaching and student learning.

## **Strengths and Weaknesses**

Across the diversity of perspectives, positions and definitions described in the previous section, the HA, through teacher reflection, is generally assumed to promote understanding and insight and to have transformation or empowerment as its purpose or effect. Thus, many argue that reflection should be a standard professional disposition for all teachers helping them to understand the complex nature of classrooms (Feiman-Nemser, 1990; Zeichner & Liston, 1996). This section provides an overview of the main strengths and weaknesses of this approach.

### ***Strengths and Advantages***

A widely accepted strength of the reflective approach is that reflection enables practitioners to analyse, discuss, evaluate and change their own practice, adopting an analytical approach towards their teaching skills. It also encourages them to appraise the moral and ethical factors implicit in classroom practices, including the critical examination of their own beliefs about good teaching. Through reflective practice, teachers may reinterpret and reframe their experiences from a different perspective and participate consciously and creatively in their own growth and development (Munby & Russell, 1990). In addition, the reflective approach may encourage teachers to take greater responsibility for their own professional growth and to seek ways of acquiring some degree of professional autonomy. It may also help them develop their own theories and empower them to take a more active role in educational decision-making.

For example, a key finding in a study conducted by Scott and Dinham (2002) was that teachers had, either on their own or with a mentor or other colleagues, reflected on

and identified their professional strengths and weaknesses. They had then formulated, either formally or informally, a personal action plan to meet their professional needs and had taken steps to put this plan into action. However, in planning to meet these needs, these teachers gave a low priority to formal employer-led professional development initiatives, as they considered them to be unrelated to their priorities for improvement. A sample of secondary heads of department in another study had similar views (Dinham, Brennan, Collier, Deece & Mulford 2000). Generally, educational systems are perceived by teachers to provide various training packages which are often generic in nature, covering areas such as leadership, school management, child protection and other mandatory requirements. However, both teachers and school managers showed a clear preference for professional development which was focused on their subject discipline and area of teaching and tailored to meet their needs. In this context, professional development provided by educational systems was frequently concerned with current priorities which were more to do with systems, school administration and policy rather than actual teaching practice.

Moreover, according to Day (2002), there are three reasons why reflective practice is increasingly being recognised as essential to good teaching and playing a central role in the professional life of the effective teacher. The first concerns the nature of teaching. The assumption is that since teaching and learning are complex processes and since there is not necessarily one right approach (Loughran, 1996), deliberating about competing versions of good teaching and recasting past understandings and current practices (Grimmett, MacKinnon, Erickson & Riecken, 1990) are likely to lead to improvement. Although we agree that there is not one right approach to teaching, we could argue at this point that, drawing on the EER, there are specific teaching skills identified as having an impact on student achievement. If we ignore this, then efforts for improvement might lose their focus and scope. From this perspective, we consider teaching not only as an art but also as a science with a particular knowledge base and empirical evidence to be taken into consideration. Without the capacity to evaluate assumptions, teachers will not be able to improve further.

The second is that engaging in reflective practice is a means of helping individuals towards gaining greater self-knowledge and the ability to challenge themselves, which are in turn considered to be useful ways to achieve personal development (Johnston & Badley, 1996) through an analysis of the personal values and theories that underlie teaching. Finally, the third reason, according to Day (2002), is related to the idea that reflective practice is considered to be central to the growth of teachers as inquirers who engage in collaborative research with others from both inside and outside the school, generating knowledge of practice rather than regarding themselves as objects whose role is to implement existing theory in their practice.

Taking this argument further, Forde, McMahan, McPhee and Patrick (2006) argue that teachers need to forge new professional identities in order to reclaim ownership of their profession. The authors suggest that the way to achieve this is through professional development, reflection and inquiry. The forging of new identities is a critical process within approaches to professional development since it is important to enable teachers to reflect on, and to create, new practices which



best serve the learning needs of their students. The authors also argue that these new practices should centre on an increased sense of teacher agency and ownership of the profession. Most professional development programmes do not appear to be based upon a recognition of the complexity of teaching, nor do they demonstrate a commitment to supporting teachers' *moral purposes* (Sockett, 1993) as an essential part of their professionalism or recognise the *emotional labour* (Hochschild, 1993) and *emotional intelligence* (Goleman, 1995) which are fundamental parts of the teaching process. As Hargreaves (1997, p. 12) argues, 'good teaching is not just a matter of being efficient, developing competence, mastering technique, and possessing the right kind of knowledge. Good teaching also involves emotional work. It is infused with pleasure, passion, creativity, challenge and joy [...] it is a passionate vocation'. Although we accept Hargreaves's argument, at the same time, we do not approve the extent to which such aspects of teaching are over-emphasised, whereas other scientific aspects of teaching are being underestimated or even ignored. As has been mentioned earlier, research findings have revealed that specific teaching skills have an impact on student achievement. Our argument is that such knowledge should not be ignored, especially with respect to our efforts to improve student learning. However, as many argue (e.g. Bierman et al., 2008; Buczynski & Hansen, 2010; Domitrovich et al., 2009; Sprinthall et al., 1996; Yoon et al., 2007), it is crucial to move beyond the theoretical discussions about the merits of reflection to actually investigate the impact of such approaches on teaching and learning and identifying possible limitations.

### ***Weaknesses and Limitations***

The main criticism has been that the holistic or reflective approach lacks a grounded theoretical foundation on the basis of which specific teaching skills could be developed. In other words, this approach seems to neglect research findings related to what constitutes effective teaching and is based on the assumption that reflective practitioners can improve solely by virtue of their own critical thinking and reflection on their past experiences. Nevertheless, teachers do not always learn from experience and that experience itself can be limiting in terms of their development (Britzman, 1991). In addition, while there are increasing demands on teachers to become more reflective, there have been few studies of practical strategies to facilitate such reflection and even fewer investigations of the impact of various strategies upon the development of reflective practices. Most importantly, there appears to be little, if any, evidence in the published literature that assisting teachers to become reflective without providing them with a framework to meet their personal needs and priorities for improvement, necessarily makes their practice more effective (Smith & Hatton, 1992b).

Consequently, another major weakness of the HA is related to the vagueness of its content. Despite the considerable emphasis on promoting reflection in teachers, it is not always clear exactly what teachers are supposed to reflect upon when they



wish to become better teachers (Cornford, 2002). The general or even vague nature of reflective approaches has been noted by Cruickshank and Metcalf (1990) when they argue that all of these approaches are 'intended to prepare teachers to become more thoughtful' (p. 485). According to earlier studies, reflection must be broad and deep in order to be productive (Luttenberg & Bergen, 2008). Breadth refers to the content of teachers' reflections, which may be restricted to a narrow area of their teaching activity or may involve many different aspects. Furthermore, reflection is considered broad if it is both internally and externally oriented (Korthagen, 2001) or if both the past and the future are considered (Conway, 2001). Reflection is also broad if it pays attention to personal, cognitive or moral dimensions (Harrington, Quinn-Leering & Hodson, 1996) or if it refers to social, cultural and political conditions of teaching (Dinkelman, 2000; Noddings, 1995).

In addition, teacher educators supporting reflective teaching have generally employed research selectively to illustrate or support their standpoints or provide a methodology for teacher education and professional development. For example, work on narrative and journal writing has been used to justify reflective practices in some programmes and also to provide a methodology. However, the use of such approaches in teacher education and professional development itself raises many questions that require exploration in order to expand our understanding of the developmental process. For instance, how journal writing contributes to teachers' professional development has not been investigated thoroughly. Both for teacher professional development and for research, it is important to pursue these questions so that the processes and particular activities of professional development under the HA are more fully understood.

Another major criticism of the HA is that although reflection is high on the agenda of teacher education and professional development, it has often not been connected with practice (Kaasila & Lauriala, 2012). Similarly, in terms of adult learning theory, Johnston and Usher (1996) have challenged the relevance of reflective practice as articulated by Boud, Cohen, and Walker (1993) on the grounds that such reflection separates theory and practice. We are all likely to have encountered less effective teachers who are particularly adroit at reflecting; they are able to give cogent and superficially acceptable accounts of their practice and to justify their behaviour in the classroom. In other words, there are teachers who are excellent at reflecting on their practice but whose execution is very unsatisfactory. As McNamara (1990) argues, it is comparatively straightforward, indeed routine, for some teachers to offer critical and reflective analyses of teaching in their formal written assignments and to engage in lively critical talk about practice in non-teaching situations (such as tutorials when stimulated by video transcripts), but their transfer of these mental capacities to their actual teaching is problematic. It is difficult to promote reflective teaching among teachers which goes beyond academic tokenism and actually leads them to modify their behaviour and teach differently and more effectively. Although much has been written about teachers' need to reflect, reflection without action can be sterile (Wragg, 1993).

In this context, the relation between reflection and action remains complicated (Boud et al., 1993; Kaasila & Lauriala, 2012; McNamara, 1990). Teacher behaviour

cannot be comprehended completely by understanding its subjective meaning for the person involved (Kelchtermans, 1993). As Argyris and Schon (1978) put it, there is a difference between *espoused theory* and *theory in use*. Teacher professional behaviour is determined to a great extent, according to those supporting reflection, by the *theories of action*. Through reflection, this theory can be thematised and made more explicit, which then could lead to the *espoused theory*. But what people say they do and why often differs from the *theory in use*, the *theory of action* that can be inferred interpretatively by observing the actual behaviour of teachers at schools.

Although reflection has been very fashionable in all sectors of teacher education, including vocational and adult education, for a number of years, there is little solid empirical evidence that supports the view that it results in superior teaching practices (Cornford, 2002; McNamara, 1990). One might have anticipated that there would have been concerted efforts to evaluate the practical effectiveness of these various approaches to reflection by means of empirical methods and through these, the ideological positions that such approaches represent, but this has not occurred to any appreciable degree. In addition, it should be acknowledged that there has been pertinent, carefully reasoned criticism of reflective teaching in a number of published sources (e.g. Gilliss, 1988; Shulman, 1988), but this does not seem to have dented the enthusiasm in any way.

The results from the few published empirical studies that have attempted to quantify the effects of reflective thinking programmes upon teachers' thought and classroom performance have not managed to provide sound support for the impact of this approach. Chandler, Robinson, and Noyes (1991) found that reflection is not significantly related to teaching performance. Wubbels and Korthagen (1990), comparing teachers who had graduated, both recently and some time before, from conventional colleges and colleges implementing reflective teaching programmes, found no differences between the two groups in their attitude to reflection and inclination towards innovation. Moreover, research by Winitzky and Arends (1991) indicated that it is possible to develop schemas approximating those of expert teachers using reflective methods, but they found no statistically significant differences between the experimental and control groups regarding knowledge or performance. While there is some evidence that the HA in some studies can produce greater ability to verbalise (Stoiber, 1991; Winitzky & Arends, 1991), there is no clear evidence that this can be carried through into superior practical teaching performance. Overall, as Cornford (2002) argues, there is a strong tendency for studies assessing the efficacy of reflective teaching to reveal equivalence between reflective treatment and control groups on a range of measures.

In this context, there is a failure to compare experimentally the different reflection paradigms and the results from the implementation of these. At the same time, it is acknowledged that numerous qualitative or case studies on reflective practice have been widely disseminated through publication (see Kagan, 1992). Many of these have reported the enthusiasm of trainee teachers and lecturers using reflective approaches and/or have explored methods or processes encouraging reflection in student teachers. In addition, there have been many articles on reflection that have attempted to

categorise the diversity of views on the essential nature of reflective practices in teaching into some neat taxonomy, either on the basis of underlying philosophy or types of processes employed to achieve objectives (e.g. Copeland, Birmingham, De La Cruz & Lewin, 1993; Hatton & Smith, 1995; Tom, 1985). These articles attempting categorisation do not appear to have resulted in further agreement or a greater inclination to examine the differential effectiveness of different paradigms or processes when they are implemented. The question that still remains to be answered is related to which are the important aspects of reflection which can facilitate teacher development and improvement in the quality of teaching (Cornford, 2002; Cruickshank & Metcalf, 1990; Smith & Hatton, 1992b). The next chapter attempts to resolve the issue related to the content of reflection by arguing that we need to guard ourselves against the dichotomy existing between the CBA and the holistic or reflective approach to teacher training and professional development.

## Chapter 4

# Going Beyond the Classical Dichotomy Related to the Content of Teacher Training and Professional Development

### Introduction

In Chapters 2 and 3, the two dominant approaches to teacher training and professional development, that is, the competency-based and the holistic approaches, have been reviewed, and their strengths and weaknesses have been identified. In this chapter, taking those weaknesses into consideration, we argue that a more productive synthesis of these two approaches is needed. In particular, it is acknowledged that reflection needs to be predicated upon something to think about (Zeichner, 1993). That is, there must be content related to teaching skills or a coherent body of knowledge, supported by validated theoretical frameworks from which groups of teaching skills could be selected and based on which the developmental needs of different groups of teachers could be identified through evaluation. At the same time, teachers' critical reflection in relation to effective teaching skills should be encouraged and developed on a systematic basis. Thus, teachers' critical thinking on their experiences and research findings from TER addressing identified teacher needs should constitute the two major elements of teacher training and professional development programmes. In this chapter, the rationale for merging the two dominant approaches to teacher training and professional development is explored. In addition, the basic elements of effective teacher professional development programmes, as identified in previous research studies and literature reviews, are discussed, and their relationship to aspects of the dynamic approach, which lies between the two dominant approaches, is explained in relation to Chap. 8 of this book, which provides a detailed overview of the characteristics of the dynamic approach to teacher training and professional development.

## Conclusions About the Two Dominant Approaches to Teacher Training and Professional Development

Chapters 2 and 3 provide a description of the two dominant approaches to teacher training and professional development and reveal that they both have not only strengths but also weaknesses. In particular, the CBA is concerned with specific knowledge and isolated skills that teachers should possess, and training programmes are organised in units which relate to individual and particular teaching skills and pieces of knowledge (Burke, 1989). However, this approach led to the development of lists containing too many isolated teaching skills, all of which had to be taught in corresponding courses, something which gave rise to doubts about the feasibility and practicability of this approach. In addition, the long detailed lists of teaching skills could gradually have resulted in a kind of fragmentation of the teacher's role. Moreover, it has become increasingly apparent that this view of teaching takes insufficient account of the fact that a good teacher cannot simply be described in terms of isolated competencies, which could be learned over the course of a number of training sessions (Korthagen, 2004). On the other hand, the HA gives a much broader view of what teachers should know and expects that increased reflection on experience and beliefs will translate into action which will eventually result in improvements in teaching and learning (Cornford, 2002). However, a number of problems have been recognised that are associated with the development of the HA in teacher education and professional development. Among others, the content of reflection is not always clearly defined, nor is the whole procedure always associated with teaching practice and action for improvement (Elbaz, 1988; Zeichner, 1990), something which creates doubts in relation to the potential of reflection to improve teaching practice. As has been explained in Chap. 3, improvement in teaching as a result of reflection is the main assumption underlying the HA. However, we argue that this assumption needs to be tested through systematic research in order to discover the other essential characteristics of reflection that could facilitate improvement in teaching and learning.

In particular, in terms of empirical justification, there is little solid evidence that supports the view that the reflective approach results in superior teaching practices (Cornford, 2002; McNamara, 1990). Similarly, although some studies show that the CBA may have positive short-term effects on improving teaching practice, doubts could be raised about the long-term effects of defining teaching and improving teachers' knowledge and skills. There is so far no definite answer as to which is the most effective teacher professional development approach that should be used in order to improve quality of teaching and student attainment. As Garet, Porter, Desimone, Birman, and Yoon (2001) argue, although there is a large body of literature on professional development, surprisingly little attention has been paid to the actual content of the professional development activities. The same issue has been reported by Wragg (1993) in relation to the content of the Leverhulme Primary Project, in which, he argues, one of the most important issues was the extent to which teaching skills should be learned in part or as a whole, 'The extreme part-learning

stance is taken by some supporters of the competency-based teacher education who believe that the teaching can be atomized into hundreds of discrete mini-acts which can be systematically learned and appraised. On the other hand, the extreme holistic stance is adopted by those who contend that teaching is an art, and that to seek to segment it is to destroy it' (p. 192).

Nevertheless, we may have to guard ourselves against confining the discussion to this classical dichotomy in teacher training and professional development. In particular, in order to overcome the disadvantages of the two dominant approaches, this chapter argues that an integrated approach is needed. This approach, sited between the two dominant ones and utilising key elements from both, could help us overcome their main disadvantages. In this context, the next section explains the rationale for merging elements of the two dominant approaches.

### **Thesis–Antithesis–Synthesis: The Rationale of Merging the Two Dominant Approaches**

The rationale of merging the two main approaches is grounded in the idea that although each one has positive elements that can foster improvement in teaching skills and ultimately student outcomes, when taken on their own, especially at their extreme standpoints, they are rather inadequate, as has been discussed in the previous sections. The idea of merging different paradigms and approaches is not a new one. As Calderhead (1993) argues, effective teacher training is far more likely to reflect a combination of the different paradigms since classroom practice itself involves diverse aspects of the knowledge emphasised by the different paradigms. Similarly, Zeichner (1993) supports the view that the various approaches are not uniform and they overlap to a certain extent.

One of the most important aspects of this integration is related to the content of teacher training and professional development programmes. On the one hand, the CBA supports the idea that the content should consist of specific teaching skills. This, however, might give rise to questions relating to the practicability, validity and usefulness of such long and detailed lists of effective teaching skills. The attempt to generate long lists of individual teaching skills is not in line with EER, which refers to generic teaching factors describing teacher behaviour (Creemers & Kyriakides, 2008b). On the other hand, while there is considerable emphasis on promoting reflective approaches, at the same time, it is not always clear exactly what teachers are supposed to reflect on when they wish to become better teachers. In addition, issues related to the support (e.g. what kind of support, by whom, how often) necessary for teachers to improve, need to be investigated further. The main results of EER which relate to such arguments (explained in detail in the next part of this book) support the view that different types of teacher behaviour have been found, which explain variation in student achievement. These types of behaviour do not refer to isolated teaching skills, but it has been shown that these skills relate to each other and form groups of teaching skills.

In this context, we argue that research on teacher training and professional development should increasingly take into account the results of EER, addressing teaching skills that are found to be positively related to student achievement. This relies on the assumption that all efforts to train teachers should take into consideration *what an effective teacher is* and *how an effective teacher behaves in the classroom* in order to maximise the learning potential of the students (Antoniou & Kyriakides, 2011; Kyriakides, Creemers & Antoniou, 2009; Last & Chown, 1996; Wragg, 1993). This is exactly the reason that teacher professional development programmes should be linked to the results of EER. As has been mentioned earlier in this book, this argument was originally advanced three decades ago but was not developed further either for research or for policy purposes (see Gage, 1978; Katz & Rath, 1984). Similar issues relating to the relationship between teacher training and teacher effectiveness have been extensively discussed in both research and policy cycles (see, e.g. Ballou & Podgursky, 2000; Darling-Hammond, 2000; Darling-Hammond & Youngs, 2002; U.S. Department of Education, 2002).

Although the various models of teacher professional growth developed over the last two decades, stress that teacher training and professional development programmes should be concerned with teacher beliefs and attitudes, the importance of teaching skills is implied but not elaborated (Clarke & Hollingsworth, 2002). Cornford (2002) argues that it is important that teaching skills should form part of the basis of effective teacher education programmes, although skills are much neglected by many in the reflective teaching movement, with those advocating the teaching of these even being criticised as being ‘technicist’ (Gore, 1987). Similarly, Wragg (1993, p. 189) argues, ‘In many school-based in-service programmes and even to initial teacher training courses, there is still too little attention paid to important basic classroom skills.’ From this perspective, reflection needs to have a focus. That is, there must be a content or a coherent body of knowledge, supported by empirical data and validated theoretical frameworks, to guide the reflection process by identifying skills which (a) have been found to be related to student achievement based on research findings and (b) are appropriate for the developmental stage of the participating teachers, that is, their readiness and priorities for improvement. Both of these aspects are further elaborated in Chap. 8, in which a detailed description of the dynamic approach to teacher professional development is provided.

It is also important to note that an overemphasis on the content at the expense of the process of learning and mastering those skills would be problematic. This is the reason that the CBA is rejected by many teacher educators as it is considered to be a rather mechanistic approach (see Chap. 2) with a central focus upon outcomes rather than upon the teacher improvement process itself. The early association of the CBA with vocational training, especially in some of the narrowly behavioural approaches adopted in the USA, has led to a view amongst teacher educators that the CBA implies an instructional form of pedagogy. A narrow, skill-based definition of isolated competences has sometimes led to teaching that stresses performance at the expense of understanding. Narrow competency-based approaches to education and training have also relied particularly on the assessment of observable workplace skills. Again they are associated in the minds of many teacher educators with



behaviourist and technicist approaches. For example, in one project, 121 separate teacher behaviours had to be checked off by an independent observer and analysed individually to produce individual competency levels (see Gitlin & Smyth, 1989). Taking this into account, we could argue that the CBA has indeed tried to utilise the findings from EER to develop teacher professional programmes. From this perspective, this approach has put forwards a view of teaching as a science and attempted to use the existing knowledge base for teacher training and professional development. However, we could argue that the CBA, in generating long lists of individual competencies, has not taken into consideration the fact that any model of teacher professional development needs to be parsimonious in order to be feasible and viable. It is also important to note that models proposed by the EER are not as complicated and do not refer to such a large number of teaching skills or other factors influencing learning.

In this context, if we take the extreme position of the CBA, then the successful acquisition of every single competence at the same time is impossible (Hayes, 1997). Thus, some prioritising of teaching skills is inevitable, especially taking into consideration the different stages or levels of competence of different groups of teachers (Berliner, 1992, 1994; Hayes, 1997; Kyriakides et al., 2009). From this perspective, results from validated models of educational effectiveness, describing teacher behaviour and skills that were found to have a positive effect upon student outcomes, should be utilised when deciding upon the content of teacher professional development programmes. In particular, we argue in this book that the dynamic model of EER could be employed as the theoretical framework of an integrated approach to teacher development which has the potential to help us better understand the processes of change and the way effectiveness factors at the teacher level operate and evolve over time (Heck & Moriyama, 2010; Hofman, Hofman & Gray, 2010; Sammons, 2009). In addition, research findings relating to the grouping of factors at the teacher level of the dynamic model into five stages describing teacher behaviour (see Chap. 8) could help us overcome the major disadvantage of the CBA, namely, that associated with the training of teachers in too many separate and unconnected skills (Antonioni & Kyriakides, 2011; Kyriakides et al., 2009). The essential characteristics of the model, the factors and the measurement dimensions, along with an explanation of how it could be utilised for teacher training and professional development purposes, are elaborated in the second part of this book.

At the same time, reflection for understanding and critical thinking on those skills are, or should be, important elements in all aspects of learning and performance. As stated in the previous chapter, through reflection teachers participate consciously and creatively in their own growth and development (Schon, 1987; Zeichner & Liston, 1996). Reflection enables practitioners to analyse, discuss, evaluate and change their own practice, adopting an analytical approach towards it, thereby encouraging them to appraise the moral and ethical factors implicit in classroom practices, including the critical examination of their own beliefs about good teaching. In addition, it encourages them to take greater responsibility for their own professional growth and to seek ways of acquiring some degree of professional autonomy.



It is also important to clarify at this point the kinds of reflection to which we are referring, especially the various definitions and different types of reflection proposed in the past (see Calderhead, 1989; Hatton & Smith, 1995; Tom, 1985). Taking Jay and Johnson's (2002) description of the stages of reflection (i.e. descriptive, comparative and critical reflection) in an integrated approach, the *descriptive stage* refers to the problem-setting stage, during which the teacher, together with the A&RTeam, identifies which aspects of his/her teaching practice should form the core of his/her reflective attention and efforts for improvement, based on empirical data from classroom observations and evaluation. The framework for identifying these priorities needs to be validated from research findings, providing evidence of its significant impact on student learning.

Then, as mentioned in Chap. 3, during the *comparative stage*, the teacher begins to think about the teaching skills or other aspects of his/her role that have been previously agreed as the target for his/her improvement effort, using a number of different frameworks. The teacher tries to make sense of other people's viewpoints and also related research findings and suggestions that could facilitate his/her efforts. The ultimate result will be a more comprehensive understanding of each teaching skill as a result of taking into account the specific classroom and school contexts and their complexity and also the development of action plans with regard to specific teacher and/or student activities. This stage is also similar to what Van Manen (1977) referred to as the *technical stage*, which is concerned with the effective application of skills and technical knowledge in the classroom setting and in which reflection is confined to constantly analysing the effects of the skills and strategies used.

At the third stage of an integrated approach, the *critical reflection* stage, the teacher, having implemented the activities included in his/her action plan, evaluates the different choices and alternatives and integrates the newly acquired information with what he/she already knows and performs. This stage will form the basis for the formulation of alternative ways of teaching or approaching problems on the part of the teacher. This stage is also similar to what Van Manen (1977) called the *practical stage*, which involves reflecting on the assumptions underlying a specific classroom practice as well as the consequences and the impact of that practice on pupil learning. At this final stage, teachers assess the educational implications of their actions and incorporate new, improved skills into their everyday teaching.

From the above conceptualisation of reflection, it is clear that critical thinking is necessary, but not sufficient. There needs to be both knowledge and bodies of intellectual and performance skills validated by empirical findings that form the basis for critical analysis. Without these and the ability to translate the critical analysis into action in order to improve performance, there is little overt social benefit to be gained from engagement in critical analysis and reflection approaches. As supported by earlier studies, teacher reflection does not automatically make an individual a better teacher (see Zeichner & Liston, 1987, 1996). Without a clearer sense of the specific quality and content of reflection, its impact can be limited (Zeichner & Wray, 2001). As Wragg (1993) argues, 'It is wrong to expect that if the general development of the teacher is sound, then all teaching skills and competences will emerge of their own accord. There is now useful literature on teaching skills.

There are reflections and exercises one can undertake in a positive attempt to improve the practice of some aspects of teaching’ (p. 192).

These concerns are also confirmed by Amos and Postlethwaite (1996), who found that a concentrated effort on influencing the quality of teachers’ reflective practice only resulted in a limited change in their behaviour, other than in the way they approached lesson planning. Edwards and Brunton’s warning about the ‘ubiquity of the reflective practitioner’ leading to a ‘degradation of meaning’ (Edwards & Brunton, 1993, p. 165) should cause us to be careful about placing too much trust in claims about the benefits of loosely defined reflective practice, despite general agreement that one characteristic of effective classroom practitioners is their capacity for thoughtful, intelligent deliberation. The simple guideline of writing down strengths, weaknesses and suggestions for improving teaching generally is not sufficient. Reflection on teaching practice does not occur in a vacuum, and a concrete conceptual framework is needed to direct reflection (Huang, 2008). We regard this connection as essential for improving teacher training and development in order to make an impact on teaching skills and student attainment.

The above discussion implies that improvement in teacher effectiveness should be focused neither on the acquisition of isolated skills/competencies (Gilberts & Lignugaris-Kraft, 1997) nor on reflection across the whole process of teaching in order to help teachers obtain ‘greater fulfilment as a practitioner of the art’ (of teaching) (Clarke & Hollingsworth, 2002, p. 948). The first approach, that is, the CBA, emphasises that the development of skills (and the implied knowledge) proceeds gradually, and attempts to use the cognitive load theory to draw conclusions regarding teacher training and professional development (Feldon, 2007). The second, namely, the HA, is based on the assumption that an effective teacher cannot simply be described in terms of certain isolated competencies, which can be learned in a number of training sessions. It is argued that teacher education should refer to teachers’ personal development which attempts to change not only teacher behaviour but also their beliefs and attitudes. It is, therefore, supported that the complexity of classroom and school life demands a more rigorous, comprehensive and flexible approach to teacher training and professional development rather than simply training teachers to develop and master specific teaching skills.

In this chapter, it is argued that the two dominant approaches could be integrated into a dynamic approach in order to overcome their main weaknesses. Emphasis in teacher training and professional development on either one without considering the other is likely to fail. The integration of such elements in teacher training and professional development has been supported by previous studies. For example, Wragg (1993, p. 193) argues ‘Nor should the study and development of classroom skills be seen as in opposition to other forms of training. Some emphasis on specific skills in an initial training course, in school-based in-service programmes of professional development, in the training of mentors or appraisers, does not replace other forms of reflection and practice, but rather works in harmony with them.’ Likewise, Hextall, Lawn, Menter, Sidgwick and Walker (1991, p. 15), argue that although ‘teaching is not reducible to a set of technical operations’, they are not running away from the issue of the systematic appraisal and development of teaching

competences and skills. Moreover, Hutchinson (1994) refers to the 'flexible definition and redefinition of the complex situations in which class teachers work' (p. 311) as a warning against placing an over-reliance on mechanistic approaches such as the competency-based approaches and stresses the need for intelligent reflection to aid professional growth. However, it is important to note that at the same time he refuses to accept that reliance upon reflective practice alone will somehow transform inertia into sparkling professionalism (see Chown, 1994). This is why a combination of teaching skills, which have been found to be positively related to student achievement, and critical reflection upon these skills is necessary.

The attempt to integrate elements of the two dominant approaches in teacher training and professional development could also have greater potential to connect reflection and action initiatives to maximise improvement. An important aim of any training and/or professional development activity should be to facilitate the process whereby the inner levels of theoretical knowledge of research findings concerning teacher effectiveness, which refer to types of teacher behaviour, influence the outer levels of teaching practice. In other words, what matters is developing effective teaching behaviour, and, to that end, it is vital that teachers are not only cognitively aware of the theoretical knowledge related to each teaching skill or competence but that they take the step leading towards conscious decisions to make use of this knowledge and then carry out those decisions effectively in their classrooms. This procedure is significant since one main criticism of the holistic or reflective approach is that although reflection is high on the agenda of teacher education, it has often not been connected to practice (Kaasila & Lauriala, 2012). At the same time, many models of reflection are in fact phase models describing the reflection process, and they make no pronouncements on questions related to the content of reflection in terms of behaviours or skills on which teachers could reflect in their efforts to bring about improvement. As Johnston (2007) argues, like all skills, teaching should be developed through practice underpinned by theory, research and reflection, which is why teacher training is very specific about the need for both trainees and practising teachers to reflect on and use their developing skills. In addition, although each teacher is expected to develop his/her own strategies and action plans for improvement, it is acknowledged that to do so effectively, support should be provided to teachers by the A&RTeam. This team, consisting of researchers on school effectiveness and teacher professional development, would be in a position to make available knowledge about how to improve the functioning of factors addressed by each teacher and his/her technical expertise. This issue is further elaborated in Chap. 8, which describes a dynamic approach to teacher training and professional development.

In addition, both teaching skills and reflection on those skills should be differentiated to meet the professional needs and developmental priorities of different groups of teachers. The assumption used in the dynamic approach to teacher training and professional development, presented in Part III of this book, is that something which is relevant for one teacher might not be relevant for another. Each teacher could have different priorities in their efforts to improve, and programmes should be structured according to the circumstances and the participants' professional

needs. In this sense, evaluation of results, based on validated theoretical frameworks, can supplement the process of reflection by helping teachers to determine which skills they need to concentrate on in their efforts to improve. As for proposed integration between the two dominant approaches, it might be expected that those teacher-learner characteristics which provide a basis for entry to the course would be identified in greater detail through evaluation mechanisms, thereby facilitating a common understanding of the skills, knowledge and attitudes which the participating teachers bring to the course and providing a foundation upon which the developmental programme could be built. Such an approach might be of particular benefit in relation to teacher professional development programmes for teachers with some working experience, who bring a wide range of skills, knowledge and understanding which need to be assessed if courses are to be devised to meet their needs.

This is important, as often in teacher professional development programmes the individual development needs have been neglected, unless they were in an area that was designated a school priority. For example, McMahon (1999), reporting on the findings of a Leverhulme-funded study of teachers' perceptions of the provision of professional development, conducted in four local education authorities in the UK, found that the professional development days were often not well used, and the content and level were often judged to be inappropriate by the participating teachers. From this perspective, professional development should be linked to the teacher evaluation process and results. One of the most difficult challenges is not designing a new system of teacher appraisal, nor refining an old one, but sustaining a climate in which effective formative teacher evaluation serves to encourage teachers to develop action plans for their professional growth and continuous improvement (Beall, 1999). A similar argument is raised by Guskey (2000) when he supports the idea that the teachers' professional performance review needs to be linked to their personalised professional development plan.

## **Characteristics of Effective Teacher Training and Professional Development Programmes**

Based on reviews of teacher training and professional development programmes (Blank & de las Alas, 2009; Borko, Jacobs & Koellner, 2010; Clewell, Campbell & Perlman, 2004; Desimone, 2009; Hawley & Valli, 1999; Kennedy, 1998; Timperley, Wilson, Barrar & Fung, 2007; Van Veen, Zwart & Meirink, 2011), this section provides a description of the main characteristics on which effective teacher professional development programmes should be based. In addition, direct or indirect reference is made to key elements of merging the two dominant approaches, the rationale for which has been explained previously. The research findings have revealed that professional development is more effective if the teacher has an active role in constructing knowledge (*teacher as action researcher*), collaborates with colleagues (*collective critical reflection*), the content relates to, and is situated

in, the daily teaching practice (*emphasis on teaching skills*), the content is differentiated to meet individual developmental needs (*linked with formative evaluation results*) and the possibilities and limitations of the workplace are taken into account. These characteristics are further elaborated below, and their implications for developing teacher training and professional development programmes are also discussed.

***The Content of the Programme Should Have a Clear Focus on Specific Skills Which Are Linked to the Daily Teaching and Have Been Found to Be Positively Related to Student Progress***

As with all skill learning, regardless of whether it involves performance skills or cognitive skills, there is a need for programmes that help participants to acquire the desired skills (Cornford, 1996). In this chapter, we argue that we need to stop assuming that all teachers are in possession of effective cognitive skills, which will enable them to develop their teaching skills naturally and without the need for teaching and learning which addresses their specific needs in terms of developing teaching skills and competences. This attempt is supported by Desimone, Porter, Garet, Yoon, and Birman (2002), arguing that focusing on specific teaching practices in professional development increases teachers' use of those practices in the classroom and thus students' learning. That is not to deny in any way that thinking and critical analysis are important, as explained in the previous section of this chapter. The issue is how to encourage such critical thinking, while at the same time building a solid foundation of teaching skills, validated by research findings and connected to student outcomes, which have been neglected in the holistic-reflective paradigm.

Nevertheless, the selection of these skills and practices is also crucial as teachers or teacher professional development programmes' administrators, in their efforts to bring about improvement, have an infinite number of possible alternatives on which to concentrate their focus and actions. Justifications for the particular competences selected also seem to vary, while there is often a lack of clarity about the relationship between different types of competences (Whitty & Willmott, 1991). As Hayes (1997, p. 170) argues, 'We need to be clear about how we define competence; whether it is right to speak of one competence, two competences, three competences etc.' Although the specific competences employed in course design can be derived from a variety of sources, such as the various task analyses of teaching, attempts to specify the attributes of the teacher as professional or even competences specified by external agencies, we need to be in a position to justify this selection on the basis of research findings. This is why we need to develop or utilise validated theoretical frameworks, drawing on EER, which could guide teacher educators by focusing on groups of teaching skills that have been found to be related to student learning, while at the same time facilitating teachers' attempts to improve the skills they most need to enhance their effectiveness (Whitty & Willmott, 1991; Sharpe, 1997). From this perspective, it is argued that results from validated models of educational effectiveness, describing teacher behaviour and skills that have been found to have

a positive effect upon student outcomes, should be utilised in defining the content of teacher professional development programmes. This argument is further elaborated in the second part of this book, in which the dynamic approach to teacher training and professional development is described in detail.

### ***The Content of the Training Programme Should Be Differentiated so as to Meet the Participants' Different Priorities for Improvement and to Address Contextual Issues Influencing Quality of Teaching***

The use of a valid framework, as mentioned above, on the basis of which the content of the training programme is to be selected and formulated, cannot in itself ensure that the programme will be effective and will improve the quality of teaching of all participating teachers. In this chapter, we also argue that not only should a theory-driven approach be followed to improve quality of teaching, but emphasis should also be placed on collecting data in order to identify the teaching needs and priorities for improvement for different groups of participants, thereby facilitating the design of relevant improvement efforts with differentiated content and focus.

In practice, teachers seem to consider new initiatives on their individual merits, particularly in relation to how they will benefit classroom teaching (Corkindale & Trorey, 2002). Teachers have turned away from competency-based or holistic professional development approaches, which are not seen to have ready relevance to, and application in, the classroom and are not geared to teachers' needs (Ayres, Dinham & Sawyer, 2000; Dinham, Brennan, Collier, Deece & Mulford, 2000). As Scott and Dinham (2002, p. 112) argue, 'The pendulum is now swinging with quality of teaching becoming a major focus in the educational systems of many countries responding to teacher demands for professional development that matters in their everyday tasks and activities.'

Data should also be collected in relation to the context, in which the participating teachers operate. This is important, as several researchers argue (e.g. Imants & van Veen, 2010; Little, 2006; Smylie, 1995), since most professional development research hardly takes the condition of the daily workplace into account, although these conditions strongly influence the opportunities, limitations and the overall contribution of the professional development programmes. No single strategy will always work in every school, for every teacher, all of the time. Local customisation is necessary for the success of programmes of teacher learning or professional development (Fishman, Marx, Best & Tal, 2003). Many professional development programmes customise their content and include several strategies in one intervention, for example, a workshop that supports formal learning combined with teacher coaching or planning time with colleagues. Providing continuous support while teachers are making changes, either in the form of a series of workshops or informal collegial support, or both, is essential, since a number of recent studies suggest that the duration of professional development is related to the depth of teacher change (Shields, Marsh & Adelman, 1998; Weiss, Montgomery, Ridgway & Bond, 1998).



At this point, it should be acknowledged that teaching occurs in particular contexts: particular students interacting with particular teachers over particular ideas in particular circumstances. Teachers need to learn ‘in and from practice’ (Ball & Cohen, 1999), which allows other important components of effective professional development to occur. Firstly, it gives teachers time to collaborate with other teachers and school colleagues. Secondly, it allows more sustained learning and professional development to occur since it becomes part of the work rather than ‘an additional’ aspect of it. And thirdly, it allows work to be well integrated in a very meaningful, concrete way that addresses specific problems teachers have in their own classrooms. The importance of grounding teacher training and learning in ongoing practice in teachers’ specific educational contexts is a necessary component of developing their expertise (Putnam & Borko, 2000).

The need to develop an evidence-based training approach is based on the assumption that different groups of teachers will have different priorities for improvement. This is also supported by research relating to the developmental stage theories of teacher progression and competence. Over the past three decades, cognitive psychology has produced a range of models of how people develop expert skills in professions such as teaching, music, law and management (e.g. Berliner, 1994; Billett, 2001; Ericsson & Smith, 1991; Hoffman, 1992; Sternberg & Ben-Zeev, 2001; Sternberg et al., 2000). Although these models vary with respect to both the number of stages that must be passed through and the nature of each stage, all have fixed sequences of stages representing successively higher levels of knowledge and skills acquisition. For instance, some empirical studies distinguish novice and expert stages in terms of extent and complexity of knowledge structures (e.g. Berliner, 1994; Carter, Cushing, Sabers, Stein & Berliner, 1988; Chi, Feltovich & Glaser, 1981; Feiman-Nemser & Remillard, 1996; Livingston & Borko, 1989). The theory suggested by these models holds that the teachers must pass through a number of periods or stages of development. Failure to respect the integrity of each stage and to allow sufficient time for its fulfilment will result in subsequent problems.

From this perspective, we probably need to think about the scope and sequence of teacher education experiences in the same way and with the same care that we develop scope and sequence guides for students from kindergarten to twelfth grade. Decision-making, priority setting and other aspects demonstrating personal control over the environment are characteristic of the developmental stage of the competent teacher, rather than that of a novice. The question that must be raised while teacher educators struggle to develop reflective practitioners, sensible decision-makers and proficient problem-solvers, is whether those are proper goals for more experienced or more effective teachers. As Hayes (1997) argues, some prioritising, ranking or grouping of teaching skills is inevitable since the successful acquisition of every single competence at the same time is unattainable, although this is supported by some programmes which take the extreme position of the CBA. The research on the development of expertise suggests that we have not recognised the limitations of the novice and the potential for growth of the advanced beginner and competent teacher as we develop teacher education programmes. However, all the

stages are of fundamental importance to the professional development of teachers, and educators must be capable of intervening at all stages, if they are to achieve the best possible results.

***The Programme Should Provide Opportunities for Active Participation and Engagement of the Teachers and Provision of Feedback for Each Teacher***

Another core feature of effective professional development programmes concerns the opportunities provided for teachers to become actively engaged in meaningful discussion and planning and to practise and implement the new knowledge and skills in their everyday teaching (see, e.g. Lieberman, 1996; Loucks-Horsely, Hewson, Love & Stiles, 1998). For teachers, the effectiveness of professional development initiatives depends heavily on the conditions in which opportunities for development actually result in changes in classroom practice (Christie & O'Brien, 2005). Based on evaluation evidence relating to their needs, teachers, in collaboration with the A&RTeam, need to be involved in identifying and setting their individual and more specific goals for inclusion in the programme: furthermore, they should participate in choosing the content and the design of the professional development intervention that could best meet these developmental needs (Hawley & Valli, 1999). This is why a combination of teaching skills found to be positively related to student achievement should be selected, while at the same time, critical reflection upon the current state of each teacher in terms of these skills should be systematically encouraged and promoted.

This is also related to the argument that teachers participating in teacher professional development programmes seek empowerment (Corkindale & Trorey, 2002). Many want to be involved in the decision-making which affects the quality of their teaching. However, staff development, as Fullan (1992) has suggested, has a history of doing things *to* teachers rather than *with* the teachers. Taking the above into consideration, we argue that effective professional development programmes should provide training based on 'active teaching' and should not be restricted only to lecturing. This will provide the participating teachers with the chance to report teaching practices and comment on them, to identify effective and non-effective teaching practices, to understand the significance of specific types of skill which correspond to their developmental stage and to comprehend how these are linked to effective teaching and learning. From this perspective, special emphasis should be placed on teachers as action researchers.

Action research refers to the application of social science methods to practical problems of everyday teaching with the goals of contributing to theory and knowledge in education and improving teaching practice. According to Somekh (1995, p. 340), action research is designed 'to bridge the gap between research and practice, thereby striving to overcome the perceived failure of research to impact on



and improve practice'. It is worth mentioning that the term was first used by Kurt Lewin in the 1940s. More recently, educators have framed action research as inquiry conducted by practitioners with the help of a consultant and/or expert. The following four characteristics have been attributed to action research: (1) it is collaborative, (2) it addresses practical classroom problems, (3) it reinforces professional development and (4) it requires a specialised structure to ensure both time and support for the research initiative.

In this context, Oja and Smulyan (1989) have examined action research as a new role taken on by teachers. Using a cognitive-developmental framework, they investigated how action research projects could transform teacher thinking, empathy and perspectives. Their Action Research on Change in Schools project (ARCS) is an extensive multicase study that analyses key elements of effective collaborative action research. They used the theory of group dynamics and adult development to explain how individual teacher researchers and groups develop. Their findings 'suggest that the type and quality of collaborative action research are dependent on the developmental stages of the teachers involved' (Oja & Smulyan, 1989, p. 136). Thus, the ARCS project is yet another study that examines how a teacher's stage of development may influence his or her personal and professional development, as commented on previously in this section.

However, it is important at this stage to clarify a difference between the traditional action research approach, as has been put forwards by supporters of the HA (see Chap. 3), and the approach proposing an integration of the holistic with the competency-based approaches. In particular, although each teacher is treated as a professional responsible for designing his/her own action plan and implementing his/her own improvement strategies, teachers are not left alone to design and implement their strategies and actions, but are encouraged to make use of the expertise and knowledge of the A&RTeam and any other available resource within and/or outside the school. In such an integrated approach, teachers are the ones to take decisions relating to the improvement actions and tasks to be designed and implemented. By doing so, not only is ownership of the improvement effort established, but the teachers' experiences and the context of the school and classroom are also taken into account (Muijs, 2008). At the same time, the A&RTeam has an important role to play in designing teachers' improvement strategies. The A&RTeam is expected to share its expertise and knowledge with practitioners and help them develop strategies and action plans that are in line with the relevant knowledge base of effective teaching. This element of an integrated approach to teacher professional development reveals its main difference from the traditional approaches regarding teachers as action researchers, which are based on the assumption that teachers should develop their own strategies and action plans based only on their reflections on their or other colleagues' past experiences.

From this perspective, in an integrated approach to teacher professional development, with the supervision and guidance of the A&RTeam, each teacher develops his/her own action plan to meet his/her individual needs as identified from the evaluation results, within a validated framework of teaching skills and as discussed with each participant. Important parts of an action plan are a statement of the teaching skills the teacher aims to improve, specific actions the teacher will undertake in this

direction, the resources needed in order to undertake the proposed courses of action (e.g. materials, rooms, equipment) and, finally, evaluation of the whole process. In the evaluation section, teachers could make use of various techniques and methods for gathering evidence of the effectiveness of their action plans, such as keeping a reflective diary. Teachers could also ask their pupils to keep diaries. As Brophy and Good (1986) argue, this enables the teacher to compare his or her experience of the situation with that of the pupils. Moreover, opportunities for active learning can take a number of forms, including the opportunity to observe expert teachers and to be observed teaching; to plan how new curriculum materials and new teaching methods will be used in the classroom; to review student work in the topic areas being covered; and to lead discussions and engage in written work (Carey & Frechtling, 1997; Darling-Hammond, 1997; Lieberman, 1996). In addition, other teachers at the school of the participating teacher could act as outside observers (e.g. critical friends or peer coaches) in order to collect information and convey it to the teacher in a variety of ways, such as making video recording and showing the teacher excerpts they feel to be significant, making detailed notes as they observe and using these as the basis for a short report for the teacher to read or holding informal conversations.

After the development of the teachers' initial action plans, systematic meetings at frequent time intervals should be organised. This would allow the teachers sufficient time to implement the activities included in their action plans and also to reflect on the effectiveness of these activities. Additionally, in those meetings, teachers with the assistance and guidance of the A&RTeam would have the opportunity to revise and develop further their action plans based on their own and others' experiences and on the relevant research literature. At the same time, the teachers should receive systematic feedback and more suggestions from the research team related to their individual priorities for improvement.

***The Programme Should Provide Opportunities for Collaboration and Networking Among Teachers in the Same School, the Same Class or Teaching the Same Subject***

Another characteristic of effective professional development programmes is collective participation and learning, a feature closely related to active learning. Besides individual reflection, collective reflection can be a fruitful tool for enriching and widening a person's thinking, especially since teachers' work conditions are often claimed to support individualism and privacy. This refers to collaborations between teachers and the development of critical networks in the same school, grade or department. The underlying assumption is that the group-based management structure could utilise the accumulated experience and knowledge of the team to facilitate improvement. As Desimone (2009) argues, 'Such arrangements set up potential interaction and discourse, which can be a powerful form of teacher learning' (p. 184).

In addition, there needs to be a shared and collective responsibility on the part of the teachers for their own professional development. Research on teacher learning communities has typically explored features of professional development

programmes, such as the establishment and maintenance of communication norms and trust, as well as the collaborative interactions that occur when groups of teachers work together to examine and improve their practice. This research provides evidence that 'strong professional development communities are important contributors to instructional improvement and school reform' (Little, 2002, p. 936). Grossman, Wineburg and Woolworth's (2001) insights into teacher community suggest a conceptual explanation for these findings. They argue that we cannot expect teachers to create a community of learners among students if they do not have a parallel community to nourish their own growth. Copeland, Birmingham, De La Cruz, and Lewin (1993), for instance, emphasise the social nature of reflection. The reflective content and level of thinking represent an individual's interpretation of the roles and teaching skills which are available to him or her within the particular situation and which may be generated as individual solutions to practical problems.

In this sense, individual reflection may be more like personal interpretive hypotheses. It needs to be shared and negotiated with colleagues so that teachers can reinforce one another. The sharing of reflection gives teachers the opportunity to come together in collegial groups and reflect together on their work. The underlying rationale is that collaborative efforts are more powerful and could increase an individual's sense of satisfaction and motivation. A group of teachers can meet together to identify problems, share information and determine appropriate action regarding different dimensions of teaching practice. For example, Elbaz (1988), in her experiences with teachers examining their own knowledge, initially found that 'autobiographical writing, combined with other types of writing, work on metaphors and imagery, and group discussion, enhanced teachers' awareness of their situations' (p. 180). Later, she found that it was important for teachers to generate and exchange different views in a group process and to envisage concrete alternative courses of action if they are to become self-sustaining in the reflective process.

Nevertheless, although teachers generally welcome the opportunity to discuss ideas and materials related to their work, and conversations in professional development settings are easily fostered, discussions that support critical examination of teaching are relatively rare (Ball, 1994; McLaughlin & Talbert, 2001; Putnam & Borko, 1997; Wilson & Berne, 1999). As Britzman (1986) argued a long time ago, collaboration and collective efforts are not customary in teachers' workplaces, and to change this culture, collective action and reflection should be cultivated in teacher education and training. The improvement effort may have better results if it is to be reviewed as a whole-school process, rather than by each teacher in isolation. In this context, Zwart, Wubbels, Bergen, and Bolhuis (2009) point out, in relation to peer coaching (Joyce & Showers, 1995), the significance of a safe learning culture and collaborative climate in the school. Such conversations must occur, however, if teachers are to explore collectively ways of improving their teaching and support one another as they work to transform their practice. To foster such discussions, tutors in the teacher professional development programme must help teachers to establish trust, develop communication norms that enable critical dialogue and maintain a balance between respecting individual community members and critically analysing issues in their teaching (Frykholm, 1998; Seago, 2004).

### ***The Programme Should Last for a Sufficient Period of Time***

Another important element of effective professional development programmes is their duration. Research has shown that on-off professional development workshops are not typically aligned with the participants' existing practices, needs and priorities for improvement and do not reliably lead to changes in classroom teaching (Loucks-Horsley et al., 1998). In addition, a number of recent studies have suggested that the duration of professional development is related to the depth of teacher change (Shields, Marsh & Adelman, 1998; Weiss et al., 1998). Desimone (2009) supports the view that 'research shows that intellectual and pedagogical change requires professional development activities to be of sufficient duration, including both span of time over which the activity is spread and the number of hours spent in the activity' (p. 184). Depending on the type of the activity, it is not always easy to identify the optimal point of a programme's duration. Findings from the review by Yoon, Garet, Birman, and Jacobson (2007) support a duration of at least 14 h; Desimone (2009) suggests a minimum of 20 h, while Supovitz and Turner (2000) state that a minimum of 80 h of training is necessary for teacher behavioural change to occur. Of course, we need to acknowledge that identifying the optimum point in determining a programme's duration is crucial, since research also indicates that too many hours of professional development can be ineffective (Telese, 2008). This principle is also in line with the stage dimension of the dynamic model, explained in the second part of this book. According to the stage dimension, by giving extended duration to a developmental programme, teachers can implement and practise the new skills more frequently and on a systematic basis throughout the school year (Creemers & Kyriakides, 2006).

In addition, issues related to the sustainability of the intervention (Desimone, 2009; Yoon et al., 2007) are important in determining its effectiveness. On-off, short-term interventions might be less effective than long-term interventions combined with sustained follow-up support, such as coaching at the workplace, follow-up sessions and the provision of continuous support for teacher networking. For example, a study by Dadds (1991) illustrates how in-service experience takes time to be incorporated into classroom practice and that, given time, it can begin to influence the thinking and practice of other teachers of the same group.

### ***The Programme Impact on Teaching Skills and Student Achievement Should Be Evaluated***

Another conclusion drawn from the literature review is that despite the number of studies on teacher professional development, the majority of these do not measure the impact of different approaches and programmes on student learning outcomes (Cochran-Smith & Zeichner, 2005). Few rigorous studies have addressed the effect of professional development on student achievement (e.g. Antoniou & Kyriakides, 2011;

Borko, 2004; Clewell et al., 2004; Kennedy, 1998; Killion, 1999; Loucks-Horsley & Matsumoto, 1999; Supovitz, 2001). At the same time, there is more literature on the effects of professional development on teacher learning and teaching practice; however, these fall short of demonstrating effects on student achievement (Garet et al., 2001). In this context, while those responsible for professional development have generally assumed a strong and direct relationship between professional development and improvements in student learning, few have been able to describe the precise nature of that relationship (Guskey & Sparks, 2002). Likewise, according to an extensive review by Van Veen, Zwart and Meirink (2011), only a limited number of studies have focused on the relation between professional development interventions and student results (e.g. Antoniou & Kyriakides, 2011; Borko, 2004; Little, 2006; Loucks-Horsley & Matsumoto, 1999). Nevertheless, improvement programmes should be introduced only when they have been systematically evaluated using designs that demonstrate their impact on quality of education (Slavin, 2002). In this respect, in order to implement any professional development programme at the regional or national level, there needs to be empirical evidence supporting the effectiveness of the programme in terms of student outcomes.

However, teacher professional development programmes are usually evaluated on the basis of summarising the activities undertaken as part of the professional development programme: what courses were attended, how many credits accrued, etc. This clearly gives no indication of the effectiveness of the activities undertaken, making this form of data collection inadequate as a means of looking at the effects of the programme (Nicolaidou & Petridou, 2011). Where some evaluation does exist, this usually takes the form of participant satisfaction questionnaires. Obviously, such questionnaires allow one to gauge whether participants considered the event to have been enjoyable and successful, but does not engage with issues such as gains in knowledge, or changes in teaching practice as a result of participating in the professional development programme, and certainly does not evaluate whether there have been changes in student outcomes. For example, in a study of teacher professional development activities in England, Edmonds and Lee (2002) found that in most cases, evaluation took the form of a feedback questionnaire that was completed by teachers, including questions on delivery, content and whether they felt the course had met its objectives. Follow-up was unusual, with actual effects on teaching and learning being very rarely studied.

Nevertheless and beyond the current limitations, Guskey (2000) distinguishes a hierarchy of five levels of impact. These levels are hierarchically arranged from simple to complex, that is, each successive level of evaluation is more complex than the previous one. The first three levels of this model relate to participants' reactions to, and satisfaction with, the programme, participants' knowledge and organisational support and change. The final two levels of this model are considered by Guskey to be the hardest to achieve and at the same time the most important. In particular, level 4 refers to the evaluation of the participants' use of new knowledge and skills. The extent to which such knowledge and skills have made a difference in participants' professional practice is the focus of evaluation at this level. This analysis should be based upon predetermined, clear indicators of both the degree and the quality of

implementation. Finally, the fifth and top level in the evaluation of professional development programmes continuum is the evaluation of student learning outcomes. Therefore, a range of evaluative approaches is needed that match Guskey's levels and have the potential to provide meaningful formative and summative feedback for teachers, school principals and policy-makers at the system level. Employing a more comprehensive approach to evaluating the outcomes and the impact of teacher professional development programmes, and aiming to identify changes in teacher perceptions, teaching skills and student outcomes might reveal important information related to the effectiveness of these programmes and assist policy-makers in taking informed decisions regarding improvement.

Summing up, in this chapter, it is proposed that an integrated approach, which merges key elements of the two dominant approaches to teacher training and professional development, is needed to overcome their main weaknesses. In this context, it has also been argued that research on teacher training and professional development should utilise the main findings of EER. By establishing links between these two fields, both of them could have mutual benefits. In particular, research on teacher professional development could expand its research agenda by taking into consideration the impact of effective programmes on student outcomes, and at the same time, EER could identify the extent to which its validated theoretical models could be used for improvement purposes. In this way, stronger links between research, policy and improvement of teaching practice could be established.

In summary, the first part of this book has provided a critical review of research on teacher training and professional development. It has been shown that this field of research has been dominated by two different and somewhat opposing approaches: the CBA and the HA. These two approaches have been described in Chaps. 2 and 3, respectively, and their strengths and weaknesses are discussed. In this chapter, it is argued that we may have to guard ourselves against confining the discussion to this classical dichotomy relating to content and develop an integrated approach to teacher professional development that will focus on the improvement of grouping of teacher factors. For this purpose, not should only reflection and understanding of practice be encouraged, but research on teacher effectiveness should also be taken into account. In the second part of this book, a critical review of TER is provided. Thus, the following chapters refer to the main phases of TER, the main teaching approaches, such as the direct teaching and mastery learning approaches and those associated with constructivism. It is also shown that current models of educational effectiveness adopt an integrated approach in defining quality of teaching by referring to factors associated with student achievement, irrespective of the fact that they belong to one or another teaching approach. It is finally argued that another significant limitation of this field of research is that the whole process of seeking to identify for teacher effectiveness factors had no significant impact upon teacher training and professional development. For this reason, the proposed dynamic approach to teacher training and professional development is discussed in the third part of this book.

## **Part II**

# **Main Foundations of Research on Teacher Effectiveness**

The second part provides a critical review of teacher effectiveness research. The main phases of teacher effectiveness research and their findings are presented in Chap. 5. It is shown that teacher factors are presented as being in opposition to one another. Thus, in Chap. 6, we refer to the main teaching approaches, such as direct teaching, mastery learning and the approaches associated with constructivism. In Chap. 7, it is shown that current models of educational effectiveness adopt an integrated approach in defining quality of teaching and refer to factors associated with student achievement, irrespective of the fact that they belong to different teaching approaches. It is finally argued that another significant limitation of teacher effectiveness research is that the whole process of attempting to identify teacher effectiveness factors has not been able to make a significant impact upon teacher training and professional development. For this reason, the proposed dynamic approach to teacher training and professional development is elaborated in the third part of this book.



## Chapter 5

# Establishing the Field of Teacher Effectiveness Research: Moving from Investigating Personal Characteristics of Teachers to Understanding Effective Teaching Practices

### Introduction

EER reveals that the teacher is an important component of the school effect upon students' progress (Scheerens & Bosker, 1997). A number of studies on effective schools have revealed that the classroom level is more influential than the school level, when examining students' performance (Hextall & Mahony, 1998; Kyriakides, Campbell & Gagatsis, 2000; Muijs & Reynolds, 2000; Wright, Horn & Sanders, 1997; Yair, 1997). Students' academic outcomes are more heavily dependent on the procedures and activities carried out in the classroom, than on those carried out at the school level. In fact, without effective teacher guidance and instruction in the classroom, learning and progress cannot be achieved (Creemers, 1997; Munro, 1999; Oser, Dick & Patry, 1992; Scheerens & Bosker, 1997). Caldwell and Spinks (1993) also argue that while organisational aspects of schools provide the necessary preconditions for effective teaching, it is the quality of teacher-student interactions that principally determines student progress. In this context, this chapter is an attempt to provide a critical review of research into teacher effectiveness. It is shown that during the last century, we have gradually moved from studies focusing on the teacher as a role model for his/her students, to studies aiming to understand effective teaching practices that promote student learning and learning outcomes. One of the major contributions of this field of research is that some assumptions about the importance of personal characteristics of teachers, such as teacher personality and experience, for student learning are not empirically supported, whereas the importance of teacher behaviour in the classroom has been demonstrated. However, it is acknowledged that studies on teacher effectiveness have presented the teacher factors as being in opposition to one another. In this way, a narrowly focused perspective of effective teaching practice has been provided.



## Research into Teacher Effectiveness: Major Findings

Brophy and Good (1986) argue that research on effective teaching was slow to develop because of historical influences on the conceptualisation and measurement of teacher effectiveness. Medley (1979) identified five successive conceptions of the effective teacher: (a) possessor of desirable personal traits, (b) user of effective methods, (c) creator of a good classroom atmosphere, (d) master of a repertoire of competencies and (e) professional decision-maker who has not only mastered required competencies but also learned when to apply them and how to orchestrate them. Table 5.1 provides a summary of the characteristics of effective teachers, identified by the various phases of TER. More information regarding studies investigating the impact of these factors upon teacher effectiveness is provided below.

**Table 5.1** The main factors associated with effective teacher examined by each phase of research into teacher effectiveness

Studies on teacher effectiveness	Factors examined
Presage–product studies	<p><b>Psychological characteristics</b></p> <p>(a) Personality characteristics</p> <p>(b) Attitude</p> <p>(c) Experience</p> <p>(d) Aptitude/achievement</p>
Process-product model	<p><b>Teacher behaviour</b></p> <p>(a) <i>Quantity of academic activity</i></p> <p><i>Quantity and pacing of instruction:</i> Effective teachers prioritise academic instruction and maximise amount of curriculum covered but at the same time move in such steps that each new objective is learnt readily and without frustration</p> <p><i>Classroom management:</i> Effective teachers organise and manage classroom environment as an efficient learning environment, and thereby, engagement rates are maximised</p> <p><i>Actual teaching process:</i> Students should spend most of their time being taught or supervised by their teachers rather than working on their own, and most of teacher talk should be academic rather than managerial or procedural</p> <p>(b) <i>Quality of teacher’s organised lessons</i></p> <p><i>Giving information:</i> The variables which were examined referred to structuring and clarity of presentation</p> <p><i>Asking questions:</i> The variables which were examined referred to the cognitive level of question, the type of question (i.e. product vs. process questions), the clarity of question and the length of pause following questions</p> <p><i>Providing feedback:</i> The variables which were examined referred to the way teachers monitor students’ responses and how they react to correct, partly correct or incorrect answers</p> <p><i>Practice and application opportunities</i></p>

(continued)

**Table 5.1** (continued)

Studies on teacher effectiveness	Factors examined
Beyond-classroom behaviour model	(c) <i>Classroom climate</i> Businesslike and supportive environment
	(a) Subject knowledge
	(b) Knowledge of pedagogy
	(c) Teacher's beliefs
	(d) Teacher's self-efficacy

### ***Presage–Product Studies: The Early Phase of TER***

Early studies concerned with teachers' personal traits led to presage–product studies and to an attempt to identify the psychological characteristics of an effective teacher, such as personality characteristics (e.g. permissiveness, dogmatism, directness and anxiety), even though gradually characteristics more related to education, like attitude (e.g. motivation to teach, empathy towards children and commitment), experience (e.g. years of teaching experience, experience in the subjects and in grade level taught) and aptitude/achievement (e.g. professional recommendations, student teaching evaluations), were also studied.

Although this approach produced some consensus on virtues considered desirable in teachers, no information on the relations between these psychological factors and student performance was provided (Borich, 1992; Rosenshine & Furst, 1973). In addition, even if some personality characteristics, such as emotional stability or the way teachers deal with problems, are probably important for effective teaching, there are no clear findings on which emotional or social characteristics, as measured by personality tests, are actually essential. With regard to attitudes, the fundamental problem is that teachers' attitudes do not give much information as to their actual classroom behaviours (Walberg, 1986). It is more problematic to measure teacher attitudes in relation to effective teaching in a valid way than it is directly to observe teacher behaviour that supposedly reflects attitudes. Teaching experience is also too global a characteristic to be used to distinguish effective teachers. Research shows that experience with specific curricula is more important than general teaching experience (e.g. Schoen, Cebulla, Finn & Fi, 2003; Slavin, Lake & Groff, 2009). Relationships between experience, achievement rates and the abilities of teachers, on the one hand, and effective teaching, on the other hand, are weak and not very meaningful with respect to actual classroom behaviour (Kyriakides, Campbell & Christofidou, 2002).

Therefore, research has concentrated on the question of what an effective teacher might be in terms of student knowledge and skills development. This research tradition acknowledges the importance of teacher characteristics for teaching, but research during the past four decades has ceased to concentrate on these 'good qualities' of teachers. Actual teacher behaviour in classrooms was described, and a search began for the behavioural characteristics of effective teachers.

## *The Process-Product Studies*

The subsequent focus produced experimental studies attempting to investigate the impact of specific teaching methods upon student achievement. However, the majority of these studies produced inconclusive results because the differences between teaching methods were not significant enough to produce meaningful differences in student achievement (Medley, 1979). Furthermore, the significant differences that did appear tended to contradict one another (Borich, 1992). In addition, the 1950s and 1960s brought concern about creating a good classroom climate and about the teaching competencies involved in producing student achievement. This led to an emphasis on measurement of teacher behaviour through systematic observation and, by 1970, to a proliferation of classroom observation systems (Shavelson, 1973; Simon & Boyer, 1970). It was shown that certain teacher behaviours were consistently correlated with student achievement. Thus, during the last four decades, researchers have turned to teacher behaviour as predictor of student achievement in order to build up a knowledge base on effective teaching. The paradigm dominating research on teaching for several decades has been the process-product paradigm, also known as the ‘criterion for effectiveness’ paradigm (Gage, 1963). This approach looks for processes (teacher behaviour, such as teaching skills, techniques or strategies) that predict or preferably cause products (educational results, such as growth in student knowledge and skills). At first, most studies were of a descriptive nature. Later, many correlational studies were conducted, but experimental studies, which introduced certain behaviours and then checked whether these caused the expected effects on students, were also undertaken (Gage & Giaconia, 1983).

This research has led to the identification of a range of behaviours which were found to be positively related to student achievement (Borich, 1992; Brophy & Good, 1986; Doyle, 1986; Evertson, Anderson, Anderson & Brophy, 1980; Galton, 1987; Muijs & Reynolds, 2000). Many of these findings have been validated experimentally, but experimental findings are weaker and less consistent than correlational findings (e.g. Griffin & Barnes, 1986). Additionally, it was not possible to record all teacher behaviour, and therefore it was not possible to create a purely scientific basis for teaching by extensively summing up factors, variables and the characteristics of effective teachers. However, scientific evidence has been collected that shows which behaviours can be effective. It is also shown that teachers themselves can make a choice from behaviours that have proven to be effective, depending on their classroom contexts.

Brophy and Good (1986) argue that the most consistently replicated findings in American studies link student achievement to the *quantity and pacing of instruction*. Amount learned is related to opportunity to learn, and achievement is maximised when teachers prioritise academic instruction, expect their students to achieve the curriculum aims and allocate available time to curriculum-related activities (Brophy & Evertson, 1976). Opportunity to learn has also been found to be a significant factor associated with both teacher and school effectiveness (e.g. Kyriakides et al., 2000; Reynolds et al., 1994; Scheerens & Bosker, 1997). Consistent success is another significant factor associated with student achievement. To learn efficiently,

students must be engaged in activities that are appropriate in terms of difficulty level and suited to their current achievement levels and needs (Bennett, Desforges, Cockburn & Wilkinson, 1984; Stallings, 1985). Thus, there is a tension between the goal of maximising the amount of curriculum covered by pacing the students through the curriculum as rapidly as possible and the need to move in small steps so that each new objective can be learnt readily and without frustration. Brophy and Good (1986) argue that the pace at which a class can move should depend on the students' abilities and developmental levels and the nature of the subject matter since students' errors should be held to a minimum.

Since opportunity to learn is related to student engagement and time on task and engagement have been used as criterion variables in classroom management studies (Emmer & Evertson, 1981), effective teachers are also expected to organise and manage the classroom environment as an efficient learning environment and thereby to maximise engagement rates (Creemers & Reezigt, 1996). Doyle (1986) points out that key indicators of effective classroom management include the following: good preparation of the classroom and installation of rules and procedures at the beginning of the year, smoothness and momentum in lesson pacing, consistent accountability procedures and clarity about when and how students can get help and about what options are available when they finish a teaching task.

As far as the actual teaching process is concerned, research has revealed that students achieve more in classes where they spend most of their time being taught or supervised by their teachers rather than those where they work on their own (Brophy & Good, 1986). Thus, effective teachers should spend most of their teaching time presenting information and attempting to develop concepts through presentation of information and demonstration. Moreover, research into classroom discourse reveals that, although in the classes of effective teachers there is a great deal of teacher talk, most of it is academic rather than managerial or procedural, and much of it involves asking questions and giving feedback rather than extended lecturing (Cazden, 1986).

The findings summarised above deal with factors associated with the quantity of academic activity. The variables presented below concern the *form and quality of teachers' organised lessons* and can be divided into those that involve giving information (structuring), asking questions (soliciting) and providing feedback (reacting). As for structuring, Rosenshine and Stevens (1986) point out that achievement is maximised when teachers not only actively present materials but also structure it by the following: (a) beginning with overviews and/or review of objectives, (b) outlining the content to be covered and signalling transitions between lesson parts, (c) calling attention to main ideas and (d) reviewing main ideas at the end. Summary reviews are also important since they integrate and reinforce the learning of major points (Creemers & Kyriakides, 2008a). It can be claimed that these structuring elements not only facilitate memorising of the information but allow for its apprehension as an integrated whole with recognition of the relationships between parts. Moreover, achievement is higher when information is presented with a degree of redundancy, particularly in the form of repeating and reviewing general views and key concepts (Kyriakides & Creemers, 2008, 2009).

Clarity of presentation is also a consistent correlate to student achievement (Borich, 1992). Effective teachers are able to communicate clearly and directly to their students without digression, speaking above students' levels of comprehension or using speech patterns that impair the clarity of what is being taught (Smith & Land, 1981; Walberg, 1986). Muijs and Reynolds (2000) indicate that the focus on teachers actively presenting materials should not be seen as an indication that traditional lecturing and drill approach is an effective teaching approach. Effective teachers ask a lot of questions and attempt to involve students in class discussion. Although it was discovered that the cognitive level of questions was not consistently correlated to students' achievement (Redfield & Rousseau, 1981), it was pointed out that question difficulty could be expected to vary with teaching context. There should also be a mix of product questions (i.e. expecting a single response from students) and process questions (i.e. expecting students to provide explanations), but effective teachers are expected to ask more process questions (Askew & William, 1995; Creemers & Kyriakides, 2006; Evertson et al., 1980). Clarity of question is also a factor, and length of pause following questions should vary according to their difficulty level. For example, a question calling for application of abstract principles should require a longer pause than a factual question. Once the teacher has asked a question and called on a student to answer, the teacher has to monitor the student's response and react to it. Correct responses should be acknowledged for the purpose of other students' learning, while responses that are partly correct require affirmation of the correct part and rephrasing of the question (Brophy & Good, 1986; Rosenshine & Stevens, 1986). Following incorrect answers, teachers could begin by indicating that the response is not correct, but avoid personal criticism and show why the right answer is correct (Rosenshine, 1971). In general, effective teachers are expected to answer relevant student questions or redirect them to the class and incorporate relevant student comments into the lesson (Borich, 1992; Brophy & Good, 1986; Flanders, 1970).

Effective teachers also use seatwork or small-group tasks since they provide required practice and application opportunities (Borich, 1992; Creemers, 1994b). The effectiveness of seatwork assignments is enhanced when the teacher explains the work that students are expected to do and, once the students are released to work independently, the teacher circulates to monitor progress and provide help and feedback (Brophy & Good, 1986; Creemers & Kyriakides, 2006).

Finally, Muijs and Reynolds (2000) point out that classroom climate is a factor that TER has found to be significantly associated with student achievement. The classroom environment should not only be businesslike but also supportive for the students (Walberg, 1986). Effective teachers expect all students to be able to succeed, and their positive expectations should be transmitted to students (Brophy & Good, 1986).

The process-product paradigm was the leading model for research on teaching for years, even though it was criticised from different angles. Because of the definitions of both process and product variables, the process-product paradigm preferred empirical research of a quantitative nature. Critical advocates of the qualitative approach stated that the quantitative approach did not do enough justice to the 'richness' of education at classroom level (Guba, 1978).

Ethnographic and detailed descriptions of education processes at classroom level, paying very little attention to the outputs of education, were presented as an alternative.

The paradigm seems to concentrate on the frequencies of teacher behaviour, which stems from a preference for the measurement of so-called 'low-inference' behaviour, which can be observed directly, without any interpretation by the observer. Doyle (1986) suggests that too little importance is attached to what behaviour means for the actors in education at classroom level. The process-product paradigm and the quantitative approach also prefer to deal with teacher behaviour that is consistent over time, although of course instability and inconsistency of behaviour are known to occur and can be of great influence on classroom procedures and student achievement. Results of research on teacher behaviour in the process-product paradigm might lead to overly directive recommendations for educational practice, the same kind of directions observed formerly with 'teacher-proof' curricula. Alternative models or paradigms, trying to meet the restrictions of the process-product paradigm, emphasise the intermediary processes between teaching and learning (Doyle, 1986), the ecology of classrooms (which leads to descriptions of classroom contexts) and the necessity of finding out why students learn (Creemers, 1994b).

### ***Beyond-Classroom Behaviour***

The process-product paradigm emphasises the importance of directly observable teacher behaviour, although other variables in the general area of teacher variables, such as training and experience, have also been considered important. Research on non-directly observable behaviour, related to the hidden factors of teacher thinking and judging, has also taken place, and research on a more cognitive approach to teaching, focusing on thinking, cognitive processes and decision-making has been promoted, based on studies by Clark and Yinger (1979), Shavelson (1983) and Shulman (1986). This approach concerns not only teachers but students as well and shows some similarity to Doyle's (1986) mediating paradigm.

Consequently, factors other than classroom behaviour have been the focus of considerable research effort, especially during the last three decades. Although these factors can be classified in a variety of ways, the category system adopted here follows that used by Wang, Haertel, and Walberg (1990). Wang and his colleagues evaluated 179 authoritative papers examining the factors associated with student learning. The papers encompassed 228 items organised into 30 scales within six categories. Four of the categories related to beyond-classroom factors and are discussed below.

### **Subject Knowledge**

Two kinds of professional knowledge have been identified: subject knowledge and teachers' general knowledge of pedagogy (Fennema & Loeff-Franke, 1992). Subject knowledge is widely perceived as a factor affecting teacher effectiveness

(Scriven, 1994), but the evidence is problematic (Monk, 1994). Borich (1992) points out that teachers' prior achievement, regardless of how it is measured, has rarely correlated strongly with classroom practice and student achievement. Darling-Hammond (2000) argues that a number of studies on the relationship between teachers' scores on the National Teacher Examinations and the performance of their students have found little or no effect. Similar results are reported from a study conducted recently (Konstantopoulos & Chung, 2011), which makes use of data that emerged from an experimental study (i.e. the STAR project), in which subject knowledge was not found to be associated with student achievement. This could be attributed to the fact that subject knowledge could be treated as a minimum requirement for effective teaching, but teachers with a high level of subject knowledge may not necessarily have better teaching skills than others. Thus, those with a high level of subject knowledge may not necessarily be more effective from those who meet the minimum requirements for teaching (Monk, 1994).

### **Knowledge of Pedagogy**

In addition to subject knowledge, teachers possess a body of specialised pedagogical knowledge acquired through training and experience related to teaching methods, subject matter and child behaviour, together with other information resulting from their experience of working with children in numerous contexts (Calderhead, 1987). Although it is unclear how pre-service or in-service training contributes to such knowledge (Bednarz, Gattuso & Mary, 1996), two studies in England (Askew, Brown, Rhodes, Johnson & William, 1997; Medwell, Wray, Poulson & Fox, 1998) have shown that pedagogical knowledge is a more significant characteristic of effective teachers than subject knowledge in itself. However, the impact of pedagogical knowledge on student achievement is indirect since it has a relatively small impact on quality of teaching and, through that, on student achievement. This can be attributed to the fact that some teachers may be aware of effective teaching practices and of the knowledge base of TER but may not be able to apply this knowledge in their classroom practice. Although teacher training and professional development courses should aim to improve teacher pedagogical knowledge, its impact on promoting quality of teaching depends on the extent to which training courses help teachers to improve not only their pedagogical knowledge but also their teaching skills.

### **Teacher's Beliefs**

Currently, an increasing amount of research into teacher effectiveness is focused on the beliefs of teachers (Askew et al., 1997; Creemers, 2008). It is argued that teachers' own beliefs about, and attitudes to, teaching and the subject they teach are more important than immediately observable behaviours. The relationship between teachers' beliefs and practice is expected to be a dynamic two-way relationship. It is assumed that beliefs are also influenced by practical experience (Kyriakides, 1998; Rose,



Cousins & Gadalla, 1996; Thompson, 1992). Teachers' beliefs were included as one factor in the design of international studies under the auspices of IEA (e.g. TIMSS and PIRLS) in order to investigate factors affecting student performance. Teacher beliefs have been seen as an explanation for the high performance of East Asian students (e.g. Philippou & Christou, 1999; Stevenson, Chen & Lee, 1993), but secondary analyses of international studies have not shown that teacher beliefs can explain variation in student outcomes (Kyriakides & Charalambous, 2005). Schoenfeld (1992) argues that the area of beliefs is under-conceptualised and needs new methodological and explanatory frames. This is reflected in the fact that instruments measuring teacher beliefs do not usually have satisfactory psychometric properties (Creemers, Kyriakides & Sammons, 2010). Another explanation has to do with the fact that teacher beliefs do not have a direct impact on student outcomes, and if there is any impact, this could be indirect through encouraging teachers to take actions in order to improve their behaviour in the classroom. A teacher could also have positive attitudes towards teaching as a profession but may not be aware on how to improve his/her behaviour in the classroom. Thus, we argue here that teacher professional development should be focused on improving quality of teaching through providing opportunities to improve teaching skills. This might have a positive side effect on teacher beliefs. Concentrating on improving teacher beliefs is very unlikely to have an impact on improving the quality of teaching since there is no clear relation between the development of teacher beliefs and the improvement of their teaching skills.

### **Teachers' Self-Efficacy**

During the last 15 years, teachers' sense of efficacy has become a focus for research. Bandura (1997) defines perceived self-efficacy as 'beliefs in one's capabilities to organise and execute the courses of action required to produce given attainment' (p. 3). In the same sense, teaching efficacy can be defined as teachers' beliefs in their capabilities to organise and orchestrate effective teaching-learning environments. Soodak and Podell (1996) found that teacher efficacy is composed of three factors: personal efficacy (PE), outcome efficacy (OE) and teaching efficacy (TE). Self-efficacy has been shown to be the best predictor of behaviour to accomplish the task (Bandura, 1997; Guskey & Passaro, 1994; Hoy & Woolfolk, 1993; Pajares, 1996). It is supported that self-efficacy influences several aspects of behaviour that are important to teaching and learning. For example, Schunk (1991) revealed that teachers' self-efficacy beliefs were positively associated with their students' achievement in mathematics and language. It was also found that students with teachers who scored high on self-efficacy did better in standardised tests of achievement (Anderson, Greene & Loewen, 1988; Dembo & Gibson, 1985). Moreover, low teacher efficacy beliefs have been linked to low expectations of students, which are expected to predict student achievement. Further, teacher self-efficacy has been found to be related to student self-efficacy and student motivation. However, effectiveness studies conducted in different countries did not manage to demonstrate



a relation between teacher efficacy beliefs and their effectiveness as measured through student learning outcomes (e.g. De Jong, Westerhof & Kruiter, 2004; Kyriakides & Tsangaridou, 2008). Drawing on the literature on efficacy beliefs (e.g. Bandura, 1996, 1997; Marsh & Parker, 1984; Muijs, 1997; Pajares & Schunk, 2001), one may also claim that this association could be negative. As Bandura (1997) argues, one could be quite competent in a certain domain, but still harbour low-efficacy beliefs.

### *Concluding Comments*

The review of the literature on factors of teacher effectiveness seems to reveal that teacher behaviour in the classroom has a direct impact on student learning outcomes. Searching for factors beyond teacher behaviour may help us to discover those that may be related to teacher behaviour. Research on factors other than the teacher behaviour, conducted during the last two decades, has not generated empirical support to show that these factors have direct effect on student achievement. In addition, those studies that reported indirect effects of these factors on student outcomes managed to show that the teacher behaviour in the classroom was the mediating variable, and thereby, the reported effect sizes of these factors on student achievement were very small. Thus, in this book, the importance of focusing on teacher behaviour in the classroom and improving teaching skills is stressed, and we see the other factors as possible contributors (to a certain level) in improving teaching skills. Establishing connections between the functioning of these factors and the improvement of teaching skills is also an issue that needs to be investigated further.

### **Conceptual Limitations of TER**

The second part of this section deals with three conceptual problems of teacher effectiveness in the research literature. These are the limited conceptions of teaching, the need to search for relations among teacher factors and the disconnection of TER from research on teachers' professional development. We argue that a solution to these problems can be found through establishing a dynamic approach to teacher professional development, and this approach is presented in the third part of this book.

Although students' academic outcomes are of great importance for defining the quality of education (Creemers, 1994a), measuring students' progress can be criticised as a one-sided quantitative approach to defining the characteristics of the effective teacher (Thrupp, 2001), ignoring the fact that effective teachers may be also expected to contribute to the improvement of the school community and to the development of national educational policy. The existing approaches have resulted in a list of traits of the effective teacher, which are mainly focused on his/her abilities in teaching students, without taking into consideration other important elements of the teacher's behaviour and performance that might contribute

to students' development and progress across many dimensions. Schools in the twenty-first century are expected to perform a wide range of functions to support the new, rapidly occurring developments that are seen in individuals, local communities, societies and international relations. As a consequence, teachers are expected to adopt expanded roles and responsibilities, such as those of curriculum developers, action researchers, team leaders and staff development facilitators. All these roles suggest that the traditional conception of teacher effectiveness that focused exclusively or mainly on the teaching performance of individual teachers in the classrooms, has its limitations and cannot meet the needs of the school as a whole. There is a need to develop a multimodel conception of teacher effectiveness. In this context, Cheng and Tsui (1999) develop multiple conceptual models of teacher effectiveness that are not concerned with the impact of the teacher on promoting learning outcomes. The main models are briefly presented below, and their main strengths and limitations are discussed.

### ***Resource Utilisation Model***

Teachers are often expected to accomplish complicated tasks and meet objectives within a predetermined time frame. Consequently, the sources and support provided constitute important facilitating factors for their work. Considering that in practice resources and support are often limited, teachers could be considered effective if they can maximally exploit allocated resources and support and also locate new resources. Although researchers could make use of this model to develop criteria for measuring teacher effectiveness, it is stressed here that this model is only useful when there is evidence linking resource exploitation and the achievement of desirable outcomes. However, research taking into account the economic approach does not provide empirical support for this argument. Specifically, effectiveness studies of this approach are focused on estimating the relationship between the 'supply of selected purchased schooling inputs and educational outcomes controlling for the influence of various background features' (Monk, 1992, p. 308). The emerging 'education production' models (e.g. Brown & Saks, 1986; Coates, 2003; Elberts & Stone, 1988) are based on the assumption that increased inputs will lead to increments in outcomes, and their main characteristics are concerned with the following: (a) the selection of resource inputs as the major type of selection of antecedent condition, (b) the measurement of direct effects and (c) the use of data at only one level of aggregation {i.e. either at micro (e.g. student)-level or aggregated (e.g. school) level}. However, the research done using these models has revealed that the relation between input and outcomes is more complex than was assumed. For example, studies by Hanushek and Hedges (e.g. Hanushek, 1986, 1989; Hedges, Laine & Greenwald, 1994) show that reducing the student/teacher ratio and/or increasing the amount of funding education per student does not necessarily result in higher student outcomes. Unless the following questions are answered, one could not claim that this model can be used to define effective teachers: What kinds of resources are

necessary to facilitate educational work? Are there sufficient and/or common resources for all teachers? How are resources related to teacher performance and education outcomes?

### ***The School-Constituencies Satisfaction Model***

In this model, teacher quality is related to client satisfaction (e.g. students, parents). Teachers are thereby considered effective when their performance satisfies their 'clients' (Peterson, Caverly, Nicholson, O'Neal & Cusenbary, 2000). From this perspective, the model could satisfactorily meet the shortcomings of the aforementioned models, since it provides different criteria for evaluating teachers, based on the different needs of the various 'clients' of the educational system. However, the following questions arise: What are the key school constituencies that strongly influence school functioning and teachers' work? Whose needs and expectations from the various 'clients' should teachers try to satisfy? Are those needs and expectations related to the programmed objectives and duties of the teacher? How should teachers react if there are conflicting client needs or if client needs fail to meet the prescribed school objectives? A possible answer to the above questions is to form a hierarchy of needs. The issue that remains, however, is who will determine this hierarchy and according to what standards.

### ***The Accountability Model***

The accountability model is based on the assumption that employees (i.e. teachers) should be held accountable to the public in order to ensure the quality of the educational system. It therefore links the measurement of teacher effectiveness with the establishment of a central mechanism for assessing teacher performance. Thus, teachers are required to demonstrate competence and responsibility in discharging teaching and school activities, as well as in making related professional decisions. The assumptions of this model seem to conform to those of the school-constituencies model, since effectiveness is linked to the satisfaction of social or school constituencies involved in the educational process. According to this model, teachers should provide information to various school constituencies about their work, the decisions they make and their standards. Therefore, the model is useful when teachers are requested to show evidence of accountability or when the school constituencies exercise their right to monitor and evaluate teacher performance and school outcomes.

The teachers' accountability model introduces new factors to measuring teacher effectiveness, such as keeping social or school constituencies informed of what is done in school. These factors may evoke teachers' negative reactions, since teachers perceive their obligation to provide an account of their work as an intervention in their professional role (Kyriakides & Demetriou, 2007). Consequently, before applying

this model, evaluators should establish the highest possible level of teacher consent. Moreover, the teacher role and responsibilities should be explicitly predetermined (Helsby, 1995). One could therefore claim that unless the following questions are answered, this model cannot be used for identifying teacher effectiveness factors and informing research on teacher professional development: What systems of accountability exist inside and outside the school, and what standards are used for teacher evaluation in each of these systems? How significant and relevant are professional accountability and reputation to the goals that teachers set and to their working processes?

### ***The Absence of Problems Model***

This model assumes that teachers are effective if there are no problems, troubles, defects, weaknesses or misbehaviour when teachers are discharging their duties. Consequently, effective teachers are those who satisfy at least the minimal requirements, do not face problems or insufficiencies in their daily work and are able to solve problems between teachers and parents or between teachers and school directors. This model could be seen as useful when the criteria for measuring teacher effectiveness refer to specific problems that certain groups of teachers encounter. Usually this model is applied when evaluators or teacher trainers aim to evaluate/identify learning needs of new and inexperienced teachers. However, the model contains a number of deficiencies, as illustrated by the following questions: What could be perceived as teachers' major weaknesses, problems, defects and limitations, bearing in mind that teachers are expected to work in different educational settings? What are the key indicators and standards that can be used to monitor teachers' problems? How are these problems and defects in teachers' working processes related to the achievement of prescribed goals and to students' learning outcomes? Finally, it should be emphasised that the absence of problems does not necessarily mean that the objectives are met and student learning is promoted.

### ***The Continuous Learning Model***

The continuous learning model assumes that teachers are effective if they can adapt to external and internal changes, cope with different challenges, meet diverse expectations and develop themselves through continuous learning. Fullan (1991) stresses that, as long as the need for change in the educational system exists, the professional improvement of teachers is also imperative. Educational systems should therefore develop mechanisms for teachers' continuing professional improvement. This model is particularly useful when teachers work in continuously changing educational environments and need to adapt to changes and face internal and external challenges. Therefore, the continuous learning model assumes that there is a link

between teacher development and school improvement (Fullan & Hargreaves, 1992) and that professional development programmes can help teachers become more effective. The model could also be useful in evaluating teachers' pedagogical and content knowledge. However, before employing this model, evaluators should examine whether teacher adaptation to these changes and challenges is necessary for school improvement and if these changes emerge from the existing programmed objectives. One could claim that there may be a discrepancy between the intermediate goal (adapting to the new environment) and the ultimate aim, which should refer to the promotion of student learning and learning outcomes. Thus, we argue in this book that TER should be focused on identifying factors concerned with teacher behaviour, which are related to student achievement.

## Concluding Comments

The historical review of TER seems to reveal that there has been a gradual movement from investigating input variables to define teacher effectiveness, such as personality traits and qualifications, to examining process variables concerned with teacher behaviour in classrooms. It has also been possible to demonstrate that specific variables concerned with teacher behaviour in the classroom are associated with student learning outcomes. In this book, we therefore draw implications of the findings of TER for the design of teacher professional development programmes. The importance of focusing on improving teaching skills through teacher professional development is emphasised, especially since the input variables, such as personality and qualifications, have not been found to be related to student outcomes. Shulman (1986) acknowledges that alternative approaches, often proclaimed with ardour and élan, like the cognitive approach, have not resulted in the further development of theories to the extent that was suggested by their creators. This is a further argument against a too rapid integration of diverse theoretical insights and methodological approaches and paradigms, thereby eliminating contrasts. It may be more useful to let contrasts crystallise and to check theoretical and methodological pretensions of ideas and thoughts. Traditions which are invalid may then fall into the background or even disappear, as has happened to research on the personalities of teachers. In general, it is not detrimental to the development of science, and this also applies to research on teaching, when scientific insights and methodological traditions appear and disappear again after some time, sometimes leaving hardly any discernable traces.

With regard to the conceptual models of TER presented above, we point out some limitations of these models especially since there is little evidence supporting the relationship of the factors addressed to quality of teaching. For example, the focus of the resource model on teacher ability to use available resources and locate new ones is not directly related to student outcomes. Although resources can have an impact on teacher behaviour in the classroom, what actually matters is how

teachers make use of resources in their teaching practice. This implies that our focus should be on teacher behaviour in the classroom since the skills of teachers to organise a lesson are those that determine the impact (positive or negative) that using resources could have on promoting learning outcomes. Similar arguments could be made about the continuous learning model where the focus on learning has an influence on learning outcomes only when it helps teachers to improve their teaching skills and become more effective.

A second constraint of the existing approaches of TER is the fact that the process has not managed to contribute significantly to teachers' professional development or to improving their effectiveness. This is partly due to the fact that correlational research findings are based on variation in existing practices, and even most of the experiments involved practices previously observed. Thus, even if most of the results of TER are transferable to the classroom (Brophy & Good, 1986) and several professional development programmes, such as the Active Mathematics Teaching (Good, Grouws & Ebmeier, 1983) and the Teacher Effectiveness Enhancement Project (Muijs & Reynolds, 2000), have been developed, prescriptions for applications derived from these studies usually remain within the ranges of teacher behaviour which were observed. Since the criteria for teacher effectiveness have been primarily generated by the researchers through naturalistic classroom observations, specific needs for professional development are not necessarily identified, and only a few intervention studies that may have an impact on teacher professional development have been conducted so far (see Kyriakides & Christoforou, 2011; Seidel & Shavelson, 2007).

Thirdly, studies on teacher effectiveness have presented the factors concerned with teacher behaviour in the classroom as being in opposition to one another (Kyriakides, 2008). As a consequence, different teaching approaches, such as the direct and active teaching approach (Joyce, Weil & Calhoun, 2000) and the new learning approach (Schoenfeld, 1998), have been developed. These approaches are presented in the next chapter, and it is shown that each of them places emphasis on a single aspect of the teacher's role. In this way, a narrowly focused perspective of effective teaching practice is provided. However, recent meta-analysis of research on teacher behaviour reveals that within each approach there are factors which are associated with student achievement (Kyriakides & Christoforou, 2011; Seidel & Shavelson, 2007). This implies that an integrated approach to defining quality of teaching should be adopted in designing teacher training and teacher professional development programmes (Creemers & Kyriakides, 2006). Moreover, the complex nature of effective teaching can be described in a more comprehensive way by taking into account the fact that some teacher factors may be interrelated. Recently, three effectiveness studies have demonstrated the importance of defining types of teacher behaviour, which refer to groupings of factors that explain student achievement (Antoniou, 2009; Janosz, Archambault & Kyriakides, 2011; Kyriakides, Creemers & Antoniou, 2009). By defining grouping of teacher factors, not only is the complex nature of effective teaching illustrated but also specific strategies for teacher improvement may emerge (see Chap. 7).

# Chapter 6

## Different Approaches to Teaching Which Emerged from Teacher Effectiveness Research

### Introduction

In educational research, there is already a long tradition of research into teacher effects. The major contribution of Gage (1963) was that he stressed the fact that the characteristics of teachers and teaching activities (or teaching behaviour) should be related to student learning outcomes. Gage's statement was the start of a vast amount of research on the effects of teaching, reviewed and summarised by, among others, Rosenshine (1976) and Brophy and Good (1986). In the previous chapter, the main findings which emerged from the process-product model of TER were reported. This chapter moves a step forwards and refers to the main approaches to teaching which are concerned only with specific teaching factors each time and underestimate the importance of others. Specifically, mastery learning and the direct and active teaching approaches are described in the first two parts of this chapter, and their strengths and weaknesses are discussed. In the third part, approaches to teaching associated with constructivism are presented. It is finally stressed that an integrated approach to effective teaching should be adopted, referring to factors associated with student learning, irrespective of the approach to which each of them belongs.

### Mastery Learning

Mastery learning as an instructional model was developed by Bloom (1976) and is theoretically based on Carroll's model (1963) of school learning (see Chap. 7). According to Anderson and Block (1987), mastery learning is in fact a modern translation of a traditional optimistic philosophy about education and learning, namely, that 'the teacher can help "slow" and "unmotivated" students to learn like "smart", "fast" and "motivated" students' (p. 58). Bloom tried to transform Carroll's key concepts into directions for the design of classroom instruction. His assumption

is that although students' capacities are normally distributed, the majority of students can be helped to achieve at a criterion level when they are provided with sufficient learning time and optimal instruction. The mastery criterion is the degree of mastery students should achieve with respect to a given learning unit, before they are allowed to start working on the next unit. While only 5 or 10% of highly achieving students used to succeed in achieving these objectives having undergone traditional instruction, mastery learning was supposed gradually to reach full achievement of objectives for 80% of the students (Warries, 1979). The order and quantity of learning units are selected in such a way that they form a logical sequence: delays or cumulative deficiencies are not supposed to occur. Block and Burns (1976, p. 12) define the essential characteristics of mastery learning as follows:

1. A set of course objectives that students will be expected to master at some high level is pre-specified.
2. The course is broken into a number of smaller learning units so as to teach only a few of the course's objectives at any one time.
3. Each unit is taught for mastery—all students are firstly exposed to a unit's material in a standard fashion: then they are tested for their mastery of the unit's objectives, and those whose test performance is below mastery level are then provided with additional instruction.
4. Each student's mastery over the course as a whole is evaluated on the basis of what the student has and has not achieved, rather than on how well he or she has achieved relative to classmates.

In addition, McNeil (1969, p. 308) describes the educational practice of mastery learning, which includes quite concrete guidelines on how to proceed:

1. Students have to understand the nature of learning tasks, and they should know the procedure they are to follow in learning their tasks.
2. Specific instructional objectives have to be formulated for these tasks.
3. Courses or extensive subjects should be broken down into smaller units, with a test at the end of each unit.
4. After each test, teachers provide feedback to students on their errors and difficulties.
5. Teachers should find ways to alter the time some individuals need to learn.
6. Alternative learning opportunities (e.g. materials other than the initial materials) may be profitable.
7. Student effort will increase when small groups of two or three students meet regularly, for about an hour, to review their test results and to help one another to overcome the difficulties identified by means of the test.

Students of Bloom continued to develop the theory of, and research into, mastery learning, as well as its applications for educational practice. The procedure developed by Bloom and his students is mostly directed at classrooms and small groups of students. The individualised form of mastery learning, which had a different origin, is known as the Keller Plan or Personalised System of Instruction (PSI) (Keller, 1968). The Keller Plan also requires a mastery criterion, but it is adapted to



individual students to a greater extent, concerning curricular materials as well as instructional time. Some whole-class instruction may occur but only to stimulate and motivate students. In the United States and in other countries, such as the Netherlands, the Keller Plan was popular in college courses for some years, especially because of its emphasis on students' responsibility for their own programmes (Braak, 1974; Plomp, 1974).

Mastery learning is widespread in the United States, becoming so when it became clear that the implementation of mastery learning in individual classrooms was not very effective and that mastery learning should be introduced and implemented at the school level. The ideas of mastery learning were successively extended from classrooms to schools and from schools to school districts. Eventually, a national movement was involved in mastery learning, and both educational policy and educational practice were inspired by the thought that education should produce results and, moreover, that the results could be produced by the design of education.

A lot of research on mastery learning is available, and several reviews have been published (e.g. Bloom, 1984; Guskey & Pigott, 1988; Kulik, Kulik & Bangert-Drowns, 1990; Slavin, 1987), although, the results reported in reviews are not very consistent. Bloom (1984), for example, concluded very optimistically that group-based mastery learning can improve achievement by one standard deviation. However, his conclusion is based on a very limited set of studies (Creemers, 1994b). Sometimes mastery learning was not implemented accurately, and the experimental and control groups were not confronted with traditional instruction but with other individualised programmes. The main problem, however, is that several studies did not control for the sometimes large quantities of extra learning time involved in the mastery learning condition. Such studies have made it impossible to attribute positive effects in the experimental group to mastery learning, because the effects might have been caused by the mere provision of extra time. Sometimes it is not clear whether the same curricular content was offered to the control groups (Arlin, 1984).

The best-evidence synthesis of Slavin (1987) represents the other end of the continuum. Slavin concludes that group-based mastery learning, although there is an effect on experimenter-made tests, does not succeed in improving student achievement, as measured by standardised norm-referenced tests. However, the procedure used by Slavin also reveals some problems. Kulik and Kulik (1989) criticise the best-evidence approach because the number of studies included is so limited that the reviews end up being highly speculative. In this best-evidence synthesis, Slavin notes that the individualised form of mastery learning has produced positive effects. However, this implies a contradiction in one of the essential elements of mastery learning, as defined by Bloom (1976), namely, the aim to bring individual students to mastery of learning tasks in a group context, by means of classroom organisation, allocation of time, provision of curricular materials, tests and feedback. Mastery learning in an individual context resembles tutoring and individual instruction for each student. The teacher-student ratio is one-to-one in tutoring, which renders it virtually impossible to implement in regular educational settings, even though the effects are substantial: about two standard deviations (Bloom, 1984; Walberg, 1984). In meta-analyses undertaken by Hartley (1977) and Kulik, Kulik, and Cohen (1979),

the effects of tutoring were not so strong. In the meta-analysis of Kulik et al., the average effects of tutoring were even smaller than the effects of mastery learning and the Keller Plan (Kulik & Kulik, 1989, pp. 286–287). Kulik et al. (1990) report a mean effect size of 0.59. At higher levels of education, the effects are stronger (0.68), and overall effect sizes on standardised tests are much lower than those on experimenter-made tests. Guskey and Pigott (1988) selected 46 studies on group-based mastery learning from primary, secondary and college education contexts. A large variation in effect sizes was found, being largest in primary education, contrary to the results of the meta-analysis of Kulik et al. (1990). According to Guskey and Pigott (1988), an explanation is that the effects are likely to be cumulative over the years. In contrast with Slavin, Guskey and Pigott conclude that group-based mastery learning shows great potential.

Even though the results are not very consistent in terms of the size of effects, generally speaking, there is sufficient evidence for the effectiveness of mastery learning at the classroom level. However, it seems that the effectiveness of the procedure depends heavily on other factors in the instruction process, which have to be in synchronised with, or have to support, the essential elements of mastery learning. Feedback and corrective measures on the part of teachers, based on tests, are essential for the effectiveness of mastery learning. Guskey (1987) points to the ‘congruence among instructional components’ in that teachers teach what students are supposed to learn and test what they have taught. Studies by Block (1970) and Nordin (1979) support this conclusion. Specifically, Nordin distinguishes several elements in the quality of instruction:

1. Giving cues or explanations
2. Participation of students in the learning process
3. Feedback and corrective measures based on tests

In an experiment, three groups were formed, one group for each element mentioned above. Students in the feedback and corrective measures group (i.e. group 3) outperformed the other two groups. A meta-analysis on mastery testing by Kulik and Kulik (1986–1987), which included studies on individualised instruction, and group-based mastery learning, as defined by Bloom, supports these findings. When degree of mastery was not assessed by tests, effects were reduced substantially. Testing, in itself is not enough and should be followed by feedback and corrective measures to overcome deficiencies in learning. Dutch studies (e.g. Westerhof, 1989) also report the positive effects of corrective instruction, which means testing student achievement and subsequently adopting instruction. The effects were small, however. Dutch research on the effects of mastery learning is summarised by Warries (1979). Several authors (e.g. Slavenburg & Creemers, 1979) report the positive effects of mastery learning in primary education. Dutch studies on mastery learning in secondary, and post-secondary education that were published later (Nuy, 1981; Weeda, 1982) did not support the results found in studies from the United States. However, Weeda’s results partly supported the effectiveness of mastery learning because elements of mastery learning (testing and corrective measures) turned out to be effective.

A combination that is now advocated integrates cooperative and mastery learning (CML). Mastery learning is carried out in small cooperative situations in which team members proceed at the same rate, provide instant help to each other as substitute teachers, and so on. Research by Mevarech (1991) showed that pupils perform better in CML than in traditional learning situations.

## Direct and Active Teaching Approach

Because a single factor concerned with teacher behaviour is not expected to have a large impact on student outcomes, isolated behaviours were integrated into an instructional approach (Rosenshine, 1987a). Combining the findings on time, content covered, work groupings, teacher questions, student responses and teacher feedback, Rosenshine indicated a general pattern of results that he labelled the direct instruction model, sometimes called a structured approach. A slightly different model is called active teaching, with more emphasis put on involvement of students in the learning and teaching process. There is also in active teaching a great deal of teacher talk, but most of it is academic rather than procedural or managerial, and much of it involves 'asking questions' and 'giving feedback' rather than extended lecturing (Brophy & Good, 1986, p. 361).

The term 'direct instruction' had already existed for some time. It was used to describe teaching-learning processes, explicitly directed by teaching, in a stepwise procedure. Other terms came into use later, such as explicit teaching, explicit instruction and active teaching. Direct instruction is a form of explicit, stepwise instruction, emphasising student learning and cognitive achievement: 'Direct instruction and the similar terms can be summarised in the phrase: If you want students to learn something, teach it to them directly' (Rosenshine, 1987a, p. 258). Guidelines for direct instruction are based on results of correlation and experimental studies on teaching (Rosenshine, 1983). Teachers were found to be most effective, especially in teaching basic skills, when they:

1. Structure learning experiences
2. Proceed in small steps but at a brisk pace
3. Give detailed instructions, explanations and examples
4. Ask a large number of questions and provide overt student practice
5. Provide feedback and corrections, especially in the initial stages of learning new material
6. Have a student success rate of 80% or higher, especially in initial learning
7. Divide assignments into smaller assignments and find ways to control frequently
8. Provide for continued student practice (students may even learn more than is necessary; they may have a success rate of 90–100% and may be able to learn quickly and self-confidentially)

These guidelines were further developed through experimental studies. In these studies, teachers were trained in real-life educational practice to demonstrate behaviours that can promote student achievement (see Rosenshine & Stevens, 1986). Rosenshine made use of the guidelines of Good and Grouws (1979), developed for the Missouri Mathematics Effectiveness Study. According to Rosenshine and Stevens (1986), direct instruction can be adapted for use with all students. Veenman, who introduced direct instruction in the Netherlands (Veenman, Lem & Nijssen, 1988; Veenman, Lem, Roelofs & Nijssen, 1992), summarised the benefits of direct instruction on the basis of a large number of studies (Veenman, 1992). Direct instruction is most appropriate for teaching well-structured school subjects, like mathematics, where subjects can be divided into small units. In this area, the model is very successful, especially for students from disadvantaged backgrounds. In several projects, like the *Missouri programme* (Good & Grouws, 1979) and the Gersten and Carnine programme (1986), direct instruction was used. Studies like *What Works* (1986) recommended direct instruction. In educational practice, teachers look upon direct instruction as an instructional approach that resembles their usual daily work.

Direct instruction in fact stems from the behaviouristic process-product tradition in education. However, schools should not only focus on basic skills and basic cognitive knowledge, they should also promote higher cognitive processes, such as learning strategies, problem-solving and meta-cognitive behaviour. This requires more strategic teaching from teachers, but it turns out that such forms as modelling and scaffolding can be included in the direct instruction model (Veenman, 1992, p. 265). Originally, direct instruction was used only to achieve a set of specific objectives, such as acquiring knowledge or skills, but to achieve these objectives, learning strategies are important and these strategies can be used in more complex learning situations utilising the already-acquired information and skills. For that purpose, in the different phases of the learning process, scaffolds are included in the direct instruction model to structure such strategic learning. These scaffolds contain elements that enable the acquisition of meta-cognitive knowledge and skills, such as the knowledge of how to proceed, modelling, thinking aloud and obtaining social support from peers. Many empirical studies provide evidence for the impact of direct instruction upon achievement of not only advantaged but also disadvantaged groups of students, as various reviews of TER seem to demonstrate (e.g. Adams & Engelmann, 1996; Fischer & Tarver, 1997; Flores & Ganz, 2007; Grossen, 2004; Klahr & Nigam, 2004; Kyriakides, 2004; Seidel & Shavelson, 2007).

## **New Learning and Teaching: A Constructivism Approach**

### ***Beyond Basic Knowledge and Skills in Language and Mathematics***

The emphasis on mathematics and language as criteria for educational effectiveness resulted in a prime interest in theories about learning which stress the reproduction of knowledge. Although it was mentioned frequently that there could be different

criteria for educational effectiveness such as higher-order knowledge and skills, meta-cognition or outcomes in other domains like student well-being and social skills, in the end criteria of effectiveness were mostly concerned with learning and (reproductive) learning results/outcomes in the areas of mathematics and reading. And in fact, as has become evident from educational policy outcomes, basic skills, such as reading, writing, mathematics and science, are important in helping students to become active citizens in society and to contribute to socio-economic development. In society, the importance of these basic competencies is underlined. Next to this, knowledge and skills and, probably based upon them, other competencies are seen as prerequisites for participation in society, for example, the development of moral values and social skills. Within the cognitive domains, higher-order knowledge and skills, such as the application, evaluation and synthesis of knowledge, are expected to be pursued by educative results in problem-solving and 'creative thinking' skills. Finally, it is expected that formal education will 'create' life-long learning. For that purpose, learning to learn and self-regulated and self-responsible learning are seen as important.

The final decision about the objectives of education, and thus the criteria for educational effectiveness (and quality in general), is taken by the educational policy-makers as the result of political and societal debate (Creemers, 1996). Educational theory and research and the teaching profession in general, can contribute to the debate and decision-making by addressing questions such as:

- What can be achieved by students and how can it be discerned according to their ability?
- How much can be done within the limitations of time and other tasks that have to be performed by the school?
- How do learning processes take place in these domains?
- How can teaching and instruction be provided to satisfy these educational objectives?

Research seems to indicate that for higher-order cognitive outcomes and for independent learning and meta-cognition to take place, another view is needed on learning and instruction. This approach takes a different point of departure from the one that is available in the current knowledge base on educational effectiveness, especially at the instructional level. In the following part of this section, new ways of learning and teaching will be described. In the last section of this chapter, we will discuss the possibilities of combining the traditional ways of learning and teaching with more constructivist approaches in order to address educational objectives in general but especially higher-order goals and ways of independent learning.

### *A 'New' View on Learning*

With the recognition that behaviourism provided an adequate explanation of human cognition, cognitive psychology developed in the early 1960s. It was based, however, on the early work of, amongst others, Vygotsky, Piaget and the Würzburger

Schule and Gestalt psychology. Contrary to behaviourism, these theories were especially interested in cognitive processes and later on in mental representation and knowledge structures. Cognitive psychology paid special attention to the following three main issues:

- The complex strategies for processing information. In this field, the attention was focused on research into problem-solving, especially the difference between expert and novice problem-solvers.
- Meta-cognition, especially the knowledge concerning one's own cognitive processes or products, and the skills to transform this knowledge into those needed for fine-tuning the cognitive processes.
- Learners have already acquired some knowledge before they start to tackle new tasks, and this initial knowledge structure provides the foundation for further knowledge and learning. This knowledge base will expand over a long period of learning and experience.

In the course of further development of cognitive psychology, new ideas arose, most of them stressing the special features of cognitive psychology, such as constructivism, which puts emphasis on the fact that human learning is active and constructive, situated cognition in which the emphasis is placed on the contextual character of human cognition. Constructivism and self-regulation of learning processes put emphasis on the responsibility of the learner for his own learning processes (Boekaerts, 1999). Different terms are used to describe new ideas, such as constructivism and self-regulated learning, but they have in common specific characteristics with respect to learning (De Corte, 1996; De Corte, Greer & Verschaffel, 1996) which are briefly presented below.

In order to learn, which means to change from a novice to an expert in a specific domain, students have to acquire a learning disposition that integrates the following elements (Perkins, 1991; Verschaffel & De Corte, 1998):

- A domain-specific knowledge base (knowledge about facts, symbols, conventions, definitions, formulas, concepts, rules, etc., that constitute the contents of a domain such as mathematics or reading)
- Cognitive strategies, such as heuristics (systematic searching strategies, e.g. splitting a problem into sub-problems) and learning strategies (such as repeating subject matter, making a summary)
- Meta-cognitive skills (skills that are needed for the self-regulative planning, monitoring and evaluating of learning processes)
- Affective aspects (such as attitude towards a school subject)

### ***New Ways of Teaching: A Constructivist Approach***

According to Verschaffel and De Corte (1998), the first thing that teachers must be aware of when they try to teach along the lines of constructivism is the expansion of the *goals of instruction*. Teaching aims at the development of a learning disposition

instead of the transfer of knowledge. Knowledge is not the only goal of education, but strategies, meta-cognitive skills and affective aspects are similarly important. As a consequence, the *content of school subjects and the materials that teachers use* must be expanded as well. Curricula, for example, must enable teachers to achieve the new goals, and adequate tests or other diagnostic procedures must permit teachers to monitor the development of students in relation to these new goals. They should encompass all four elements of the learning disposition, preferably elaborated in a domain-specific as well as in a cross-curricular way in order to achieve transfer of specific skills to a wider area of learning. Constructivism therefore forces teachers to expand not only their goals but also the scope of their subject content and their materials. Teachers who want to practise constructivism must also be aware of changing requirements for the *classroom organisation*. Traditional teaching is often performed by the teacher in front of the class while the students sit in. This type of organisation is appropriate when all students are supposed to listen to the teacher and when they are not intended to interact with each other. Constructivism, however, requires quite different settings because of the emphasis on student interactions and those between the teacher and the students (see also below).

In recent years, constructivist authors have developed a set of *instructional techniques* that are supposed to enhance the learning disposition of students (Bolhuis & Kluvers, 1996; Choi & Hannafin, 1995; Collins, Brown & Newman, 1989; Savery & Duffy, 1995; Verschaffel & De Corte, 1998; Von Glasersfeld, 1998). These techniques include the following:

- *Modelling*: This occurs when an expert (the teacher) carries out complex tasks and informs students about the processes that are required to accomplish these tasks. Modelling can refer to physical processes and to thought processes that underlie the actual performance.
- *Coaching*: This refers to all the supportive actions that a teacher can use to raise the attainment levels of students. Coaching is meant to help students to solve problems or find their own ways to accomplish tasks and not to simply provide them with the correct answers or procedures. Examples of coaching are offering help, contingent feedback and modelling problems closely related to those the students are dealing with.
- *Scaffolding and Fading*: These techniques refer to the provision of help that students need to carry out parts of tasks that they cannot yet master on their own. Scaffolding creates a match between the cognitive level of the student and the characteristics of instruction in such a way that the student achieves (with the assistance of the teacher or others) what he could not achieve on his own. Fading means that the assistance is gradually withdrawn as the self-regulative skills of students develop. Fading denotes the gradual transition from teacher-regulated instruction to student-regulated learning.
- *Articulation*: Articulation means that teachers invite students to articulate their ideas, solutions to problems, suggestions and thoughts. In this way, tacit knowledge is made explicit. By means of articulation, teachers can find out what students know and which skills they possess.



- *Reflection*: Reflection refers to the process of students comparing their solutions to those offered by experts (the teacher or other students). Students are encouraged to test their ideas against alternative views and contexts.
- *Exploration*: By means of exploration, the teacher ‘pushes’ students in a variety of problem-solving activities.
- *Generalisation*: This technique decontextualises domain-specific knowledge and skills and aims at the transfer of these knowledge and skills to a higher non-specific level.
- *Collaboration*: From the perspective of learning as an interactive and co-operative process, teachers must create ample opportunities for students to interact with each other and with the teacher. Activities such as classroom conversation and working in co-operative groups are examples of collaboration.
- *Provision of Anchors*: Anchors refer to the importance of the prior knowledge of students. For successful learning, students need to relate new knowledge to anchors in their prior knowledge. Teachers must check whether these anchors are already present and, if not, provide them.
- *Goal Orientation and Situation*: The goals of learning must be clear to the students. Preferably students are stimulated to formulate their own goals, but, if this is not possible, teachers should clarify the goals. In relation to this, tasks and problems that students perform must be authentic and situated in a meaningful context.

### ***Research on ‘New’ Learning and Teaching***

Even after 25 years, there is still an ongoing debate about the advantages and disadvantages of new learning and teaching, as described in the previous section (see, e.g. Van der Werf, 2005). The positive results of studies on new learning and teaching are criticised for several reasons (see Seidel & Shavelson, 2007; Van der Werf, 2006), for example:

- The intervention is provided by the researcher who is advocating new learning and teaching.
- The intervention study is mostly a small-scale study involving few students.
- The implementation of the intervention is not controlled.
- The intervention is not compared with other modes of instruction.

In recent years, however, studies have been carried out which meet the standards of research. In the following section, two studies will be summarised. The studies indicate that some elements of new learning and teaching promoting active involvement, such as problem-solving and a self-regulated learning (meta-cognition), can contribute to educational outcomes, especially in combination with more traditional evidence-based instructional methods. The studies presented, implemented instruction carefully in schools and classrooms because, as became clear from earlier studies,



teachers face problems in the implementation of new ways of teaching whether or not they are in combination with more traditional ways of teaching, such as direct or active teaching.

### ***A Comparison Between Direct (Interactive) and Constructivist Instruction***

In the previous sections, two didactic approaches were presented, direct instruction and the constructive approach for teaching. Direct instruction is based on the research evidence that is related to the effectiveness of teaching that combines components of teacher behaviour which have been shown to be effective with respect to learning outcomes. In direct teaching, different teacher activities are placed in a certain logical and didactical order. The approach as such has received quite a lot of empirical support as a recent meta-analysis has also shown (see Kyriakides & Christoforou, 2011). The constructivist approaches in teaching depart from a different view of how learning takes place. Knowledge and skills are not learned through instruction in which they are delivered by teachers and mastered by students but constructed by students themselves during the learning process. The constructive approach to teaching has also received empirical support, although to a lesser extent. It should be mentioned that most of the small-scale research studies were carried out in short-term experimental situations in which the researchers fairly often acted as teachers themselves.

It seems that the two approaches stem from different backgrounds: the constructivist approach from research on learning and the direct instruction approach from research on teaching. Perhaps they also have different objectives in mind, namely, consolidation of knowledge and development of abilities and skills. Therefore, the two are often presented as opposites. A possible means of discovering the strengths and weaknesses of the two approaches is to compare traditional ways of teaching related to student achievement in the basic school subjects and those related to, for example, meta-cognitive skills. A relevant secondary analysis came to the conclusion that traditional effectiveness characteristics are important for the development of meta-cognitive skills, and these characteristics are seen to be even more important for these skills than those of new instructional models, although such models were especially designed for the development of meta-cognitive skills (Creemers, Reezigt, Van der Werf & Hoeben, 1997). This created the starting point for an experimental study in which two didactic approaches were offered with respect to their implementation by teachers and their impact on student achievement and were compared (De Jager, 2002). The direct instruction model was chosen as the more traditional model. There is substantial empirical evidence that teachers can use this model in a regular classroom setting. Furthermore, the direct instruction model proved to have a positive effect on achievement in basic skills. The cognitive apprenticeship model (Collins et al., 1989) that takes new ideas about learning and instruction into account

was selected as the second instructional model. The cognitive apprenticeship model focuses on the active involvement of pupils and on the development of meta-cognitive skills. This model combines effective elements of instruction-psychological models, such as reciprocal teaching, procedural facilitation and modelling. However, this model has rarely been studied in regular classroom settings. In this study, both the direct instruction model and the cognitive apprenticeship model were implemented in regular classroom settings. Furthermore, both models focused on the development of basic skills and meta-cognitive skills. The implementation and effectiveness of the two models were studied and compared. To make a clear comparison, a quasi-experiment was developed in which one group of teachers learned to implement the direct instruction model, and another group was trained to apply characteristics of the cognitive apprenticeship model. A control group of teachers was not trained. The implementation of the two models was studied, as well as the effects on the achievement of pupils in relation to basic skills and meta-cognition. The highest effect sizes were found with respect to meta-cognition. In terms of meta-cognitive skills, both experimental groups showed a high effect size. Students in both experimental groups scored about one standard deviation higher than the pupils in the control group. The effect size of meta-cognitive knowledge in both groups was 0.38. The remaining significant differences between the cognitive apprenticeship (CA-group) and the control group revealed low-to-moderate effect sizes. Similarly, on the output measures the CA-group scored between 0.28 and 0.54 standard deviation higher than the direct instruction group (DI-group). In a further study into effectiveness for pupils with different intelligence, cognitive apprenticeship appeared to be more effective for achievement in reading comprehension of highly intelligent pupils, whereas direct instruction had more positive effects on the achievement of pupils of low intelligence. Only the effects on meta-cognitive skills could be attributed to specific characteristics of the two instructional models. The general characteristics, preparatory discussion and attention for developing skills showed a positive effect. In addition, the CA characteristic ‘modelling’ showed a negative effect and ‘discovery learning’, a positive effect. We can conclude that in general, the CA model is more effective than the DI model, especially in the follow-up. The way the models were constructed and implemented supports the argument for a well-structured approach to cognitive apprenticeship; actually, cognitive apprenticeship was introduced in classrooms following the procedures of direct instruction. In this sense, the results also confirm the basic principles of direct instruction as well.

### ***Effective School Improvement in Mathematics (MIP)***

Houtveen, Van der Grift, and Creemers (2004) sought to identify the key elements of a school improvement programme, which facilitate effective teaching, and to work out how each of these elements should be designed so that they operate effectively and in alignment with each of the other elements. This resulted in the

MIP-programme design for effective school improvement. School design models are rarely used in the Netherlands, although they have become highly significant in the USA (Berends, Bodilly & Kirby, 2000; Herman, 1999; Stringfield, Ross & Smith, 1996), as well as in the Australian context (Hill & Crévola, 1999). Several key elements refer to the quality of teaching. Some are more related to traditional instruction such as:

- Giving high-quality instruction (in this case, extended direct instruction)
- Optimising instruction time
- Supporting self-confidence of students

Key elements that are more related to ‘new’ learning and teaching are:

- Self-regulated learning
- Explorative learning environment

The key elements are described as follows.

### **High-Quality Instruction**

The most important aspect of instructional quality is the degree to which the lesson makes sense to the pupils. This includes presenting information in an orderly way (Kallison, 1986), noting transitions to new topics (Smith & Cotton, 1980), using clear and simple language (Land, 1987), using many vivid images and examples (Hiebert, Wearne & Taber, 1991; Mayer & Gallini, 1990) and frequently restating essential principles (Maddox & Hoole, 1975). Lessons should be related to pupils’ background knowledge, using such devices as advanced organisers (Nunes & Bryant, 1996; Pressley et al., 1992) or simply reminding pupils of previously learned material at relevant points in the lesson. Use of media and other visual representations can also contribute to quality of instruction (Hiebert, Wearne & Taber, 1991; Kozma, 1991).

Clear specification of lesson objectives to pupils (Melton, 1978) and a substantial cohesion between what is taught and what is assessed (Cooley & Leinhardt, 1980; Creemers, 1994b) contribute to instructional quality, as does frequent formal or informal assessment to see that students are mastering what is being taught (Crooks, 1988; Kulik & Kulik, 1988) and immediate feedback to students on the correctness of their performance (Barringer & Gholson, 1979).

Instructional pace is also partly an issue of quality of instruction. Frequent assessment is critical for teachers to establish the most rapid instructional pace consistent with the preparedness and learning rate of all pupils. Furthermore, speed of pace will prevent pupils from becoming disengaged and bored and thus will help to keep them actively engaged in learning (Muijs & Reynolds, 2000; Pressley, Goodchild, Fleet, Zachowski & Evans, 1989). So, in short, teachers who explicitly model, scaffold and explain strategies, give corrective feedback and practise mastery contribute highly to the academic success of their pupils (for meta-analyses of the research, see Brophy & Good, 1986; Carnine, Dixon & Silbert, 1998; Dixon, Carnine &

Kameenui, 1992; Dixon, Carnine, Lee & Wallin, 1998; Ellis & Worthington, 1994; Rosenshine & Stevens, 1986; Slavin, 1996; Veenman, 1992).

Although most Dutch schools use methods based on realistic mathematics education, teaching practices have not changed accordingly (Gravemeijer, 1990; Harskamp, 1988; Willemsen, 1994). Therefore, in the MIP programme, the following domain-specific instruction principles have been formulated: sound preparation of formal calculation, context-bound instruction, action, verbalisation, use of models, focus on essential understanding and skills and finally attending automation (especially for struggling learners) (Van de Vijver & Dijkstra, 1999).

### **Instruction Time**

In the theoretical models of learning at school (Bloom, 1976; Carroll, 1963; Harnischfeger & Wiley, 1978), instruction and its efficient use are considered important determinants for learning. The connection between time spent and pupils' results has been established in a large number of empirical research projects (e.g. Carnine, Dixon & Silbert, 1998; Dixon et al., 1998; Scheerens & Bosker, 1997). In the MIP programme, optimal use of time in terms of classroom management as well time spent on explicit instruction in skills and integration of skills is stressed.

### **Supporting Self-Confidence of Students**

The third aspect of optimising instruction stresses the relationship between learning and emotion. A certain amount of self-confidence turns out to be a prerequisite for learning. Self-confidence is built upon the base of experienced success. This implies that teachers have to provide experience of success for all learners (Ellis & Worthington, 1994). For initially less-successful students, it is vital to give second chances to demonstrate success after corrective feedback (Guskey, 2003).

### **Self-Regulated Learning**

Since learning is an active process of knowledge acquisition and construction, teachers should take measures that make it possible for pupils to adopt an active learning attitude and then gradually pass on responsibility for the learning process to them (Boekaerts, 2002; Ellis & Worthington, 1994).

### **Explorative Learning Environment**

Heterogeneous grouping is not enough to help pupils at risk of school failure. Extended learning and instruction time for these pupils is necessary. In all cases, extension of instruction time for struggling learners demands a classroom organisation

in which all pupils are able to manage their own learning process. In the MIP programme, this classroom organisation is referred to as an 'explorative learning environment'. Apart from organisational reasons, an explorative learning environment has a value in itself because it contributes to school success and the intrinsic motivation of pupils (Carver & Scheier, 2000; Ryan & Deci, 2000).

In the improvement project, the elements were implemented in the experimental schools. This implementation was especially successful for the elements of 'direct instruction' and 'instruction time' since a relatively large effect size was identified (see Houtveen et al., 2004). In the further analysis of the positive results of the project with respect to student outcomes, it turned out that not only direct instruction but also supporting self-confidence and creating an explorative learning environment contributed significantly to the explanation of the learning outcomes. The results underline the importance of both 'traditional' instructional approaches as well 'new' ways of learning and teaching. This implies that adopting an integrated approach to teaching can have better results than focusing on a single approach.

### ***The Implementation of 'New' Teaching***

The ultimate value of 'new' teaching for educational practice depends on the possibilities for actual implementation and the effects on different groups of students. Teachers must be able to succeed in the *implementation* of this type of teaching, and the desired effects on students must be achieved, that is, the development of a learning disposition (Slegers, 2000). Because of the strong focus of constructivists on learning processes, as yet there is not much empirical evidence on implementation and effects in regular educational settings. A survey in Dutch secondary education (Bolhuis, 1997; Bolhuis & Kluvers, 1996), however, has shown that teachers find it hard to transfer responsibilities to students and to promote self-regulative learning. They also find it hard to tolerate the mistakes and errors of students and to interpret these as starting points for further learning. They are constantly inclined to provide correct answers instead of stimulating students to find their own answers and solutions. In the content of their lessons, they tend to focus strongly on knowledge and to forget the importance of strategies, skills and affective aspects in the processes of learning. Moreover, they offer isolated knowledge instead of situated knowledge. Teachers do not provide sufficient opportunities for student co-operation. It was also found that mathematics teachers practise more elements of constructivist teaching than language teachers do or teachers of subjects like geography and history. Unfortunately, this survey did not study the actual effects of teaching practices on students. Literature on the implementation of innovations consistently shows that teachers in general do not easily implement major innovations that require a change in vision, materials and behaviour. The implementation of constructivist teaching certainly can be considered a major innovation. Teachers have to change their vision about the goals that they are trying to achieve and the techniques they are using to achieve them. Teachers will need new materials in order to cover the full range of goals bringing together the concept of a learning disposition.

The implementation of innovations promoting constructivism is likely to be influenced by the *culture of teaching* in a country. This culture is reflected in the initial teacher training and teacher professional development and has to be taken into account when designing courses aiming to promote constructivist approaches to teaching. Most of all, the culture will be reflected in the ideas that teachers form about their profession and the activities that they are required to perform on a daily basis. If the culture of teaching holds notions that strongly oppose the basic concepts of constructivism, it will be much harder for teachers to implement this new way of teaching.

Finally, the implementation of new ways of teaching and learning will be influenced by the *training and support* offered to teachers. When teachers are given specific training for their new practices, in-service or otherwise, implementation will be enhanced. The same holds for support in the form of collegial coaching or feedback from external agents, such as school advisors or specialists from national resource centres (Reezigt, 2000). Training and support in general should include the concepts described by Joyce and Showers (1980): theory, demonstration, practice, feedback and coaching. Also, the *perception of teachers of the school conditions* will influence the implementation.

Constructivist theories in general do not pay very much attention to the consequences for teaching, but the consequences for the school organisation are even less apparent. In an attempt to define some of the changes that constructivist teaching brings about in the school organisation, several authors (Bolhuis & Kluvers, 1996; Scheerens, 1994; Scheerens & Bosker, 1997) mention practical as well as more conceptual changes. The practical changes include the following:

- Changes in the *time schedule*. So far, schools are used to a uniform time schedule that allocates a certain amount of time (measured in number of lessons, approximately 1 h per lesson) to each school subject. When teaching procedures change, the schedule must be more flexible to allow for formats other than the 1-h lesson, for example, when students need time for independent learning or problem-solving activities.
- Changes in the *physical environment* of schools. In general, most schools provide a number of classrooms, a canteen, a library and so on. Most educational activities during the school day take place in the classroom setting. When teaching changes, the environment will have to change too. Students, for example, will need small, quiet rooms for independent study or group work.

The conceptual changes come about when the main concepts of constructivism are extrapolated from the student to the teacher level. When teachers are seen as learning professionals and their learning processes are defined in a similar way to students' learning processes, the following changes are needed in the school:

- Changes in the *co-operation* between teachers. Constructivists should consider learning as a social and interactive process. For teachers to learn, they should co-operate and interact more than they are used to doing. However, teaching in most schools is a rather isolated effort. Even within subject departments, co-operation and reflection cannot be taken for granted.

- Changes in the relation between teachers and the school direction. Constructivists focus on the teacher as a facilitator of learning processes and a coach. When teachers are seen as learning professionals, the more senior staff in the school, such as the school directorate, are supposed to provide *facilitative leadership*. The school directorate, for example, should promote teacher training and development and peer-coaching procedures. Strict hierarchical relations between the school level and the teachers do not seem to fit the main notions of constructivism.
- Major innovations, such as the introduction of constructivist teaching in schools, will not succeed when the school organisation does not fit the new way of teaching. In general, for innovations to succeed, the school should provide favourable conditions for the implementation and incorporation of new ways of teaching. When the school conditions hinder the innovation efforts of teachers, implementation will either not occur at all or fade quickly away. In addition, research in the field of school improvement has made abundantly clear the fact that innovations will fail to yield any sustained effects on students when they are not incorporated in the school organisation in some way or other (Teddlie & Reynolds, 2000).

## **The Combination of Different Approaches to Learning and Teaching**

In educational practice, combinations of the two approaches can be found. In fact, a more interactive learning (and instruction) in which students play an important role in the acquisition of knowledge and skills, replaces the original direct instruction approach, which places less emphasis on the role of the learners. Students are actively involved in the learning and teaching processes. Also, the social aspects of learning have received more attention and resulted in developing means of co-operation between students and teachers within direct instruction. In the constructivist approach, elements of direct instruction are included when knowledge and skills are required before more constructivist ways of learning can begin and also in the way that procedures for knowledge construction are presented. For example, modelling by the teachers could take place in a well-structured way (Creemers & Kyriakides, 2006). Effective instruction can combine direct instruction elements, especially those that are most directed towards active learning, as well as elements of constructivist instruction, especially when elements that foster the effectiveness of the constructivist approach are included. This argument is supported by empirical studies investigating the impact of factors associated with different approaches to teaching upon student outcomes (Kyriakides & Creemers, 2008, 2009). Although the two approaches remain different from one another, they are not in opposition to each other. The choice between the two approaches depends upon the particular educational objectives being pursued. For knowledge and skills, it seems that direct active learning/teaching approaches can provide an effective and efficient way to achieve these objectives. On the other hand, for higher-order knowledge and skills



and meta-cognitive objective factors associated with constructivist approaches may have larger effects than factors promoting direct and active teaching. Research into differential teacher effectiveness seems to reveal that the choice between the two approaches partly depends on the characteristics of the learner, such as their age, abilities and learning styles (Kyriakides, 2007). For example, it is shown that the more structured ways of teaching included in direct and active instruction (e.g. structuring, application) are more suitable for younger students in the earlier stages of learning and for more disadvantaged students who benefit from more structured ways of teaching (Kyriakides & Creemers, 2009; Muijs, Ainscow & West, 2006). Self-regulation of learning, including the more constructivist approaches, is more appropriate for students of high ability and in the later stages of learning (see, e.g. Tynjälä, 1999). Finally, the choice between the two approaches depends on the conditions and context of learning. A more constructivist learning environment requires teachers who can organise an 'open' learning situation and guide students' learning. Furthermore, constructive ways of learning require a context-rich learning environment, with appropriate learning material available for students (Hyerle, 1996). In a programme of research concerning 'structured independence' (Scheerens & Creemers, 1999), these issues are pursued in more depth. The two traditions of educational effectiveness and constructivism are compared in order to determine the strengths and weaknesses of the two traditions. One aspect of the attempt to integrate the traditions is a multilevel comprehensive mapping of the research domain, distinguishing levels of individual learners, groups of learners, teachers and school context.

This careful analysis of the two traditions related to input, context and output may result in guidelines for the choice between the two traditions based on the conditions for learning and expected outcomes. It might be that one of the two traditions is more appropriate for certain kinds of outcomes, given a particular set of conditions (with respect to the input and the context). There exist examples of this delineation between the two traditions, as presented by Veenman (1992), Marzano, Pickering and Pollock (2001) and Sharpe and Gopinathan (2001). Based on experience in educational practice and research results with examples of merging reflecting the original position of the designers in Singapore (Sharpe & Gopinathan, 2001), a more technical approach to these higher-order outcomes and independent learning has been designed (making use of elements of constructivist ways of teaching). It might be that constructivist ways of teaching and elements of it, as described in earlier sections, are more effective for higher-order outcomes than a technical, structured approach to higher-order cognitive processes.

Rather than making a choice between different didactical approaches according to criteria concerning the objectives, students' background and the conditions within the classroom and the school, a further step might be the combination of approaches within one comprehensive framework of effective instruction. Evidently, this cannot be a definite blueprint for instruction that will always remain the same and should be followed by teachers and students in the same way all the time. Many instructional tools for teaching and learning can be used according to the objectives, input and the conditions/contexts of teaching and learning. The combination of approaches



consists of process characteristics of instruction which turn out to be effective in relation to the ultimate goal of education, that is, to make students independent learners and participants in society. This implies that elements of structuring are combined with the final goal of independent learning. In the next chapter, we refer to one of the recent models of EER which adopts an integrated approach to effective teaching by referring to factors found to be associated with student achievement, irrespective of whether they belong to the direct and active teaching approach or to the constructivist approach. The dynamic model refers to factors operating at different levels that need to be addressed in order to improve quality of teaching, and its implications for teacher training and professional development are discussed in the third part of this book.

# Chapter 7

## Establishing Theoretical Frameworks to Describe Teacher Effectiveness

### Introduction

In the last chapter of the second part of this book concerned with TER, we present the main theoretical frameworks which have been developed in order to describe effective education. It is argued that by moving from Carroll's model (1963) for school learning to the comprehensive model of educational effectiveness, which is a multilevel model that places emphasis on instruction and ultimately on the dynamic model of educational effectiveness, the complex nature of educational effectiveness can be described more precisely. Thus, the comprehensive model is described in the first part of this chapter, and some limitations of the model are identified. In the second part, we refer to the dynamic model of educational effectiveness, and it is shown that this model takes into account the dynamic perspective of education. The dynamic model also incorporates the results of differential teacher effectiveness research into a generic model describing effective teaching practice. Furthermore, it is acknowledged that previous studies on teacher effectiveness have not been able to make a significant impact upon teacher training and professional development, whereas the establishment of the dynamic model of educational effectiveness may contribute significantly to addressing these weaknesses of the field. For this reason, the next part of this book discusses the use of the dynamic model to establish a theory-driven and evidence-based approach to teacher training and professional development.

### The Comprehensive Model of Educational Effectiveness: General Characteristics

A model specifies or visualises complex phenomena in a simplified or reduced manner. In more abstract terms, it is described in terms of a set of units (facts, concepts, variables) and a system of relationships between these units. A distinction should

also be made between conceptual and formal models. In the case of conceptual models, only verbal descriptions and diagrams are used, while the formal models consist of mathematical equations. The comprehensive model of educational effectiveness belongs to the category of conceptual models, and its main characteristics are described below.

Creemers's model distinguishes between levels in education (see also Scheerens, 1992; Slavin, 1996; Stringfield, 1994; Stringfield & Slavin, 1992) and is therefore multilevel in nature. Specifically, the model has four levels: the student level, the classroom level, the school level and the context level. Higher levels are expected to provide conditions for the operation of lower levels. Therefore, outcomes result from the combined effects of levels. With regard to the factors included in the model, it is important to note that the model is based on the Carroll model of school learning (Carroll, 1963), which is briefly described below.

### ***The Carroll Model for Learning in Schools: A Starting Point for Developing the Comprehensive Model***

A favourite model within EER was Carroll's model for learning in schools (Carroll, 1963). It was popular because it related individual student characteristics important for learning to characteristics of education important for instruction. In addition, Carroll indicated the factors of time and the quantity and quality of instruction as important concepts for learning in schools.

The concepts of time/opportunity and quality are rather vague and can be made more concrete by looking at other characteristics of effective instruction related to learning outcomes. The Carroll model states that the degree of student mastery is a function of the ratio of the amount of time spent on learning tasks to the total amount of time needed. Time actually spent on learning is defined as equal to the smallest of three variables: (1) opportunity (i.e. time allowed for learning), (2) perseverance (i.e. the amount of time during which students are willing to engage actively in learning) and (3) aptitude (i.e. the amount of time needed to learn in optimal instructional conditions). This last amount of time may be increased in the case of poor quality of instruction and lack of ability to understand less than optimal instruction (Carroll, 1963).

The Carroll model can be criticised for being more of an instructional than a teaching model since it does not provide information about how learning itself takes place. Rather, it emphasises that learning takes time and depends on multiple-level interrelated factors. The relationship between time, perseverance, aptitude and quality of the instruction was further elaborated by Bloom, using Carroll's model to develop mastery learning (see Chap. 6). Because of the elaboration Bloom provided within a broadly instructional framework (although some of Carroll's writings make clear that he thinks that this is a rather technical and mechanical elaboration of his original intentions), the influence of this learning theory on educational practice has been substantial. However, it is acknowledged that one of Carroll's intentions was to raise

new and better questions for research, and he certainly succeeded in this respect, because there has been a lot of research on variables that were included in the model (see Creemers & Kyriakides, 2008b). In addition, the Carroll model has made substantial contributions to educational practice, for example, in the development of the model of mastery learning (see Chap. 6), the Keller Plan for individualised instruction, research on the length of school days and school years (Wiley & Harnischfeger, 1974) and research on teaching related to learning time (see Creemers, 1994b).

A consistent line of reasoning has been developed in models and theories of educational effectiveness concerning learning outcomes and learning theories relating instructional processes at a classroom level and school and contextual conditions necessary to facilitate quality of instruction. Specifically, the concept of time, central to Carroll's model, has been systematically complemented by the concept of opportunity to learn, and the only classroom factor in the Carroll model, quality of instruction, has been elaborated in more detail and put at the core of the comprehensive model of educational effectiveness. Combining the key concepts and the hierarchical structure of the levels, Creemers's model defines the key concepts at each educational level by outlining specific selected factors on the basis of a theoretical criterion, namely, that these factors should have demonstrated their impact on outcomes. Most factors represent the alterable behaviours of teachers and school teams. The model shows how the levels influence student outcomes, but since the model places more emphasis on the classroom-level factors, the relation of the model to the various instructional theories is first of all elaborated in the next section of this chapter.

### ***Instructional Theories as the Basis for the Development of Creemers's Model***

Theories about effective education that start at the classroom level focus on the instructional elements of learning theories. In fact, these theories, taking into account the background characteristics at the student level, try to explain how the instructional factors can contribute to the outcomes of education or, more precisely, how differences in educational outcomes can be explained by differences in instruction at the classroom level. These theories emphasise instructional factors that are changeable. In addition to the student background characteristics, instructional theories take into account elements or components of instruction at the classroom level, such as the methods used at the classroom level, other learning methods, the learning environment and especially teacher behaviour in the classroom. Based on the distinction between the different components of instruction at the classroom level, one can discover correlates that are associated with effectiveness in research, and indeed, these correlates for effectiveness from past research are rearranged in a conceptual framework (Creemers & Reezigt, 1996). It is important to note that in various instructional theories developed in the 1970s (e.g. Bloom, 1976; Carroll, 1963; Cooley & Lohnes, 1976; Glaser, 1976; Harnischfeger & Wiley, 1976),

the theoretical constructs are almost the same. Specifically, a distinction between 'the quality of instruction' and 'time on task and opportunity to learn' is often made. Like Carroll (1963), they merge together time and opportunity to learn. However, time and opportunity to learn can be discerned in several categories. For example, Harnischfeger and Wiley (1976) distinguish seven categories of time. In this context, Creemers (1994b) made a distinction between time on task, on the one hand, and opportunity to learn, on the other. Thus, Creemers developed Carroll's model of learning by adding to the general concept of opportunity the more specific notion of opportunity to learn. Moreover, in Creemers's model, time and opportunity are discerned both at the classroom level and at the school level. In this way, Creemers made a distinction between available and actually used time and opportunity.

Similarly, quality of instruction can be identified in quite a lot of different elements, especially when quality is distinguished for different components within the instructional process, such as curricula, grouping procedures and teacher behaviours (Creemers, 1994b). Each of these three components of instruction can contribute to the quality of instruction and have characteristics that are correlated with the effectiveness of education at the classroom level (Kyriakides, Campbell & Gagatsis, 2000). Creemers claims that these components can influence learning outcomes directly but may also influence time and opportunity, and therefore learning outcomes, indirectly.

It is apparent that there is a difference between what is offered to students and the actual use students make of that offer. That holds true, according to Creemers' model, both for time and opportunity. Therefore, the quality of instruction can influence the use that students make of time and opportunity, as well as the amount they need before mastering the objectives of education. With respect to time, Creemers (1994b) argues that the distinction between planned time and used time is obvious in terms of allocated and engaged time. With respect to opportunities, the distinction between the opportunity that is offered (planned) and the opportunity that is used is rarer, but it can provide a useful tool for explaining differences in student outcomes.

In summary, Creemers's model concentrates on the classroom level since most studies on educational effectiveness have supported the idea of the predominance of classroom-level factors over school-level factors (Teddlie & Reynolds, 2000). Moreover, the classroom factors most directly related to time on task and opportunities to learn used at the student level are the corresponding factors used at the class level: 'time for learning' and 'opportunity to learn'. Furthermore, Creemers (1994b) distinguishes three components of quality of classroom instruction: curriculum, grouping procedures and teacher behaviour. However, teachers are considered to be the central component in instruction. They make use of curricular materials, and they carry out grouping procedures (such as mastery learning, ability grouping and co-operative learning). These three components of quality of instruction are elaborated in the specific effectiveness-related variables in the model. In curriculum and teacher behaviour, similar kinds of variables are distinguished, such as clarity of goals, structuring of content and evaluation and feedback to produce corrective

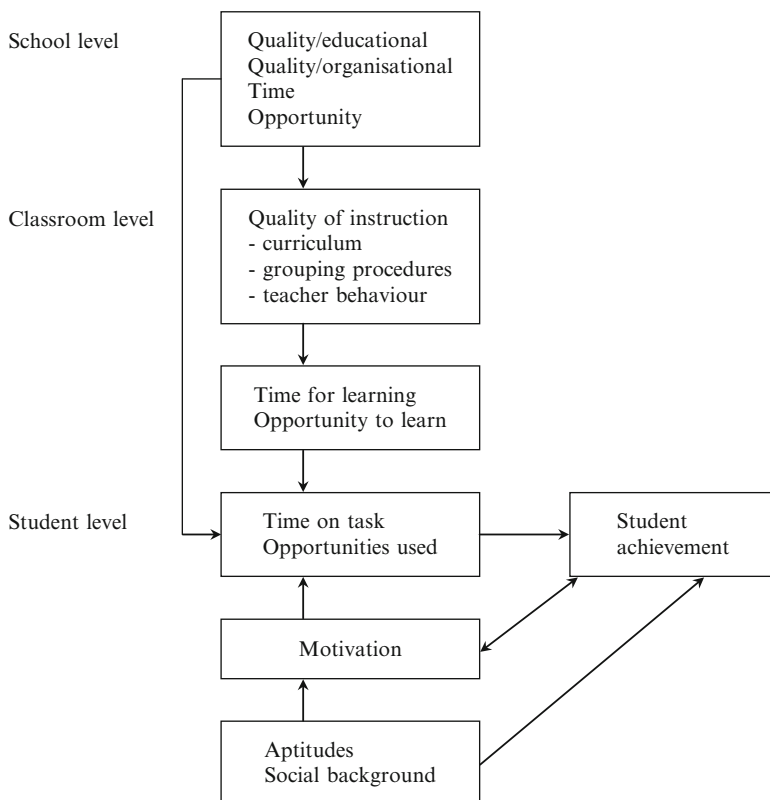
instruction. Additional teacher behaviour characteristics refer to high expectations, homework, presentational skills and class management (Creemers). Finally, it could be claimed that the model in its concentration on education emphasises learning and instruction but, as articulated below, the model is less developed in relation to the organisational part of the school and the educational system.

### *The Conditional Role of the School Level*

Creemers takes as his point of departure the fact that student learning, and especially differences in learning outcomes, has to be explained by the primary processes at the classroom level. These primary processes directly influence time on task and opportunities to learn used by students and indirectly influence student achievement. However, it is not expected that the school level directly contributes to time on task and opportunities used by the students or to student achievement. Creemers (1994b) claims that the school provides conditions for quality of instruction, time on task and opportunity to learn at the classroom level. It is also postulated that at the school level, the conditional factors can be related to the overarching categories mentioned above: quality, time and opportunity. The conditional role of the school level is depicted in Fig. 7.1 which illustrates the comprehensive model of educational effectiveness.

### *Quality, Time and Opportunity at the School Level*

Figure 7.1 shows that school-level factors are expected to directly influence the quality of instruction, time for learning and opportunity to learn at the classroom level. Their influence on student achievement is mediated by time on task and by opportunities used at the student level. Therefore, school-level factors are categorised within the same conceptual notions of quality, time and opportunity as the classroom-level factors. However, the school-level factors include not only the organisation of the school (teachers, students, parents) but also the educational system beyond the school level (i.e. the context/national level). This relates to the curriculum of the school in terms of effects on the textbooks and the timetable. Thus, Creemers (1994b) makes a distinction between the school level as an organisational and as an educational system. The two systems are related to each other, but the first—the school level—can create and sustain the situation in which education takes place to some extent, comparable with what management of classroom ‘does’ for instruction. According to the comprehensive model of educational effectiveness, the factors at the school level are seen as conditions for what goes on at the classroom level. However, conditions can be either clear (e.g. the curriculum) or less clear (e.g. the structure of the organisation). The latter factors can also affect the instructional process by, for example, influencing what happens between head teachers and teachers (see, e.g. Rosenholz, 1989; Teddlie & Stringfield, 1993).



**Fig. 7.1** The comprehensive model of educational effectiveness (Adopted from Creemers and Reezigt (1996))

A distinction is also made between the educational and organisational aspects of the quality of instruction (see Fig. 7.1). With respect to the educational aspects, the rules and agreements in the school concerning the instructional process at the classroom level are of the utmost importance, especially those related to curricular materials, grouping procedures and teacher behaviour. For example, it is expected that there should be a school policy which defines educational goals that have to be achieved in the classroom. This does not imply that wide range of goals may be difficult for students to achieve; however, the school policy should refer to realistic goals that can be achieved, as well as those that are in line with the educational needs of the students and can provide guidance to teacher behaviour in the classroom (Campbell & Kyriakides, 2000). Moreover, effective schools are expected to have an evaluation policy that directs activities at the classroom and the student levels by means of a student monitoring system. Therefore, effective schools promote the testing of students and stimulate teachers to disseminate their assessment results to students and parents, to take corrective measures and to act as necessary

on the basis of their students' progress, providing opportunities for rehearsal, corrective materials and remedial teaching. This implies that effective schools place more emphasis on the formative purposes of assessment than on the summative purposes (Kyriakides, 2005a).

The organisational aspects of quality at the school level are related to the interconnectedness (mutual supervision) of teachers and the professionalisation of teachers and head teachers. These aspects refer not only to the structure of the organisation but also to the collaboration among teachers and their head teacher, which contributes to the improvement in both classroom practices and the school as a whole. In this respect, the effective head teacher is expected to act as an 'instructional leader' who takes responsibility for the professional development of the teachers in his/her school. Creemers (1994b) also argues that team consensus about the mission of the school and the way to fulfil this mission through shared values will support the activities of individual teachers and will result in continuity and consistency. This can create a school culture amongst head teachers, teachers, students and parents that promotes effectiveness (Cheng, 1993).

Conditions for the use of time at the school level are connected with the timetable. For all grade levels, this timetable spells out how much time should be devoted to different subjects. Apart from this, it is important to keep track of the time utilisation. In less effective schools, a lot of scheduled time is wasted, because there is no system to ensure time in the classroom is used effectively.

The time available for learning can be expanded by a homework policy. For this reason, such a policy is seen as an important school-level factor. When homework assignments are well controlled and structured and constructive feedback is given, such assignments can expand effective learning time outside the school. Moreover, contacts between schools and parents and agreements about school policies and activities may lead to the effective use of time spent on homework. Furthermore, when parents expect their children to achieve goals set by the school, the effectiveness of education increases.

Creemers (1994b) also argues that measures taken at the school level can maintain an orderly environment that facilitates teaching and learning at the classroom level. Several studies on school effectiveness reveal that learning time is increased by an orderly classroom climate (Teddle & Reynolds, 2000). At a school level, such a climate can be fostered; therefore, it is necessary to establish order, a quiet atmosphere and structure, and to support teachers trying to achieve this in their classes.

According to the comprehensive model of educational effectiveness, at the school level, conditions can be created that contribute to the opportunity to learn at the classroom level. At the school level, the opportunity to learn is provided by the development and the availability of documents, such as a formal curriculum, a school working plan and an activity plan for what has to be done to pursue the goals of the curriculum. In this document, the school management team can explain its vision of education and make clear how effectiveness will be pursued in the school. Effective schools are expected to feel responsible for student achievement: it is their 'mission' to contribute to achievement. A school policy based on these principles can yield important effects (Creemers, 1994b).



In summary, the following conditions at the school level are necessary to ensure quality of instruction:

- Rules and agreements about all aspects of classroom instruction, especially curricular materials, grouping procedures and teacher behaviour, and the consistency between them.
- An evaluation policy and a system at school level to check on student achievement, to prevent learning problems or to correct those that might have emerged at an early stage. This includes regular testing, remedial teaching, student counselling and homework assistance.

With respect to the organisational aspects at the school level, important conditions for quality of instruction are as follows:

- A school policy on supervision of teachers, heads of departments and head teachers by higher ranking persons and a school policy to support and further professionalise teachers who do not live up to the school/national standards
- A school culture promoting and supporting effectiveness

As far as the conditions relating to time at the school level is concerned, the model refers to the following school-level factors:

- The development and provision of a timetable for subjects and topics
- Rules and agreements about time utilisation, including the school policy on homework, student absenteeism and cancellation of lessons
- The maintenance of an orderly and quiet atmosphere in the school

Finally, factors which provide conditions for the opportunity to learn are as follows:

- The development and availability of a curriculum and a school working plan or activity plan
- Consensus about the mission of the school
- Rules and agreements about how to proceed and how to follow the curriculum, especially with respect to transition from one grade to another

However, it is important to note that it is not the intention of Creemers (1994b) to refer to all kinds of school factors mentioned in review studies of school effectiveness research (e.g. Levine & Lezotte, 1990; Sammons, Hillman & Mortimore, 1995) but rather to show that the school-level factors which refer to the conceptual notions of quality, time and opportunity are the most important predictors of effectiveness. For example, the variable 'resources' is mentioned in several review studies but is not regarded as a separate category of school factors. This is attributed to the fact that Creemers does not assume that just providing additional finance and resources to schools is likely to improve their effectiveness status. On the contrary, resources should be defined in such a way that their relationship to effectiveness is clarified. In other words, the influence of resources on the quality of curricular materials and on teacher behaviour or other factors in the model that support education should be identified.

### ***The Main Assumptions of the Comprehensive Model***

The comprehensive model of educational effectiveness does not refer only to factors operating at different levels. Creemers' model also shows how the levels in the model influence student outcomes. Specifically, the model is based on four assumptions which help us identify the nature of interactions shown in the model and also how the student and the context levels are defined. Firstly, time on task and opportunity used at the student level are directly related to student achievement. Secondly, the quality of teaching, the curriculum and the grouping procedures influence the time on task and opportunity to learn. For example, some teachers spend more time actually teaching, while others spend more time on classroom management and keeping order. Therefore, teachers are seen as the central component in instruction at the classroom level. Thirdly, teaching quality, time and opportunity at the classroom level are also influenced by factors at the school level that may or may not promote these classroom factors. The school level is also influenced by factors at the context level. Outcomes therefore cannot be seen as a result of classroom factors only, as in many studies of effectiveness. The influences of the context and school levels are indirect and mediated by the classroom level. Finally, it is acknowledged that although teachers are able to influence the amount of time spent on learning and the provision of opportunities to learn in their classrooms through the quality of their instruction, it is the students who decide how much time they will spend on their school tasks and how many tasks they will complete. Thus, achievement is also determined by student factors such as aptitudes, social background and motivation.

### ***The Four Formal Principles of the Model***

Although focusing on the effects of various factors, the fully elaborated model of Creemers (1994b) makes tentative statements about their joint impact on student outcomes by introducing the formal principles of consistency, cohesion, constancy and control. These formal principles were considered a major improvement compared with those of other models, because they hold together the other factors in the model and can explain the joint cumulative impact of factors, which together constitute learning environments. The formal principles concern the relationships between the factors of instruction, (textbooks, grouping procedures and teaching behaviour) the stability of factors over time and mechanisms to put the factors into practice. The idea behind the notion of formal principles is that the influence of the factors at a particular level, and between factors at different levels, can be enforced or can take place if these factors are pursued for a longer period of time and are in line with each other. Research on effective education at the classroom level shows that individual components of effective teaching do not result in strong effects on student achievement (Creemers & Reezigt, 1996). For example, good curricula need teachers who can make adequate use of them and who will show effective

**Table 7.1** School-level factors and formal principles operating in generating effectiveness

School-level effectiveness factors: characteristics of quality, time and opportunity		Formal principles
Quality/educational	Rules and agreements about classroom instruction	Consistency
Quality/organisational	Evaluation policy/evaluation system	Cohesion
	Policy on intervention, supervision and professionalisation	
Time	School culture inducing effectiveness	Constancy
	Timetable	
Opportunity	Rules and agreements about time use	Control
	Orderly and quiet atmosphere	
	School curriculum	
	Consensus about mission	
	Rules and agreements about how to implement the school curriculum	

instructional behaviour. The same holds true for grouping procedures. It is integration of components that is necessary to achieve substantial effects. An integrated approach to education rather than exclusive use of the direct instruction or the mastery learning approach is necessary (Creemers, 1994b). In this integrated approach, the educational components of curricula, grouping procedures and teacher behaviour are adapted to each other. To achieve time and opportunity to learn, Creemers argues that the three components in general should have the same effectiveness characteristics. This is called consistency of the effectiveness characteristics and is based on the assumption that effectiveness characteristics that are in line with each other mutually reinforce each other and can have a synergistic effect that exceeds the effectiveness of the separate components (e.g. Kyriakides, 2008; Scheerens & Bosker, 1997). As mentioned above, like consistency at the classroom level, there are four formal principles at the school level which, when they operate, ensure that educational effectiveness is generated (see Table 7.1).

Formal principles cannot be seen easily or immediately in schools, and for this reason, it is difficult to test the validity of the model in relation to these four principles. However, we can assume that they exist, based on the fact that the same factors are seen across instructional components, subjects, grades and classes. Moreover, Table 7.1 reveals that consistency, which is based on the assumption that the effectiveness of classrooms, schools and contexts is enhanced when the factors at these levels are in line with each other and support each other, is seen as an important condition for instruction. Thus, conditions for effective instruction related to curricular materials, grouping procedures and teacher behaviour are expected to be in line with each other. When all members of a school team take care of consistency, cohesion is created, which means that every team member is aware of the need for consistency and acts according to school-wide agreements in this respect. In this way, effective instruction between classes can be guaranteed. To maximise outcomes,

schools should not change rules and policies every other year. For this reason, Creemers (1994b) argues that there should be constancy, meaning that effective instruction is provided throughout the school career of the student. Thus, constancy implies that consistency and cohesion are guaranteed over long periods of time. Finally, the control principle refers not only to the fact that student outcomes and teacher behaviour should be evaluated but also to the importance of evaluating school climate, since an orderly and quiet school climate is necessary to achieve results. Moreover, control refers to teachers holding themselves and others responsible for effectiveness.

Although greater emphasis is placed on the formal principles operating at the school level, the model also applies to the context level, taking into account the same elements of quality, time and opportunity, and the formal principles which are expected to operate in order to generate effectiveness. Therefore, Creemers (1994b) argues that at the context level, consistency, constancy and control are again formal characteristics emphasising the importance of context factors (e.g. national policy on evaluation or testing, training and support systems) over time and of mechanisms to ensure effectiveness.

## **The Dynamic Model of Educational Effectiveness**

### ***National Studies Testing the Validity of the Comprehensive Model: A Starting Point for the Development of the Dynamic Model***

During the last 15 years, six studies testing the main aspects of Creemers's model (i.e. De Jong, Westerhof & Kruiter, 2004; Driessen & Sleegers, 2000; Kyriakides, 2005b; Kyriakides et al., 2000; Kyriakides & Tsangaridou, 2004; Reezigt, Guldmond & Creemers, 1999) were conducted in two European countries, one with a more, the other with a less centralised educational system (i.e. the Netherlands and Cyprus). A comparison of the results of these studies helps us identify the extent to which the model can be used to explain effectiveness in both centralised and less centralised educational systems. Table 7.2 illustrates the main results of these studies and helps us identify the extent to which empirical support for the Creemers model has been provided.

It is first of all important to note that these studies revealed that the influences on student achievement are multilevel. Classrooms had unique effects on student learning, independently of factors operating at the school and individual levels. Moreover, by controlling for both student factors and classroom contextual factors, variables at the school level explained some variation in achievement at that level. This finding is in line with the findings of most studies on educational effectiveness conducted in various countries during the last two decades (Teddlie & Reynolds, 2000) and provides support for the argument that models of educational effectiveness should

**Table 7.2** A summary of the findings of the six studies conducted in the Netherlands and Cyprus in order to test the validity of the Creemers's model

Main assumptions of the model	The Netherlands			Cyprus		
	Study 1	Study 2	Study 3	Study 1	Study 2	Study 3
(a) Multilevel in nature	+	+	+	+	+	+
(b) Factors of the model						
<i>Student level</i>						
Socio-economic status	+	+	+	+	+	0
Aptitude	+		+	+	+	+
Motivation						
Perseverance			0	0	0	+
Self-confidence			+			
School motivation			0			
Subject motivation			+	+	+	+
Expectations				+	+	+
Time on task			+	+	+	+
Opportunity used			0	0	+	+
<i>Teacher/class level</i>						
Time for learning	-	0	0	0	+	+
Opportunity to learn (homework assigned)	+	0	+	+	+	
Grouping	0		+			
Quality of teaching						
Quality curriculum	+					
Implementation curriculum	+					
Task directness			+			+
Clear goal-setting	+					
Corrective instruction	+					
Feedback	M				+	
Assessment/test frequency	+	+				
Emphasis on basic skills		+				
High expectations		0				
Clarity of instruction				0	+	
Giving information					+	+
Practice and application					+	
Teacher's treatment of pupils				0	+	
Supportive environment					+	
Maintaining attention on lesson					+	
Maintaining appropriate classroom behaviour					+	
Classroom management					+	
Classroom climate					+	
Motor appropriately engaged						+
Grouping	0		+			
<i>School level</i>						
Orderly atmosphere	+					
Education policy			+	-		

(continued)

**Table 7.2** (continued)

Main assumptions of the model	The Netherlands			Cyprus		
	Study 1	Study 2	Study 3	Study 1	Study 2	Study 3
Implementation curriculum	0					
Classroom instruction	M			+		+
Rules about time use	-			+		+
Professionalisation policy	-					
Grouping (school track)			0			
Evaluation policy	M			+		
Curriculum			0			
Opportunity to learn: school mission				+		+
School facilities (gymnasium)						+
(c) Cross-level interactions	0		0	0		0
(d) Principles: Consistency	0	0				
(e) Differential effects	+			+		+
(f) Factors not in the model						
<i>Student level</i>						
Gender	M		0	+	M	M
Personality					+	
Thinking style					+	
Self-efficacy						0
<i>Teacher level</i>						
Teacher personal characteristics					0	0
Teacher knowledge					0	+

0: No statistically significant effects at 0.05 level were identified, +: Positive effects were identified, -: Negative effects were identified, M: Both positive and negative effects were identified

be multilevel in nature. This also implies that the models of educational effectiveness should refer to multiple factors of effectiveness, which operate at different levels.

Secondly, the six studies revealed that most of the student-level factors included in the Creemers model, such as aptitudes, social background and motivation, showed effects in the expected directions. However, the need to expand the model at the student level was pointed out since most of the unexplained variance was found to be located at this level. The importance of looking within studies in the field of psychology to identify student-level factors has already been stressed (Kyriakides, 2005b). Nevertheless, researchers within the field of EER should be critical about the extension of the current models and select only variables that have stable effects and can help us establish a model that is in line with the parsimony principle. At the same time, it should be acknowledged that looking at the student-level factors is not a critical issue for the development of the theoretical framework of EER. The main aim of EER is to identify effective education factors that could be introduced or changed through school improvement projects (Creemers, 2002). Therefore, it is important to identify student-level variables which not only are related to student achievement but also interact with other effectiveness factors operating at the classroom and/or school

level. For example, a factor concerned with the thinking styles of students, which emerged from the theory of mental self-government (Sternberg, 1988), was found to be associated with student achievement (see Kyriakides, 2005b). Given that thinking styles are seen as dynamic, it can be claimed that it is possible to design projects attempting to help students develop 'optimal' styles in order to improve their achievement. It can also be argued that high-quality teaching will help students develop optimal thinking styles. This argument reveals the importance of including this student-level factor in the models of educational effectiveness. It has also been shown that there is an interaction between measures of quality of teaching and measures of the personal characteristics of students. For example, one of these studies revealed that generic teaching skills, found to be consistently correlated with student achievement, have a general effect across all students but to differing degrees because of students' different thinking styles and personality traits.

Thirdly, the figures of Table 7.2 reveal that these six studies provided support for the importance of the main classroom-level factors of the Creemers model. At the same time, no empirical support was provided for classroom-level factors not included in the model, such as teacher characteristics and knowledge. These findings seem to reveal that at the classroom level, the teacher is an important actor. Teacher background characteristics, such as gender, age, education, beliefs and motivation, are important in educational theory and research because these characteristics may explain the differences between teachers in the way they behave in the classroom. However, these characteristics should not be included in the models of educational effectiveness. This argument is not only supported by the fact that these teacher characteristics were not found to be related to achievement. It is also argued here that the models of effectiveness should concentrate on the teaching activities teachers perform in order to initiate, promote and evaluate student learning (see Chap. 5).

Fourthly, in each of these six studies, the concept of quality of teaching was treated in a different way since each one was searching for the impact of different aspects of quality of teaching upon student achievement. This can be attributed to the fact that although the comprehensive model places more emphasis on the process of teaching than the other integrated models do (e.g. Scheerens, 1992; Stringfield & Slavin, 1992), the concept of quality of teaching is not defined precisely. The lack of clarity in defining quality of teaching might be attributed to one of the major weaknesses of EER, namely, its assumption that quality is guaranteed whenever an aspect of teaching is able to explain part of the variance in student achievement. However, researchers in the area of effectiveness should develop a parsimonious model at classroom level, which will provide a clear definition of the quality of teaching by referring to the most important aspects of effective teaching.

Table 7.2 also reveals that the aspects of quality of teaching taken into account by the six studies testing the validity of the Creemers model mainly referred to the direct teaching approach. However, in recent years, constructivist and others who support the 'new learning' approach (e.g. Choi & Hannafin, 1995; Savery & Duffy, 1995; Simons, van der Linden & Duffy, 2000; Vermunt & Vershaffel, 2000) have developed a set of instructional techniques that are supposed to enhance the learning disposition

of students, such as modelling, coaching, scaffolding and fading, articulating, reflection, exploration, generalisation, collaborative teaching, provision of anchors, goal orientation and self-regulated learning (see Chap. 6). Researchers attempting to develop models which illustrate the complexity of educational effectiveness at classroom level should refer not only to skills associated with direct teaching and mastery learning but also to factors which are in line with new theories of learning.

Fifthly, in contrast to the classroom-level factors, no large variation in the aspects of school factors taken into account by these six studies can be identified (see Table 7.2). However, different measurement frameworks were used in order to define similar aspects of school-level factors. For example, one study was looking at the frequency dimension of school evaluation policy to identify the effect of this factor on achievement and revealed both negative and positive effects, whereas another study was looking at the emphasis placed on the formative aspect of evaluation and revealed positive effects. A similar problem can also be identified in the way the classroom-level factors were measured by these six studies. For example, different aspects of clarity of instruction were measured in the studies conducted in Cyprus, and different results concerning the importance of this factor emerged. The fact that these six studies made use of different approaches to measure effectiveness factors can be attributed to the fact that the Creemers model (as well as all the other models of educational effectiveness) does not explicitly refer to the measurement of each effectiveness factor. On the contrary, it is often assumed that these factors represent unidimensional constructs. The synthesis of studies testing the Creemers model reported here seems to reveal that models of educational effectiveness should not only illustrate the various effectiveness factors but also identify the dimensions of each factor which can be measured. Considering effectiveness factors as multidimensional constructs provides a better picture of what makes teachers and schools effective and may help us develop specific strategies for improving educational practice.

Sixthly, none of the studies presented in this chapter were able to illustrate statistically significant cross-level interactions between school- and classroom-level factors. The Creemers model is based on the assumption that school factors are able to influence classroom-level factors, especially teaching practice. The model refers to factors at school and context level which are related to the same key concepts of quantity of teaching, provision of learning opportunities and quality of teaching used to define the classroom-level factors. However, the fact that such cross-level interactions were not identified may have to do with the fact that the comprehensive model does not take into account the dynamic perspective of effectiveness. For example, at those schools where teacher and/or student absenteeism rarely occur, change in their policy on absenteeism is not expected to be associated with only improvement in the effectiveness status of the school; only changes in those factors in relation to which schools face significant problems are expected to be associated with improvement in school effectiveness.

Seventhly, the first two Dutch studies did not provide support for one of the main principles of the model. Consistency was not found to be associated with student achievement. Table 7.2 also reveals that none of these six studies investigated the



validity of any other formal principle of the comprehensive model. As been mentioned above, although focusing on the effects of various individual factors, the fully elaborated model of Creemers (1994b) makes tentative statements about their joint impact on student outcomes by introducing the formal principles of consistency, cohesion, constancy and control. These formal principles were considered a major improvement when compared with those of other models, because they bring together the other factors in the model and can explain the joint cumulative impact of factors, which together constitute learning environments. The idea behind the notion of formal principles is that the influence of the factors at a particular level, and between factors at different levels, can be enforced or can take place by virtue of the fact that these factors are pursued over a longer period of time and are in line with each other. However, the fact that there has been no study which has attempted to test the validity of the four principles of the Creemers model might be attributed to the fact that these principles are very difficult to observe directly and their importance may need to be reconsidered.

Eighthly, Table 7.2 reveals that some support for differential effectiveness was provided by the studies which tested the Creemers model. The importance of treating differentiation as a separate dimension of measurement of effectiveness factors arises not only from the results of the studies that tested the Creemers model but also from the fact that students of any age and in any culture will differ from one another in various intellectual and psychomotor skills, in both generalised and specialised prior knowledge, in interests and motives, in their socio-economic background and in personal styles of thoughts and work during learning (Dowson & McInerney, 2003). Researchers in the area of educational effectiveness have shown that these differences are related to differences in students' progress in learning (e.g. Kyriakides, 2005b; Slavin, 1987; Teddlie & Reynolds, 2000). These relations imply individual predispositions that somehow condition student readiness to profit from the particular instructional environments provided. Despite the fact that educational practice has remained basically fixed and non-adaptive in most countries, research into differential effectiveness seems to reveal that teachers and schools may be differentially effective in promoting the learning of different groups of students (Campbell, Kyriakides, Muijs & Robinson, 2004). Thus, generic models of educational effectiveness, which are able to incorporate the results of research into differential teacher and school effectiveness, should be developed.

Based on the above analysis of the comprehensive model and the studies testing its validity, the dynamic model of educational effectiveness (Creemers & Kyriakides, 2008b) has been developed. The model takes into account the strengths and limitations of the comprehensive model and attempts to illustrate the dynamic nature of educational effectiveness. By doing so, it is expected that stronger links between EER and improvement practice may be developed. The dynamic model is described in this section. It is, however, important to note in advance that the comprehensive model of educational effectiveness is in line with at least two of the starting points upon which the dynamic model is based. Specifically, the Creemers model is based on the assumption that the influences on student achievement are multilevel and therefore it refers to factors at different levels (i.e. student, classroom, school, system),

which are related to student achievement. Direct and indirect relations between the levels and the outcomes are also identified. These characteristics of the comprehensive model can be seen as starting points for the development of the dynamic model. The observations arising from Table 7.2 reveal that the findings of the studies conducted in order to test the validity of Creemers's model provide support for the importance of establishing a multilevel integrated model of educational effectiveness, such as the Creemers model. It has also been argued above that the results of these studies reveal four weaknesses in the comprehensive model, which have been taken into account in the establishment of the dynamic model. Firstly, the dynamic model provides a clear definition of quality of teaching by focusing on eight classroom-level factors, which refer not only to the direct teaching approach but also to the new theories of learning. Secondly, the dynamic model assumes that a measurement framework should be used to measure the functioning of effectiveness factors. It is argued that considering effectiveness factors as multidimensional constructs not only provides a better picture of what makes teachers and schools effective but also helps us develop specific strategies for improving educational practice. Thirdly, the dynamic model treats differentiation as a separate dimension of measuring each effectiveness factor. In this way, it is acknowledged that the impact of effectiveness factors on different groups of students/teachers/schools may vary. It also is expected that adaptation to the specific needs of each subject or group of subjects will increase the successful implementation of a factor and ultimately maximise its effect on student learning outcomes. Thus, although the dynamic model is expected to be a generic model, it takes into account the findings of research into differential effectiveness. This suggests that the concept of differential teacher/school effectiveness ought not to be polarised against a generic concept. Rather, the former should be incorporated as a refinement into the latter. Finally, the dynamic model assumes that the impact of the school- and context-level factors has to be defined and measured in a different way from that of the classroom-level factors. According to the dynamic model, the impact of school and context factors depends on the current situation of the school/system and especially on the type of problems/difficulties that the school/system is facing.

### *The Essential Characteristics of the Dynamic Model*

The main characteristics of the dynamic model are as follows. Firstly, the dynamic model takes into account the fact that effectiveness studies conducted in several countries reveal that the influences on student achievement are multilevel (Teddlie & Reynolds, 2000). Therefore, the model is multilevel in nature and refers to factors operating at the four levels shown in Fig. 7.2. Figure 7.2 reveals the main structure of the dynamic model. The teaching and learning situation is emphasised, and the roles of the two main actors (i.e. teacher and student) are analysed. Above these two levels, the dynamic model also refers to school-level factors. It is suggested that school-level factors influence the teaching-learning situation by encouraging the

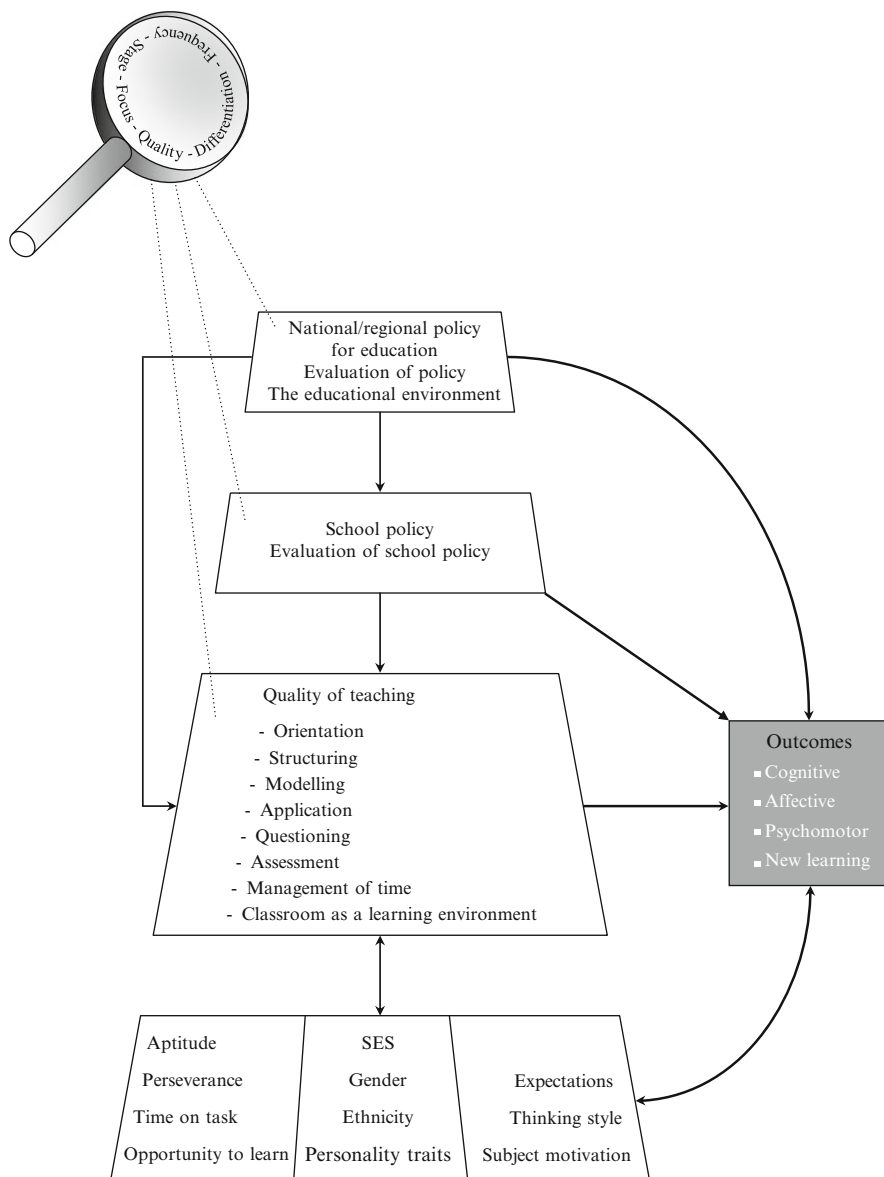


Fig. 7.2 The dynamic model of educational effectiveness

development and evaluation of school policies on teaching and on creating a learning environment in the school. The context level refers to the influence of the educational system in a more formal way, especially the development and evaluation of educational policy at the national/regional level. It is also taken into account that the

teaching and learning situation is influenced by the wider educational context in which students, teachers and schools are expected to operate. Factors such as the values of the society regarding learning and the importance attached to education play an important role both in shaping teacher and student expectations and in the development of the perceptions of various stakeholders about effective teaching practice.

Secondly, Fig. 7.2 does not only refer to the four levels of the dynamic model and each level's association with student outcomes, the interrelations between the components of the model are also illustrated. In this way, the model supports the view that factors at the school and context level have both direct and indirect effects on student achievement since they are able to influence not only student achievement but also the teaching and learning situations. This assumption is supported by the findings of effectiveness studies conducted in order to test the validity of the comprehensive model (e.g. De Jong et al., 2004; Kyriakides, 2005b), which reveal that the relationships between factors at different levels might be more complex than assumed in the current integrated models. This is especially true for interaction effects among factors operating at classroom and student level, which reveal the importance of investigating differential effectiveness (Strand, 2010).

Thirdly, the dynamic model also assumes that the definition and measurement of the impact of the school- and context-level factors has to be done in a different way from that of the impact of classroom-level factors. Policy on teaching and actions taken to improve teaching practice must be measured over time and in relation to the weaknesses that exist in a school. The assumption is that schools and educational systems which are able to identify their weaknesses and develop a policy on aspects associated with teaching and the school learning environment (SLE) are also able to improve the functioning of classroom-level factors and their level of effectiveness. Only changes in those factors in relation to which schools face significant problems are expected to be associated with the improvement of school effectiveness. This implies that the impact of school- and context-level factors depends on the current situation of the objects under investigation. This characteristic of the dynamic model not only reveals an essential difference between the nature of this model and all other current models of educational effectiveness but also has some significant implications for designing studies attempting to use the dynamic model for improvement purposes (see Creemers, Kyriakides & Sammons, 2010).

Fourthly, the dynamic model is based on the assumption that the relation of some effectiveness factors to achievement may not be linear. This assumption is supported by results of quantitative syntheses investigating the effect of some effectiveness factors upon student achievement. These studies revealed that although these variables have been perceived as factors affecting teacher or school effectiveness, the research evidence is problematic. For example, teacher subject knowledge is widely perceived as a factor affecting teacher effectiveness (Scriven, 1994), but teachers' subject knowledge, regardless of how it is measured, has rarely correlated strongly with student achievement (Darling-Hammond, 2000). The explanation may be, as Monk (1994) reports, that the relationship is curvilinear: a minimal level of knowledge is necessary for teachers to be effective, but beyond a certain point,

a negative relation is observed. Similar findings have been reported with regard to the impact of classroom emotional climate and teacher management upon effectiveness. A negative emotional climate usually shows negative correlations, but a neutral climate is at least as supportive as a warm climate. Beyond an optimal level of teacher direction, drill or recitation becomes dysfunctional (Soar & Soar, 1979). Rosenshine (1971) suggests inverted-U curvilinear relationships with student learning for verbal praise, difficulty level of instruction, teacher questions and amount of student talk. The possibility of interaction with student individual differences is also supported. Therefore, the dynamic model of educational effectiveness is based on the assumption that the relation of some effectiveness factors with achievement may not be linear. This implies that optimal points for the functioning of factors in relation to student outcomes have to be identified. In doing so, different strategies focusing on the improvement of specific factors relating to each teacher/school could emerge.

Fifthly, the model assumes that there is a need to examine carefully the relationships between the various effectiveness factors which operate at the same level. Such an approach to modelling educational effectiveness reveals grouping of factors that make teachers and schools effective. Therefore, specific strategies for improving effectiveness, which are more comprehensive in nature, are expected to emerge (see Kyriakides, Creemers & Antoniou, 2009).

Finally, the dynamic model is based on the assumption that different dimensions for measuring the functioning of effectiveness factors are used. The use of different measurement dimensions reveals that looking at just the frequency of an effectiveness factor (e.g. the extent to which an activity associated with an effectiveness factor is present in a system/school/classroom) does not help us identify those aspects of the functioning of a factor, which are associated with student achievement. Considering effectiveness factors as multidimensional constructs not only provides a better picture of what makes teachers and schools effective but may also help us develop more specific strategies for improving educational practice (Kyriakides & Creemers, 2008). The dimensions of measuring effectiveness factors are described in the next part.

### ***Dimensions of Measuring Effectiveness Factors***

In principle, each factor, which refers to the classroom, school and system, can be measured by taking into account the following five dimensions: frequency, focus, stage, quality and differentiation. Table 7.3 illustrates the operational definition of these five dimensions, which reveal the importance of collecting both quantitative and qualitative information about the functioning of each factor. The importance of taking each dimension into account is also illustrated below by explaining how one of the teacher factors included in the model, namely, orientation, is defined.

**Table 7.3** Operational definitions of the five dimensions of measuring each effectiveness factor and ways of measuring each dimension

Dimensions	Operational definitions	Ways of measuring
Frequency	This refers to the <i>quantity</i> that an activity associated with an effectiveness factor, which is present in a system, school or classroom	Two indicators are used (a) How many tasks are used? (b) How long does each task take?
Focus	This reveals the function of the factor at classroom, school and system level. The following two aspects of focus of each factor are measured (a) Specificity (b) The number of purposes of an activity	(a) Specificity is measured by investigating the extent to which activities are too specific or too general. (b) How many purposes are expected to be achieved?
Stage	This refers to the <i>period</i> over which they take place. It is assumed that the factors need to take place over a long period of time to ensure that they have a continuous direct or indirect effect on student learning	When does the task take place? (Based on the data which emerged from the above question, data about the continuity of the existence of a factor are collected)
Quality	This refers to the properties of the specific factor itself, as are discussed in the literature	(a) What are the properties of tasks associated with a factor which reveal the functioning of each factor? (b) To what extent is the function of each task in line with the literature?
Differentiation	This refers to the extent to which activities associated with a factor are implemented in the same way for all the subjects involved with it	To what extent are different tasks associated with each factor provided to different groups of subjects involved with this factor?

## Frequency

Orientation refers to teacher behaviour in terms of providing the objectives which a specific task or lesson or series of lessons aim to fulfil and/or to challenging students to identify the reason for which an activity takes place in the lesson. The engagement of students with orientation tasks may encourage them to actively participate in the classroom since the tasks that take place are meaningful for them. As a consequence, the *frequency* dimension is measured by taking into account the number of orientations tasks that take place in a typical lesson as well as how long each task takes to complete. These two indicators help us identify the importance that the teacher attaches to this factor.

## Focus

The effectiveness factors are also measured by taking into account the *focus* of the activities which are associated with each factor. Two aspects of focus for each factor are measured. Firstly, it is taken into account that each task associated with the functioning of an effectiveness factor may not take place by chance but for certain reasons. Thus, according to the dynamic model, the first aspect of the focus dimension of each factor addresses *the purpose(s)* for which an activity takes place and the fact that it may be expected to achieve single or multiple purposes. The importance of measuring this aspect of focus dimension can be attributed to research findings which reveal that if all the activities are expected to achieve a single purpose, then the chances of achieving that purpose are high, but the effect of the factor may be small due to the fact that other purposes are not achieved and/or synergy may not exist since the activities are isolated (Schoenfeld, 1998). On the other hand, if all the activities are expected to achieve multiple purposes, there is a danger that specific purposes are not addressed in such a way that they can be implemented successfully (Pellegrino, 2004). In the case of orientation, this aspect of focus is measured by examining the extent to which there is a single or multiple reasons for carrying out a particular task in an activity. The second aspect of this dimension refers to the *specificity* of the activities, which can range from particular to general. The specificity of the orientation tasks is measured by taking into account the fact that such a task may refer to a part of a lesson or to the whole lesson or even to a series of lessons (e.g. a lesson unit).

## Stage

Activities associated with a factor can be measured by considering the *stage* at which they take place. There is support for the idea that the factors need to take place over a long period of time to ensure that they have a continuous direct or indirect effect on student learning (Creemers, 1994b). This assumption is partly based on the fact that evaluations of programmes aiming to improve educational practice reveal that the extent to which these intervention programmes have any impact on educational practice is partly based on the length of time that the programmes are implemented in a school

(e.g. Gray et al., 1999). Moreover, the importance of using the stage dimension to measure each effectiveness factor arises from the fact that it has been shown that the impact of a factor on student achievement partly depends on the extent to which activities associated with this factor are provided throughout the school career of the student (Slater & Teddlie, 1992). Although measuring the stage dimension gives information about the continuity of the existence of a factor, activities associated with the factor may not necessarily be the same. Therefore, using the stage dimension to measure the functioning of a factor can help us identify the extent to which there is constancy at each level and flexibility in using the factor during the period in which the investigation takes place. In the case of orientation, tasks may take place in different parts of a lesson or series of lessons (e.g. introduction, core, ending of the lesson). Effective teachers are expected to offer orientation tasks at different points in the lesson (Killen, 2007). Further, it is expected that effective teachers are able to take others' perspectives into account during this orientation phase. For example, students may come with suggestions about the reasons for doing a specific task, which an effective teacher is expected to consider (Gijbels, Van de Watering, Dochy & Van den Bossche, 2006).

## Quality

The *quality* dimension refers to the properties of the specific factor itself, as discussed in the literature. This implies that the quality dimension deals with the process of teaching and is not concerned with the effects of teaching in terms of student outcomes. We assume that this dimension, as well as all the others, may help us explain variation in student outcomes and for this reason is included in the model. The importance of using this dimension also arises from the fact that looking at the quantitative elements of a factor ignores the possibility that the functioning of the factor may vary. The measurement of the quality dimension refers to the properties of the orientation task and especially whether it is clear to the students. It also refers to the impact that the task has on student engagement in the learning process. For example, teachers may present the reasons for doing a task simply because it has to be done and is part of their teaching routine even though it has little effect on student participation, whereas others may encourage students to identify the purposes that can be achieved by carrying out a task which therefore increases their motivation in relation to a specific task/lesson/series of lessons.

## Differentiation

The dynamic model takes into account the findings of research into differential educational effectiveness (Campbell, Kyriakides, Muijs & Robinson, 2003). Specifically, it is acknowledged that the impact of teaching factors on different groups of students may vary. As a consequence, *differentiation* is treated as a measurement dimension and is concerned with the extent to which activities associated with a factor are implemented in the same way for all the subjects involved.



It is expected that adaptation to the specific needs of each group of students will increase the successful implementation of a factor and ultimately maximise its effect on student outcomes. Although differentiation could be considered a property of an effectiveness factor, it was decided to treat differentiation as a separate measurement dimension of each effectiveness factor rather than incorporating it into the quality dimension. In this way, the importance of considering the special needs of each group of students is stressed. Thus, the dynamic model is based on the assumption that it is difficult to deny that persons of all ages learn, think and process information differently.

One way to differentiate instruction is for teachers to teach according to individual student learning needs, as are defined by their background and personal characteristics, such as gender, socio-economic status, ability, thinking style and personality type (Kyriakides, 2007). However, the differentiation dimension does not imply that these groups of students are not expected to achieve the same purposes. On the contrary, adapting the functioning of each factor to the special needs of each group of students may ensure that all of them will be enabled to achieve the same purposes. This argument is partly supported by research into adaptive teaching and the evaluation projects of innovations concerned with the use of adaptive teaching in classrooms (e.g. Houtveen, van der Grift & Creemers, 2004; Noble, 2004). However, the use of differentiation as a measurement dimension does not imply that all instructions have to be individualised since findings on aptitude treatment interaction research reveal that in real classroom situations, it is neither feasible nor effective to offer only individual tasks throughout the teaching time (Corno & Snow, 1986; Good & Stipek, 1983). On the contrary, all the factors of the dynamic model and their measurement dimensions can be observed irrespective of the use of specific classroom organisation procedures, and the majority of the factors can easily take place in whole-class teaching.

In the case of orientation, differentiation is measured by looking at the extent to which teachers provide different types of orientation tasks for students according to their learning needs and especially by acknowledging differences in the personal and background characteristics of students. Using different orientation tasks is expected to help all students to discover the reasons for which specific tasks take place in their classroom. Moreover, taking into account the different types of objectives that are supposed to be fulfilled during the course of instruction, teachers are also expected to use different orientation tasks in order to introduce students to the importance of different objectives that have to be acquired (Gijbels et al., 2006). Finally, teachers may differentiate the orientation tasks in relation to the organisational and cultural context of their school or classroom in order to facilitate the students' understanding of the purposes of learning tasks (Kyriakides, 2007).

### *Classroom Factors of the Dynamic Model*

Based on the main findings of teacher effectiveness research (e.g. Brophy & Good, 1986; Muijs & Reynolds, 2001; Rosenshine & Stevens, 1986), the dynamic model refers to factors which describe teachers' instructional role and are associated with

student outcomes. These factors refer to observable instructional behaviour of teachers in the classroom rather than on factors that may explain such behaviour (e.g. teacher beliefs, knowledge and interpersonal competences). The eight factors included in the model are as follows: *orientation, structuring, questioning, teaching modelling, application, teacher role in making the classroom a learning environment, management of time and classroom assessment*. These eight factors do not refer only to one single teaching approach, such as structured or direct teaching (Joyce, Weil & Calhoun, 2000), or to approaches associated with constructivism (Schoenfeld, 1998); an integrated approach in defining quality of teaching is adopted. Specifically, the dynamic model refers not only to skills associated with direct teaching and mastery learning, such as structuring and questioning, but also to orientation and teaching modelling, which are in line with the theories of teaching associated with constructivism. These two factors also are in keeping with the principles of teaching for understanding. Moreover, they promote the achievement of the new goals of education, such as the development of metacognitive skills. Furthermore, collaborative learning (Slavin, 1983; Slavin & Cooper, 1999) is included under the overarching factor '*teacher role in making the classroom a learning environment*'. Table 7.4 provides a description of the main aspects of each teacher factor included in the model (for further information, see Creemers & Kyriakides, 2008b) and shows how the main findings of TER (see Chap. 5) were taken into account in defining these factors. The essential characteristics of these factors are also described below.

### **Orientation**

Orientation refers to teacher behaviour in terms of providing the objectives which a specific task, lesson or series of lessons aims to fulfil and/or challenging students to identify the reason for which an activity takes place in the lesson. It is expected that the engagement of students with orientation tasks may encourage them to participate actively in the classroom since the tasks are meaningful for them (Kyriakides & Creemers, 2008). Additionally, teachers are expected to provide different types of orientation tasks for students according to their learning needs (differentiation).

### **Structuring**

Rosenshine and Stevens (1986) point out that achievement is maximised when teachers not only actively present materials but structure their teaching by (a) beginning with overviews and/or review of objectives, (b) outlining the content to be covered and signalling transitions between lesson parts, (c) calling attention to main ideas and (d) reviewing main ideas at the end. Summary reviews are also important since they integrate and reinforce the learning of major points (Brophy & Good, 1986). It can be claimed that these structuring elements not only facilitate memorising of the information but allow for its apprehension as an integrated whole with recognition of the relationships between parts. Moreover, achievement is higher when information is presented with a degree of redundancy, particularly in the form

**Table 7.4** The main elements of each teacher factor involved in the dynamic model

Factors	Main elements
1. Orientation	(a) Providing the objectives for a specific task/lesson/series of lessons and (b) challenging students to identify the reason that an activity is taking place in the lesson
2. Structuring	(a) Beginning with overviews and/or review of objectives, (b) outlining the content to be covered and signalling transitions between lesson parts and (c) drawing attention to, and reviewing, main ideas
3. Questioning	(a) Raising different types of questions (i.e. process and product) at appropriate difficulty level, (b) giving time for students to respond and (c) dealing with student responses
4. Teaching modelling	(a) Encouraging students to use problem-solving strategies presented by the teacher or other classmates, (b) inviting students to develop strategies and (c) promoting the idea of modelling
5. Application	(a) Using seatwork or small-group tasks in order to provide necessary practice and application opportunities and (b) using application tasks as starting points for the next step in teaching and learning
6. The classroom as a learning environment	(a) Establishing on-task behaviour through the interactions it promotes (i.e. teacher-student and student-student interactions) and (b) dealing with classroom disorder and student competition by establishing rules, persuading students to respect them and using the rules
7. Management of time	(a) Organising the classroom environment and (b) maximising engagement rates
8. Assessment	(a) Using appropriate techniques to collect data on student knowledge and skills, (b) analysing data in order to identify student needs and report the results to students and parents and (c) evaluating their own practices

of repeating and reviewing general views and key concepts. Structuring tasks should not only be clear for the students but also help them understand the structure of the lesson. Finally, teachers are expected to organise their lessons or series of lessons in such a way that students move from easier tasks to more complicated ones. Different types of structuring tasks to students according to their learning needs should also be provided.

### Questioning

Muijs and Reynolds (2000) indicate that the focus of TER on the teacher actively presenting materials should not be seen as an indication that traditional lecturing

and the drill method are effective teaching approaches. Effective teachers ask a lot of questions and attempt to involve students in class discussion. Although the data on cognitive level of questions yield inconsistent results (Redfield & Rousseau, 1981), optimal question difficulty is expected to vary with context. There should also be a mix of product questions (i.e. those requiring a single response from students) and process questions (i.e. those expecting students to provide explanations), but effective teachers ask more process questions (Askew & William, 1995; Evertson, Anderson, Anderson & Brophy, 1980). The clarity of a question and especially the extent to which students understand what they are expected to find out is an important element of this factor. In addition, the appropriateness of the difficulty level of the question is taken into account, since it is possible that students may understand the question but still be unable to answer it because it is too difficult for them. Moreover, the factor refers to the way the teacher deals with student responses to his or her questions. Correct responses should be acknowledged for the purpose of other students' learning, while responses that are partly correct require affirmation of the correct part and rephrasing of the question (Brophy & Good, 1986; Rosenshine & Stevens, 1986). Following incorrect answers, teachers should begin by indicating that the response is not correct but avoid personal criticism and show why the correct answer is the right one (Rosenshine, 1971). It is also assumed that the feedback that effective teachers give to students' answers varies according to their needs.

### **Teaching Modelling**

Although there is a long tradition in research on teaching higher-order thinking skills, especially problem-solving, these teaching and learning activities have received more attention during the last two decades due to the emphasis given in policy to the achievement of new goals of education. Thus, TER has shown that effective teachers are expected to help pupils to use strategies and/or develop their own strategies, which can help them solve different types of problems (Kyriakides, Campbell & Christofidou, 2002). As a result of this, it is more likely that students will develop skills that will help them organise their own learning (e.g. self-regulation, active learning). This factor is also concerned with the properties of teaching-modelling tasks and especially with the role that the teacher is expected to play in order to help students use a strategy to solve their problems. Teachers may either present a strategy with clarity or they may invite students to explain how they might solve a problem and use that information to promote the idea of modelling. The latter may encourage students not only to use but also to develop their own strategies for solving problems. Another element of this factor has to do with the impact that an orientation activity has on student behaviour. Students may either become able to use a strategy in an effective way (i.e. finding the solution to a problem) or the use of the strategy may become an obstacle to dealing with a problem (e.g. causes more confusion about the problem). Finally, effective teachers may adopt teaching modelling to meet the specific needs of a group of students. This might result in

more emphasis on using a single strategy with a group of students to help them solve problems or using multiple strategies or even developing new ones with other groups of students.

### **Application**

Effective teachers also use seatwork or small-group tasks since they provide necessary practice and application opportunities (Borich, 1992). This factor can be linked to the direct teaching model (Rosenshine, 1983), which emphasises immediate exercise relating to topics taught during the lesson. It is important to examine whether students are simply being asked to repeat what they have already covered with their teacher or whether the application task is more complex than the content covered in the lesson. Effective teachers provide application tasks that can be used as starting points for the next step of teaching and learning. In addition, they provide more opportunities for application for students who need them. This factor also refers to teacher behaviour in monitoring, supervising and giving corrective feedback during application activities. Brophy and Good (1986) argue that once the students are released to work independently, effective teachers circulate to monitor progress and provide help and feedback.

### **Teacher Role in Making the Classroom a Learning Environment**

Muijs and Reynolds (2000) point out that classroom climate is a factor that TER has found to be significant. The climate is usually seen as being associated with the behaviour of the stakeholders, whereas culture is seen to measure the values and norms of the organisation (Heck & Marcoulides, 1996; Hoy, 1990). It is asserted that a healthy organisation deals effectively with outside forces while directing its energies towards its goals. Classroom climate research is described as the stepchild of psychological and classroom research (Creemers & Reezigt, 1996). The classroom effects research tradition initially focused on climate factors defined as managerial techniques (e.g. Doyle, 1986). Management is necessary to create conditions for learning and instruction, but management itself is not sufficient for student results (Creemers, 1994b). On the other hand, the psychological tradition of classroom environment research has paid a lot of attention to instruments for the measuring of students' perceptions of climate. Many studies report on their psychometric characteristics (Fraser, 1991), but climate factors (such as the way a teacher behaves towards the students) and effectiveness factors (e.g. quality of teaching) were studied as isolated constructs (Johnson & Johnson, 1993; Wubbels, Brekelmans & Hooymayers, 1991). In this context, EER has to take the first steps to integrate elements of different research traditions. The dynamic model of educational effectiveness concentrates on measuring the teacher's contribution in creating a learning environment in his or her classroom, and five elements of the classroom

as a learning environment are taken into account: teacher-student interaction, student-student interaction, students' treatment by the teacher, competition between students and classroom disorder. The first two elements are important components of the measurement of classroom climate as classroom environment research has shown (Cazden, 1986; Den Brok, Brekelmans & Wubbels, 2004; Fraser, 1991), but we concentrate on the type of interactions that exist in a classroom rather than on how students perceive teacher interpersonal behaviour. The other three elements refer to the attempt of teachers to create a businesslike and supportive environment for learning (Walberg, 1986), and classroom effectiveness research has shown their importance in promoting student learning (Brophy & Good, 1986; Hextall & Mahony, 1998; Scheerens & Bosker, 1997). The immediate impact that teacher initiatives have on establishing relevant interactions is also examined. We are mainly interested to see the extent to which a teacher is able to establish on-task behaviour through the interactions she or he promotes since Creemers's model emphasises the importance of keeping students on task. Finally, the factor refers to the extent to which the different teaching strategies the teacher is able to use in order to keep different groups of students involved in the classroom interactions promote student learning. As far as the other three elements of the classroom as a learning environment are concerned, they are measured by taking into account the teacher's behaviour in establishing rules, persuading students to respect and use the rules and maintaining them in order to create a learning environment in their classroom. The first element refers to more general problems that can arise when students do not believe that they are treated fairly or respected as individuals by their teacher, whereas the other two deal with specific situations in the classroom which might create difficulties in promoting learning (i.e. competition between students and classroom disorder). The impact that the teacher behaviour has on solving the problems that arise, as measured through students' behaviour, is an important feature of this factor. For example, a teacher may not use any strategy at all to deal with a classroom disorder problem or may use a strategy which only solves the problem temporarily or, alternatively, one that has a long-lasting effect. Finally, effective teachers use different strategies to deal with problems which are caused by different groups of students. For example, individual student(s) may cause a problem in order to gain attention from classmates and/or the teacher. It is probably a better strategy to pay no attention when the problem is small, since any reaction from the teacher may promote the continuation of the problem (Kyriakides & Creemers, 2008, 2009).

### **Management of Time**

Creemers's model considers opportunity to learn and time on task as two of the most significant factors of effectiveness that operate at different levels. Opportunity to learn is also related to student engagement and time on task (Emmer & Evertson, 1981). Therefore, effective teachers are expected to organise and manage the

classroom environment as an efficient learning environment and thereby to maximise engagement rates (Creemers & Reezigt, 1996). In this study, management of time is considered to be one of the most important indicators of teacher ability to manage the classroom in an effective way.

### **Classroom Assessment**

Evaluation is seen as an integral part of teaching (Stenmark, 1992), and in particular, formative evaluation is one of the most important factors associated with effectiveness at all levels, especially at the classroom level (e.g. De Jong et al., 2004; Kyriakides, 2005b; Shepard, 1989). Information gathered from assessment can be used to enable teachers to identify their students' needs as well as to evaluate their own practice. Quality is measured by looking at the properties of the evaluation instruments used by the teacher, such as validity, reliability, practicality and the extent to which the instruments cover the teaching content in a representative way (see Cronbach, 1990). This dimension is also measured by investigating the type of feedback that the teacher gives to the students and the way students use such feedback. Specifically, effective teachers provide constructive feedback, which has positive implications for teaching and learning (Muijs & Reynolds, 2001). Finally, effective teachers are expected to use different techniques for measuring student needs and/or different ways to provide feedback for groups of students by taking into account their needs.

### ***School Factors of the Dynamic Model***

School factors are expected to influence classroom-level factors, especially the teaching practice. Therefore, the dynamic model places emphasis on the following two main aspects of school policy, which affect learning at the level of both students and teachers: (a) school policy concerning teaching and (b) school policy regarding the creation of a learning environment at school. Guidelines are seen as one of the main indications of school policy, and this is reflected in the way each school-level factor is defined. However, in using the term 'guidelines', we refer to a range of documents, such as staff meeting minutes, announcements and action plans, which make the policy of the school more concrete for the teachers and other stakeholders. These two factors do not imply that each school should simply develop formal documents to establish its policy. The factors concerned with the school policy mainly refer to the actions taken by the school to help teachers and other stakeholders gain a clear understanding of what is expected of them. Support offered to teachers and other stakeholders to implement the school policy is also an aspect of these two school factors (Creemers & Kyriakides, 2010a).

Based on the assumption that the essence of a successful organisation in the modern world is the search for improvement, the dynamic model is also concerned

with the processes and activities which take place in the school in order to improve the teaching practice and the school's learning environment. For this reason, the processes which are used to evaluate the school policy on teaching and the SLE are investigated. It is expected that evaluation mechanisms will generate data that will help schools to take decisions on how to improve the functioning of school factors. Thus, the following four overarching factors at the school level are included in the model:

- a. School policy on teaching and actions taken to improve teaching practice
- b. Evaluation of school policy on teaching and actions taken to improve teaching
- c. Policy on creating a SLE and actions taken to improve the SLE
- d. Evaluation of the SLE

Figure 7.3 illustrates the interrelations among the school factors which are briefly described below (for more information, see Creemers & Kyriakides, 2008b). The inclusion of these factors is also based on the results of a synthesis of 123 studies on school effectiveness conducted in different countries since 1986 (see Kyriakides, Creemers & Charalambous, 2008). This meta-analysis has provided support for the importance of the factors included in the model and also revealed that the effect sizes of other factors not taken into account by the dynamic model are extremely low.

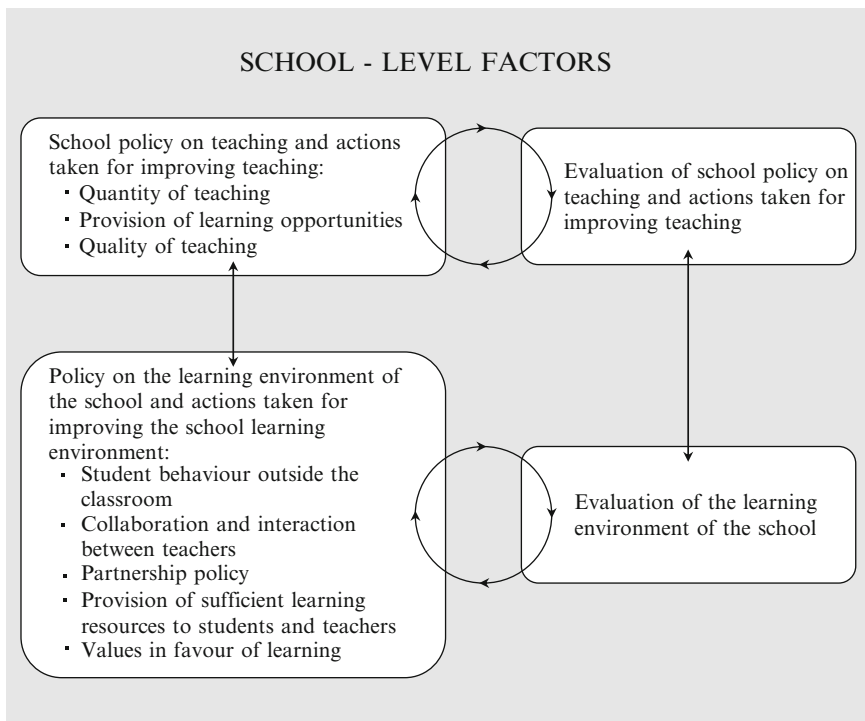
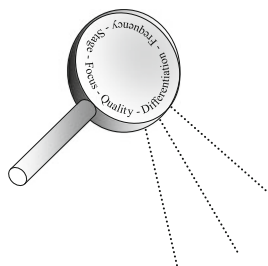
### **School Policy on Teaching and Actions Taken to Improve Teaching**

Since the definition of the dynamic model at the classroom level refers to factors related to the key concepts of quality, time on task and opportunity to learn, the model attempts to investigate aspects of school policy on teaching associated with quantity of teaching, provision of learning opportunities and quality of teaching. Actions taken to improve the above three aspects of teaching practice, such as the provision of support for teachers to help them improve their teaching skills, are also taken into account. Specifically, the following aspects of school policy on quantity of teaching are considered:

- School policy on the management of teaching time (e.g. lessons starting and finishing on time; there is no interruption of lessons for staff meetings and/or for preparation of school festivals and other events)
- Policy on student and teacher absenteeism
- Policy on homework
- Policy on lesson schedule and timetable

School policy on provision of learning opportunities is measured by looking at the extent to which the school has a mission concerning the provision of learning opportunities, which is reflected in its policy on curriculum. We also examine school policy on long-term and short-term planning and on providing support for students with special needs. Furthermore, the extent to which the school attempts to make good use of school trips and other extracurricular activities for teaching/learning





**Fig. 7.3** Factors of the dynamic model operating at the school level

purposes is investigated. Finally, school policy on the quality of teaching is seen as closely related to the classroom-level factors of the dynamic model, which refer to the instructional role of teachers.

Therefore, the way school policy on teaching is examined reveals that effective schools are expected to make decisions regarding maximising the use of teaching time and the learning opportunities offered to their students. In addition, effective schools are expected to support their teachers in their attempt to help students learn by using effective teaching practices. In this context, the definition of this factor implies that we should measure the extent to which: (a) the school makes sure that

teaching time is provided for students, (b) learning opportunities beyond those offered by the official curricula are made available for the students and (c) the school attempts to improve the quality of teaching practice.

### **School Policy on Creating the SLE and Actions Taken for Improving the SLE**

School climate factors have been incorporated in effectiveness models in different ways. Stringfield (1994) defines the school climate very broadly as the total environment of the school. This makes it difficult to study specific factors of the school climate and examine their impact on student achievement. The dynamic model refers to the extent to which a learning environment has been created in the school. This element of school climate is seen as the most important predictor of school effectiveness since learning is the key function of a school (Linnakyla, Malin & Taube, 2004). Moreover, EER has shown that effective schools are able to respond to the learning needs of both teachers and students and to be involved in systematic changes in the school's internal processes in order to achieve educational goals more effectively in conditions of uncertainty (Harris, 2001). In this context, the following five aspects which define the SLE are taken into account:

- a. Student behaviour outside the classroom
- b. Collaboration and interaction between teachers
- c. Partnership policy (i.e. relations of school with community, parents and advisors)
- d. Provision of sufficient learning resources for students and teachers
- e. Values in favour of learning

The first three aspects refer to the rules which the school has developed in order to establish a learning environment inside and outside the classroom. Here the term 'learning' does not refer exclusively to student learning. For example, collaboration and interaction between teachers may contribute to their professional development (i.e. learning of teachers) but may also have an effect on their teaching practice and thereby may improve student learning. The fourth one refers to the policy on providing resources for learning. The availability of learning resources in schools may not only have an effect on student learning but may also encourage the learning of teachers. For example, the availability of computers and software for teaching geometry may contribute to teacher professional development since it encourages teachers to find ways to make good use of the software in their teaching practice and thereby to become more effective. The last aspect of this factor is concerned with the strategies which the school has developed in order to encourage teachers and students to develop positive attitudes towards learning.

Following a similar approach to the one concerned with school policy on teaching, the dynamic model attempts to measure school policy on creating an SLE. Actions taken to improve the SLE beyond the establishment of policy guidelines are also taken into account. Specifically, actions taken to improve the SLE can be

directed at (a) changing the rules in relation to the first three aspects of the SLE factor mentioned above, (b) providing educational resources (e.g. teaching aids, educational assistance, new posts) and/or (c) helping students/teachers develop positive attitudes towards learning. For example, a school may have a policy on promoting teacher professional development, but this may not be enough, especially if some teachers do not consider professional development to be an important issue. In this case, actions should be taken to help teachers develop positive attitudes towards learning, which may help them become more effective.

### **Evaluation of Policy for Teaching and Evaluation of the SLE**

The last two overarching school factors of the dynamic model refer to the mechanisms used to evaluate the functioning of the first two such factors. Creemers (1994b) claims that control is one of the major principles operating in the generation of educational effectiveness. This implies that goal attainment and the school climate should be evaluated (Grosin, 1993; Torres & Preskill, 2001). It was therefore considered important to treat evaluation of policy on teaching and of other actions taken to improve teaching practice, as well as evaluation of the SLE, as overarching factors operating at school level. Data which have emerged from these evaluation mechanisms are expected to help schools develop their policies and improve teaching practice at the classroom level as well as their SLE (see Creemers & Kyriakides, 2008b).

### **Main Conclusions Emerging from the Second Part of This Book**

The main arguments emerging from the second part of this book are presented in the final section of this chapter. The second part of this book provides a critical review of research on teacher effectiveness. The main phases of this field of research are analysed in Chap. 5. Since teacher factors are presented as being in opposition to one another, an integrated approach in defining quality of teaching is adopted. Specifically, this approach refers not only to factors associated with direct teaching and mastery learning such as structuring and questioning but also to orientation and teaching modelling which are in line with theories of teaching associated with constructivism. Moreover, we argue for the importance of taking into account findings of studies investigating differential teacher effectiveness. Finally, a significant limitation of this field of research is that the whole process of searching for teacher effectiveness factors has not revealed any significant impact upon teacher training and professional development. During the last century, we gradually moved from studies focusing on the teacher as a role model for his/her students to studies aiming to understand effective teaching practices that promote student learning and learning

outcomes. One of the major contributions of this field of research is that some assumptions about the importance of the personal characteristics of teachers, such as teacher personality and experience of student learning, are not empirically supported, and the importance of teacher behaviour in the classroom is demonstrated. We also provide a critical review of studies conducted over the last two decades investigating the impact of variables that may explain observable teacher behaviour in the classroom, such as teacher knowledge and teacher beliefs. The limitations of this approach are discussed and the importance of training teachers to develop their teaching skills in order to become more effective is stressed. Finally, it is acknowledged that studies on teacher effectiveness have presented the teacher factors as being in opposition to one another. In this way, a narrowly focused perspective of effective teaching practice has been provided. To demonstrate this argument, Chap. 6 is concerned with the main approaches to teaching, namely, the mastery learning approach, the direct and active teaching approach and the new learning approach associated with constructivism. Teacher effectiveness research has provided support for some factors associated with each of these approaches. This implies that an integrated approach to effective teaching should be adopted which will refer to factors associated with student learning, irrespective of the approach to which each of them belongs.

Chapter 7 looks at the two main theoretical models of EER, which place emphasis on the instructional role of teachers and the importance of teacher factors in explaining school effectiveness. The comprehensive model of educational effectiveness is described, and the main findings of studies testing its validity are presented. It is shown that the studies which have investigated the validity of the model provide support for the importance of establishing a multilevel integrated model of educational effectiveness, such as that of Creemers. The importance of the main effectiveness factors has also been demonstrated. However, empirical support for the importance of cross-level interactions and for the main principles of the model has not been provided. In this context, a dynamic model of educational effectiveness has been established. The main assumptions of the model and the teacher and school-level factors of the model are presented. It is argued that by moving from Carroll's model of school learning to the comprehensive model of educational effectiveness and ultimately to the dynamic model of educational effectiveness, the complex nature of educational effectiveness is described more precisely. Moreover, the latter theoretical model takes into account the dynamic perspective of education and incorporates the results of research on differential teacher effectiveness into a generic model describing effective teaching practice. Furthermore, it is acknowledged that previous studies on teacher effectiveness have not been able to have a significant impact upon teacher training and professional development, whereas the establishment of the dynamic model of educational effectiveness may contribute significantly to addressing these weaknesses of the field. For this reason, the next part of this book refers to the use of the dynamic model to establish a theory-driven and evidence approach to teacher training and professional development.

## **Part III**

# **Combining Teacher Effectiveness Research with Research on Teacher Training and Professional Development**

This part advocates the use of an evidence-based and theory-driven approach to teacher training and professional development. Specifically, we argue that the dynamic model can be used to establish such an integrated approach, combining research on teacher effectiveness with research on teacher training and professional development. The main characteristics of this approach are described in Chap. 8. In Chaps. 9 and 10, we present two studies conducted in different countries illustrating how the proposed approach can be used as a matter of policy and practice in teacher training and professional development. In the final chapter of this book, suggestions for the development of this approach and for further research on using this approach for teacher training and professional development are presented.

## Chapter 8

# Using the Dynamic Model to Develop an Integrated Approach to Teacher Training and Professional Development

### Introduction

In this chapter, it is advocated that teacher training and professional development should be focused on how to address specific groupings of teacher factors associated with student learning rather than with an isolated teaching factor or with the whole range of such factors without considering the professional needs of student teachers and teachers. In order to test this element of the dynamic model and identify groupings of factors, we refer to the results of studies which made use of the Rasch model to identify the stages of effective teaching. These studies show that each grouping of factors refers to the different developmental stages of teacher professional behaviour, and the dimensions used to measure their functioning can help us develop programmes designed to enable student teachers and teachers to improve their teaching skills by moving from easier to more complicated stages. The stages of effective teaching are described in the second part of this chapter. In the last part, we present the main characteristics of the proposed dynamic approach to teacher professional development. In this way, the dynamic model is used to establish an evidence-based and theory-driven approach to teacher training and professional development by providing suggestions regarding how to move from one stage to the next and demonstrating the relationship of these to student learning and learning outcomes.

### Studies Seeking to Identify Stages of Effective Teaching

The research findings on the importance of teacher effect (e.g. Kyriakides, Campbell & Gagatsis, 2000; Muijs & Reynolds, 2000; Opdenakker & Van Damme, 2000; Scheerens & Bosker, 1997; Wright, Horn & Sanders, 1997; Yair, 1997) were taken into account in the development of the dynamic model (Kyriakides, 2008). Teaching is emphasised in the model (see Chap. 7), and teacher behaviour in the classroom and its impact on student learning are taken into account in defining the classroom-level factors. Thus, the dynamic model refers to eight teacher factors, which were

found to be associated with student achievement: structuring, orientation, questioning, application, management of time, assessment, teaching modelling and classroom learning environment (see Chap. 7). These factors do not refer to just one approach to teaching, such as the direct and active teaching approach (e.g. structuring, application) or the constructivist approach (e.g. orientation, modelling). An integrated approach to effective teaching is adopted, and both longitudinal studies and a relevant meta-analysis (Kyriakides & Christoforou, 2011; Kyriakides & Creemers, 2008, 2009) support the importance of these factors. In addition, these eight factors are measured using the five dimensions which describe both the quantitative and qualitative characteristics of these factors (see Chap. 7).

The use of the dynamic model for improvement purposes at the teacher level assumes that teacher factors refer to knowledge and skills which can be developed. The model is also based on the assumption that teacher factors and their dimensions may be interrelated, and thus, the importance of grouping specific factors to explain achievement gains is emphasised (see Chap. 7). In this way, not only is the complex nature of effective teaching illustrated but also specific strategies for teacher improvement may emerge. In order to investigate the significance of the teacher level of the dynamic model, especially its potential to improve teaching practices and student attainment, the concept of 'groupings' of factors which operate at the same level and are interrelated has been further explored in a recent longitudinal study (Kyriakides, Creemers & Antoniou, 2009). This study is briefly presented below because it provides empirical evidence supporting the importance of grouping factors.

### ***A Study Seeking to Identify for Stages: Levels of Effective Teaching Conducted in Cyprus***

All the grade 5 students ( $n=2,503$ ) from each class ( $n=108$ ) in 50 primary schools in Cyprus participated in this study. Student achievement in mathematics, Greek language and religious education was measured, both at the beginning and at the end of grade 5. In order to collect data on the teacher factors of the dynamic model, 972 observations of the 108 teachers of the student sample were conducted. Two low-inference and one high-inference observational instruments were used. These instruments were designed to collect data concerned with all the eight factors of the teacher level, in relation to the five measurement dimensions which are included in the dynamic model of EER. Specifically, one of the low-inference observation instruments is based on Flanders's system of interaction analysis (Flanders, 1970). However, we developed a classification system of teacher behaviour which is based on the way that each factor of the dynamic model is measured. Moreover, the observer is expected to identify the students who are involved in classroom interaction. As a consequence, the use of this instrument enables us to generate data about teacher-student and student-student interaction (see Creemers & Kyriakides, 2012). The second low-inference observation instrument refers to the following five factors

of the model: orientation, structuring, teaching modelling, questioning techniques and application. This instrument is designed in such a way that it enables collection of more information in relation to the quality dimension of these five factors. Thus, the two instruments helped us generate data for all eight factors and their dimensions. The high-inference observation instrument covers the five dimensions of all eight factors of the model, and observers are expected to complete a Likert scale to indicate how often each teacher behaviour was observed (e.g. the teacher spent time on explaining the objectives of the lesson).

Observations were carried out by six members of the research team who attended a series of seminars on how to use the three observation instruments. During the school year, the external observers visited each class nine times and observed three lessons per subject by using both types of low-inference observation instruments. After each occasion, the observers completed the rating scale of the high-inference observation instrument. For each scale of the three observation instruments, the alpha reliability coefficient was higher than 0.83 and the inter-rater reliability coefficient  $\rho^2$  was higher than 0.81.

The eight factors and their dimensions were also measured by administering a questionnaire to students. Specifically, students were asked to indicate the extent to which their teacher behaved in a certain way in their classroom (e.g. at the beginning of the lesson the teacher explained how the new lesson was related to previous ones). A Likert scale was used to collect data. A generalisability study on the use of students' ratings revealed that the data collected from almost all the items could be used to measure the quality of teaching of individual teachers in each separate subject. However, three items in the questionnaire concerned with assessment in religious education, and one item dealing with the differentiation dimension of learning strategies in both Greek language and religious education had to be removed. Thus, the score for each teacher in each of the questionnaire items found to be generalisable was the mean score of the grade 5 students of the class she/he taught.

For each subject, separate confirmatory factor analyses (CFA) for each factor were conducted in order to identify the extent to which data that emerged from different methods could be used to measure each factor in relation to the five dimensions of the dynamic model. The main results which emerged from using CFA approaches to analyse the multitrait, multimethod matrix concerned with each classroom-level factor of the dynamic model in relation to each subject provided support for the construct validity of the proposed five measurement dimensions of most effectiveness factors (see Creemers & Kyriakides, 2008b). The two exceptions which were identified reveal the difficulty of defining the quality dimension. In the case of questioning, aspects of quality were found to belong to two separate factors, whereas in the case of teaching modelling, the differentiation and the quality dimensions were found to belong to the same factor. Moreover, the results of this study seem to reveal that the classroom as a learning environment cannot be treated as a single factor but as two interrelated factors in the learning environment, namely, relations among students and relations between the teacher and his/her students. Furthermore, the comparison of CFA models used to test each factor confirmed convergent and discriminant validity for the five dimensions. Convergent validity for most measures



was demonstrated by the relatively high (i.e. higher than 0.60) standardised trait loadings, in comparison to the relatively lower (i.e. lower than 0.40) standardised method loadings. These findings support the use of multimethod techniques to increase measurement validity, construct validity and thus stronger support for the validity of subsequent results. Therefore, based on the results of the structural equation modelling (SEM) analyses, 44 factor scores for the performance of each teacher in teaching each subject were estimated. Each factor score was estimated by calculating the average score which emerged from the various methods used to measure the factor (i.e. the observation instruments and the student questionnaire).

### **The Scaling and Structure of Teaching Skills Included in the Dynamic Model**

Having established the construct validity of the framework used to measure the functioning of the teacher-level factors of the dynamic model, it was decided to use the Rasch model in order to identify the extent to which the five dimensions of these factors (i.e. the 44 first-order factor scores) could be reducible to a common unidimensional scale. The Rasch model not only tests the unidimensionality of the scale but is also able to find out whether the tasks can be ordered according to the degree of their difficulty; at the same time, the people who carry out these tasks can be ordered according to their performance in the construct under investigation. This procedure is justified theoretically and is used in studies on teacher evaluation (e.g. Burry & Shaw, 1988; Wang & Cheng, 2001; Wright & Linacre, 1989). Specifically, the Rasch model puts people and tasks on the same scale and enables the researcher to examine the range of the teaching practice scale to see if the items/tasks within it form a continuum of teaching practice from 'easy to perform' to 'difficult to perform', that is, devoid of gaps in construct coverage (Green & Frantom, 2002). Furthermore, the reliability of persons and items is calculated, indicating how well the scale discriminates among people on the basis of their estimated teaching practice and how well items/tasks can be distinguished from one another in terms of their difficulty (Andrich, 1988). Finally, Rasch analysis provides a basis for assessment of the validity of a measurement tool and provides information that may indicate the limitation of the reliability and validity of measures made with the instrument (Sampson & Bradley, 2004). In the case of this study, specifying the position of one factor score (i.e. teaching skill) on the scale provided exact information about the individuals (teachers) who could perform at a sufficient level (i.e. those scoring higher than the position of this teaching skill on the scale) or insufficient level (those scoring lower than the position of this teaching skill). This analysis also made it possible to make statements about the relative difficulty of each teaching skill. Similarly, specifying an individual teacher's position on this continuum provided information about the probability of this teacher demonstrating teaching competence below or above this position (Bond & Fox, 2001).

Thus, the Rasch model was applied on the whole sample of teachers and all 44 measures concerned with their teaching skills together, using the computer program

Quest (Adams & Khoo, 1996). It is important to note that we treated teacher behaviour in each subject separately, meaning that 324 person estimates (i.e. for each of the 108 classrooms, three estimates of the performance of teachers to teach each subject) were generated. Two teaching skills (i.e. the focus dimension of the structuring factor and the quality dimension of time management) but no individual fitted the model. The results of the various approaches used to test the fitting of the Rasch model with our data revealed that there was a good fit with the model when teachers' performance in the other 42 teaching skills was analysed. Moreover, by using the Rasch model to analyse teacher performance in relation to these 42 teaching skills included in the dynamic model, it was found that these skills were well targeted against the teachers' measures since teachers' scores ranged from  $-2.96$  to  $3.04$  logits and the difficulties of the 42 teaching skills ranged from  $-2.69$  to  $3.05$  logits. Moreover, the indices of persons and of teaching skills separation were found to be higher than  $0.93$  indicating that the separability of the scale was satisfactory. This implies that the reliability of the scale was very high and that five levels representing different types of teacher behaviour could be discerned (Bond & Fox, 2001).

Having established the reliability of the scale, one might ask if the various teaching skills were systematically grouped into levels of difficulty that might be taken to stand for types of teacher behaviour which move from relatively easy to more difficult and span the five dimensions of the eight teacher-level factors included in the dynamic model. As such, the procedure for detecting pattern clustering in measurement designs developed by Marcoulides and Drezner (1999) was used. This procedure enabled us to segment the observed measurements into constituent groups (or clusters) so that the members of any one group were similar to each other, according to a selected criterion that stands for difficulty. Applying this method to segment the 42 teaching skills on the basis of their difficulties that emerged from the Rasch model showed that they were optimally clustered into the five clusters shown in Table 8.1 These five clusters were further explored and specified by using the Saltus model described below.

The Saltus model (Mislevy & Wilson, 1996; Wilson, 1989) allows the researcher to differentiate between major and less pervasive changes in moving from one level to the other without sacrificing the idea of one common underlying continuum. To apply the Saltus model, we had to assume that the 42 teaching skills included in the dynamic model were structured in the five groups of teaching skills identified through the cluster analysis. The Saltus solution was found to represent a better fit with the actual data than the Rasch model and offered a statistically significant improvement over the Rasch model, which was equal to 1,121 chi-square units at the cost of 30 additional parameters (i.e. 16  $\tau$ s, 5 means, 5 standard deviations and 4 independent proportions). Table 8.1 presents the difficulty parameters of the 42 teaching skills for teachers in the easiest type of teacher behaviour (i.e. level 1 shown in column 3) and the implied within-level difficulty (i.e. columns 4, 5, 6 and 7). The Saltus parameter estimates (i.e.  $\tau$  values) are shown at the bottom of the table. The following observations arise from this table.

**Table 8.1** Rasch and Saltus parameter estimates for factor scores measuring the classroom-level factors of the dynamic model of educational effectiveness

Classroom-level factors	Rasch					Implied within-stage difficulty (Saltus)					
	All	Level 1	Level 2	Level 3	Level 4	Level 5	Level 1	Level 2	Level 3	Level 4	Level 5
Frequency management time	-2,69	-3,76	-3,76	-3,76	-3,76	-3,76	-3,76	-3,76	-3,76	-3,76	-3,76
Stage management of time	-2,62	-3,65	-3,65	-3,65	-3,65	-3,65	-3,65	-3,65	-3,65	-3,65	-3,65
Frequency structuring	-2,58	-3,45	-3,45	-3,45	-3,45	-3,45	-3,45	-3,45	-3,45	-3,45	-3,45
Frequency application	-2,45	-3,35	-3,35	-3,35	-3,35	-3,35	-3,35	-3,35	-3,35	-3,35	-3,35
Frequency assessment	-2,40	-3,00	-3,00	-3,00	-3,00	-3,00	-3,00	-3,00	-3,00	-3,00	-3,00
Frequency questioning	-2,38	-2,96	-2,96	-2,96	-2,96	-2,96	-2,96	-2,96	-2,96	-2,96	-2,96
Frequency teacher-student relation	-2,16	-2,50	-2,50	-2,50	-2,50	-2,50	-2,50	-2,50	-2,50	-2,50	-2,50
Stage structuring	-1,56	-1,40	-2,34	-2,31	-2,28	-2,30	-1,40	-2,34	-2,31	-2,28	-2,30
Quality application	-1,50	-1,36	-2,32	-2,22	-2,23	-2,28	-1,36	-2,32	-2,22	-2,23	-2,28
Stage questioning	-1,48	-1,30	-2,19	-2,12	-2,06	-2,17	-1,30	-2,19	-2,12	-2,06	-2,17
Frequency student relations	-1,42	-1,35	-2,26	-2,15	-2,16	-2,20	-1,35	-2,26	-2,15	-2,16	-2,20
Focus application	-1,37	-1,37	-2,29	-2,09	-2,08	-2,21	-1,37	-2,29	-2,09	-2,08	-2,21
Stage application	-1,33	-1,25	-2,25	-2,19	-2,09	-2,20	-1,25	-2,25	-2,19	-2,09	-2,20
Quality of questions	-1,30	-1,21	-2,20	-2,08	-2,00	-2,15	-1,21	-2,20	-2,08	-2,00	-2,15
Stage student relations	-0,74	-0,29	-1,10	-1,89	-1,82	-2,03	-0,29	-1,10	-1,89	-1,82	-2,03
Stage teacher-student relation	-0,71	-0,22	-0,94	-1,86	-1,75	-1,97	-0,22	-0,94	-1,86	-1,75	-1,97
Stage assessment	-0,62	-0,12	-0,88	-1,83	-1,74	-1,82	-0,12	-0,88	-1,83	-1,74	-1,82
Frequency teaching modelling	-0,60	0,08	-0,92	-1,80	-1,68	-1,70	0,08	-0,92	-1,80	-1,68	-1,70
Frequency orientation	-0,50	0,15	-0,75	-1,93	-1,60	-1,63	0,15	-0,75	-1,93	-1,60	-1,63
Focus student relations	-0,36	0,29	-0,63	-1,73	-1,43	-1,50	0,29	-0,63	-1,73	-1,43	-1,50
Quality: feedback	-0,32	0,24	-0,64	-1,55	-1,45	-1,55	0,24	-0,64	-1,55	-1,45	-1,55
Focus questioning	-0,31	0,25	-0,55	-1,39	-1,32	-1,52	0,25	-0,55	-1,39	-1,32	-1,52
Focus teacher-student relation	-0,31	0,18	-0,72	-1,62	-1,51	-1,54	0,18	-0,72	-1,62	-1,51	-1,54
Quality structuring	-0,29	0,26	-0,64	-1,53	-1,40	-1,53	0,26	-0,64	-1,53	-1,40	-1,53
Quality assessment	-0,26	0,30	-0,48	-1,38	-1,30	-1,48	0,30	-0,48	-1,38	-1,30	-1,48

Differentiation structuring	0,59	1,02	0,36	0,28	-1,12	-1,21
Differentiation time management	0,61	1,08	0,42	0,34	-1,05	-1,15
Differentiation questioning	0,71	1,09	0,39	0,31	-1,04	-1,09
Differentiation application	0,88	1,12	0,43	0,35	-1,02	-1,12
Focus assessment	0,94	1,06	0,36	0,29	-1,06	-1,17
Differentiation assessment	1,17	1,13	0,43	0,40	-1,01	-1,09
Stage teaching modelling	1,21	1,19	0,49	0,42	-0,97	-1,05
Stage orientation	1,29	1,23	0,53	0,44	-0,95	-1,03
Quality teacher-student relation	2,32	2,10	1,50	1,40	1,12	-0,93
Quality student relations	2,39	2,21	1,61	1,42	1,15	-0,82
Dif teacher-student relation	2,50	2,25	1,64	1,44	1,17	-0,78
Differentiation student relations	2,72	2,38	1,77	1,63	1,31	-0,69
Focus orientation	2,89	2,27	1,66	1,57	1,21	-0,75
Quality orientation	2,95	2,42	1,82	1,72	1,41	-0,59
Differentiation orientation	3,00	2,55	2,00	1,88	1,58	-0,42
Quality of teaching modelling including differentiation	3,04	2,78	2,19	1,99	1,69	-0,32
Focus teaching modelling	3,05	2,91	2,21	2,10	1,80	-0,10

Note 1: Empty lines in the body of Table 8.1 above are used to separate the five levels/types of teacher behaviour as indicated by cluster analysis

Note 2: The Saltus parameter estimates (i.e.  $\tau$  values) are shown below

Item class	Examinee stage				
	1	2	3	4	5
1	0,00 <sup>a</sup>	0,00 <sup>a</sup>	0,00 <sup>a</sup>	0,00 <sup>a</sup>	0,00 <sup>a</sup>
2	0,00 <sup>a</sup>	0,94	0,85	0,81	0,90
3	0,00 <sup>a</sup>	0,85	1,78	1,65	1,76
4	0,00 <sup>a</sup>	0,69	0,76	2,14	2,23
5	0,00 <sup>a</sup>	0,61	0,75	1,05	3,03

<sup>a</sup>Fixed at zero for model identification

Firstly, difficult parameters of teaching skills for teachers in level 1 (i.e. the values shown in the third column of Table 8.1) are more spread out than those of the Rasch model (shown in the second column). This finding reveals that for teachers in level 1, a large gap between the teaching skills of level 1 and those in levels 2, 3, 4 and 5 can be observed. On the other hand, for teachers who belong to level 2, the skills of level 2 are as easy as those of level 1. With regard to the difficulty of skills in level 3, these are relatively difficult for level 2 teachers, but for level 3 teachers, these skills are as easy as level 2 skills. Similar observations can be made in relation to the skills of levels 4 and 5. Secondly, using the figures of Table 8.1 and calculating the asymmetry and segmentation indices, we observe that the gappiness between levels 1 and 2 and between levels 2 and 3 is much smaller than the gappiness between levels 3 and 4 and levels 4 and 5. This implies that the transition from one level to the other is not linear, and, moreover, the transition from level 3 to 4 and from level 4 to 5 is much more difficult than the transition between the first three levels. A description of the different levels/types of teacher behaviour is given below.

#### Type 1: Basic Elements of Direct Teaching

The seven teaching skills situated in this type of teacher behaviour (see Table 8.1) refer to the quantitative characteristics of factors associated with the direct teaching approach. All but one are concerned with the frequency dimension. The stage dimension of management of time is also quantitative in character and closely associated with the frequency dimension of this factor. It is interesting to note that the first two skills with the lowest difficulty estimates are concerned with management of time. This could be attributed to the fact that quantity of teaching is a prerequisite for instruction. Moreover, these seven teaching skills reveal that teachers demonstrating this type of behaviour are able to use effectively the daily routines of teaching, such as keeping students on task, structuring the content of the lesson, asking questions, giving application tasks and administering assessment tasks.

#### Type 2: Putting Aspects of Quality in Direct Teaching and Touching on Active Teaching

In the second type of teacher behaviour, these are skills which are concerned with qualitative aspects of three factors associated with the direct teaching approach (i.e. structuring, application and questioning). Specifically, three dimensions of the application factor are included in this type of behaviour, indicating that teachers at this level are able to demonstrate competences in relation to each aspect of the application factor except differentiation. This indicates that application is a basic and relatively simple teacher competence. The other factor situated in this type of teacher behaviour is concerned with the questioning skills of teachers. Teachers are expected not only to use questions throughout the lessons but also to

articulate both process and product questions appropriately. Finally, a factor concerning the role of the teacher in establishing interactions among students is situated in this level. Although this factor is not exclusively associated with direct teaching, only the frequency dimension of this factor is included in this level. This implies that teachers at this level are not only able to put aspects of quality in the easiest factors associated with the direct teaching approach but are also able to facilitate interactions among students, which may encourage active involvement of students in learning.

### Type 3: Acquiring Quality in Active Teaching and Reaching Out

The 11 teaching skills situated in this type of behaviour mainly refer to the qualitative characteristics of active teaching, which reveal that teachers at this level are able to engage students actively in the teaching and learning processes. Moreover, teachers can create a learning environment in their classroom since all the dimensions of the two aspects of this overarching factor, other than differentiation, are part of this type of teacher behaviour. Furthermore, teachers provide constructive feedback on students' answers, and this dimension of the questioning factor also contributes to the establishment of the classroom as an active learning environment. Similar observations can be made in relation to the quality dimension of assessment, which reveals that teachers conduct assessment for formative reasons and thereby integrate assessment into teaching and learning. A new element of this level is concerned with the frequency dimension of two factors associated with the new teaching approach, namely, teaching modelling and orientation. This implies that teachers at this level are not only able to use strategies related to direct and active teaching effectively but also employ techniques in their instruction associated with constructivism.

### Type 4: Differentiation of Teaching and Putting Aspects of Quality in New Teaching

The eight teaching skills situated in this level are mainly concerned with the differentiation dimension of factors associated with direct teaching. Teachers at this level are able to differentiate their teaching practice according to their students' needs and offer appropriate application and structuring tasks to each group of students. In addition, different questions and assessment techniques are used with each group of students, which are in line with their learning needs. Another element of this level is concerned with the stage dimension of two factors associated with the new teaching approach. Thus, teachers at this level are able not only to differentiate their instruction but also to incorporate some qualitative characteristics of teaching modelling and orientation. Specifically, they are not only able to provide sufficient tasks associated with these two factors, but they also offer them at appropriate occasions.

### Type 5: Achieving Quality and Differentiation in Teaching Using Different Approaches

Finally, the nine teaching skills of this level are concerned with the most difficult qualitative characteristics of factors related to both active teaching and the new teaching approach. Specifically, the first four skills are concerned with the quality and differentiation dimensions of the classroom as a learning environment factor, stressing both teacher-student and student-student interactions (Den Brok, Brekelmans & Wubbels, 2004). The other five skills are associated with the focus, quality and differentiation dimensions of the new teaching approach. Therefore, teachers at this level use a variety of teaching approaches effectively and are also able to incorporate the qualitative characteristics of these approaches in their teaching practice. One may assume that teachers at this level are the most effective, and this assumption is tested in the next part of this section.

Looking at the description of these five types of teacher behaviour in terms of the teaching skills and approaches situated in each type, we can see that the first three levels are mainly related to the direct and active teaching approach, moving from the basic requirements concerning the quantitative characteristics of teaching routines to the more advanced requirements concerning the appropriate use of these skills as measured by the qualitative characteristics of these factors. One may also observe that these skills gradually change from the use of teacher-centred approaches to the active involvement of students in teaching and learning. The last two types of teacher behaviour are more demanding since teachers are expected to differentiate their instruction and also to demonstrate their ability to use instructional techniques associated with the new teaching approach. Again, a progression from the quantitative characteristics of factors associated with the new teaching approach to their qualitative aspects can be observed in levels 4 and 5. The content description of these five types of teacher behaviour and the distinction between levels 1–3 and levels 4 and 5 can be seen to be a justification for the results that emerged from the Saltus model, which shows the gap between the levels/types of teacher behaviour in general and also the relatively higher gappiness in moving from type 3 to type 4 and from type 4 to type 5 of teacher behaviour. Considering these five stages and the properties of the Rasch scale which were developed, one can conclude that it is more difficult to accomplish some stages than others. This supports the conclusion that the five stages are not just a grouping of effectiveness factors but represent equivalent developmental stages of teaching proficiency.

Not only should the construct validity of the developmental scale, which refers to the teaching skills included in the dynamic model, be demonstrated, but its significance and relevance to the field of teacher effectiveness should also be investigated. For this reason, it was decided to examine the extent to which the classification of teachers into these five stages explains variation in the achievement in each of the four types of outcomes of schooling. Thus, separate multilevel analysis for each dependent variable was performed. The first step in each analysis aimed to determine the variance

at individual, class and school level without explanatory variables (i.e. baseline model). In subsequent steps, explanatory variables were added at different levels. Explanatory variables (except grouping variables) were centred as Z-scores with a mean of 0 and a standard deviation of 1. Grouping variables were entered as dummies with one of the groups as a baseline (e.g. boys=0). The models presented in Table 8.2 were estimated without the variables that had no statistically significant effect at 0.05 level.

In model 1, the context variables at student, classroom and school levels were added to the baseline model. The following observations arise from the figures of model 1 in each analysis. Firstly, model 1 explains approximately 50% of the total variance of student achievement in each outcome, and most of the explained variance is at the student level. However, more than 30% of the total variance remains unexplained at the student level. Secondly, the effects of all contextual factors at student level (i.e. SES, prior knowledge, sex) are significant, but the SES was not found to be associated with the achievement of affective aims in religious education. Moreover, gender was not found to be consistently associated with student achievement in each outcome. Girls were found to have better results in relation to every outcome, except mathematics. Finally, prior knowledge (i.e. aptitude) has the strongest effect in predicting student achievement at the end of the school year. Aptitude was the only contextual variable which had a consistent effect on achievement when aggregated either at the classroom or the school level.

In the next step of the analysis, we examined whether classification of teachers into the five levels presented above was able to help us explain the variance in student achievement in each outcome of schooling. For this reason, teachers at level 3 were treated as a reference group, and four dummy variables were entered in model 1. We can observe that the students of teachers at level 1 had the lowest achievement in each outcome measure, whereas students of teachers at levels 4 and 5 had higher achievement than those of the first three levels. One can also observe that students of teachers who were found to belong to higher levels performed better than those of teachers at lower levels. The only exception to this rule is concerned with the fact that in mathematics, students of teachers at level 3 did not outperform students whose teachers were at level 2. In religious education, no teacher was found to belong to level 5, and it was therefore not possible to compare the performance in religious education of students of teachers belonging to level 4 with those of teachers at level 5.

The results of the multilevel analysis reveal that by taking student outcomes as criteria, teachers who demonstrated competencies at the higher stages were more effective than those situated at the lower stages, and thus, students of teachers situated at the former showed better outcomes. This association is found in relation to achievement in different subjects and both cognitive and affective outcomes.



**Table 8.2.** Parameter estimates and (standard errors) for the analyses of achievement in Greek language, mathematics and religious education (cognitive and affective aims)

Factors	Greek language			Mathematics			Religious education (cognitive)			Religious education (affective)		
	Model 0	Model 1	Model 2	Model 0	Model 1	Model 2	Model 0	Model 1	Model 2a	Model 0	Model 1	Model 2
<b>Fixed part (intercept)</b>	-0.39 (0.08)	-0.33 (0.08)	-0.30 (0.08)	0.36 (0.05)	0.30 (0.05)	0.13 (0.02)	-0.79 (0.11)	-0.63 (0.09)	-0.61 (0.08)	0.61 (0.08)	0.50 (0.07)	0.43 (0.07)
<b>Student level</b>												
Prior knowledge		0.49 (0.05)	0.48 (0.05)		0.71 (0.12)	0.70 (0.12)		0.51 (0.05)	0.4 (0.05)		0.41 (0.10)	0.40 (0.10)
Sex (boys=0, girls=1)		0.23 (0.10)	0.19 (0.09)		-0.18 (0.07)	-0.15 (0.07)		0.23 (0.09)	0.19 (0.09)		0.18 (0.07)	0.15 (0.07)
SES		0.32 (0.06)	0.27 (0.05)		0.60 (0.25)	0.55 (0.24)		0.12 (0.05)	0.10 (0.05)		N.S.S.	N.S.S.
<b>Classroom level</b>												
<i>Context</i>												
Average prior knowledge		0.15 (0.05)	0.10 (0.04)		0.31 (0.11)	0.28 (0.10)		0.25 (0.07)	0.21 (0.07)		0.21 (0.08)	0.18 (0.07)
Average SES		0.09 (0.04)	0.06 (0.03)		0.15 (0.04)	0.13 (0.04)		0.09 (0.04)	0.08 (0.04)		N.S.S.	N.S.S.
Percentage of girls		N.S.S. <sup>a</sup>	N.S.S.		-0.05 (0.02)	-0.05 (0.02)		N.S.S.	N.S.S.		0.05 (0.02)	0.04 (0.02)
<i>Quality of teaching/teacher behaviour</i>												
Type 1			-0.22 (0.05)			-0.24 (0.07)			-0.19 (0.04)			-0.18 (0.03)
Type 2			-0.12 (0.04)			N.S.S.			-0.10 (0.04)			-0.11 (0.05)
Type 4			0.16 (0.06)			0.18 (0.04)			0.15 (0.06)			0.12 (0.04)
Type 5			0.29 (0.05)			0.28 (0.05)			N.A. <sup>b</sup>			N.A.
<b>School level: context</b>												
Average SES		N.S.S.	N.S.S.		N.S.S.	N.S.S.		N.S.S.	N.S.S.		N.S.S.	N.S.S.
Average prior knowledge		0.13 (0.05)	0.11 (0.05)		0.11 (0.05)	0.08 (0.04)		0.13 (0.05)	0.12 (0.05)		0.08 (0.02)	0.06 (0.02)
Percentage of girls		N.S.S.	N.S.S.		N.S.S.	N.S.S.		N.S.S.	N.S.S.		N.S.S.	N.S.S.



The findings of this study are in line with theories related to the stage models of professional development (e.g. Berliner, 1988, 1992, 1994; Dreyfus & Dreyfus, 1986; Feiman-Nemser & Remillard, 1996; Sternberg et al., 2000). The five stages proposed by Kyriakides, Creemers and Antoniou (2009) build on previous stage models by specifically determining the content of each stage (in terms of teaching skills), whereas previous stage models often lacked clarity about what might constitute each developmental stage.

### ***Seeking for Stages of Effective Teaching in Different Contexts: Testing the Validity of the Dynamic Model in Canada***

The main aim of the second study was to test further the validity of the dynamic model at the teacher level by investigating the extent to which the teaching skills of teachers in Canada could be grouped into the same stages as those reported by the study conducted in Cyprus (Kyriakides, Creemers & Antoniou, 2009). In the first phase of the study, the eight teacher factors and their dimensions were measured by administering a questionnaire to students. Students were asked to indicate the extent to which their teacher behaved in a certain way in their classroom; a Likert scale was used to collect these data. This questionnaire has been used to collect data from Cypriot students of grades 5 and 6, and a generalisability study (Creemers & Kyriakides, 2008b) on the use of students' ratings revealed that data from almost all the questionnaire items could be used for measuring teaching quality. Support for the construct validity of the questionnaire has also been demonstrated (see Kyriakides & Creemers, 2008). For the development of the French version of the questionnaire, the process of double translation was used, and thus, both the face and content validity of the instrument were examined. Consequently, 78 items were kept in the final version of the questionnaire.

The sample was taken from seven primary schools in the suburb area of Montreal (Canada), who agreed to participate in the study. All grade 3, 4, 5 and 6 students ( $n=959$ ) from each class ( $n=42$ ) of the school sample were asked to complete the questionnaire. The response rate was 73%.

The generalisability study (G-study) revealed that the data from 63 out of 65 questionnaire items could be used for measuring separately the teaching quality of each teacher for each subject. It is important to note here that the student questionnaire was administered to far younger students than those participating in the Cyprus study. However, age effects in the results of the G-study were not identified (see Janosz, Archambault & Kyriakides, 2011). This implies that, at least in Canada, younger students could also generate reliable data on their teachers' classroom behaviours in relation to the eight factors of the model and their five dimensions. Since the data were found to be generalisable at the teacher level, the research team calculated a score for each teacher in each of the 63 questionnaire items deemed generalisable. Specifically, for each teacher, a score for each item was created by calculating the mean score from the responses of the students in his/her class.

Following this, the Rasch model was applied to the whole sample of teachers and all 63 measures concerning their teaching skills, using the computer program Quest (Adams & Khoo, 1996). Five items did not fit the model. By analysing the data on the other 58 items, a scale with appropriate psychometric properties was established (see Janosz, Archambault & Kyriakides, 2011). The results of the various approaches used to test the fit of the Rasch model to the data revealed a good fit when teachers' performance in the other teaching skills was analysed. Specifically, all teaching skills were found to have item infit with the range of 0.83 up to 1.20 and item outfit with the range of 0.71 up to 1.42. In addition, all the values of infit for both individuals and teaching skills were greater than  $-2.00$  and smaller than  $2.00$ . The procedure proposed by Yen (1993) was used to test for local independence, and it was found that this was generally not violated. However, if a correct response was given to the teaching skill concerned with differentiation of application, the difficulty parameter of the teaching skill concerned with assessment quality decreased by 0.32. Nonetheless, this model violation did not result in substantial bias estimates of teaching skills parameters. Finally, the fit of the Rasch model with the existing data was also tested against alternative item response theory models, but the improvement of fit by the two-parameter logistic (2PL) over the Rasch model was not statistically significant.

Subsequently, the procedure for detecting pattern clustering in measurement designs, developed by Marcoulides and Drezner (1999), was used to establish whether teaching skills were grouped into levels of difficulty corresponding to easier or more difficult types of teacher behaviours. This method of clustering teaching skills on the basis of their difficulties, using the Rasch model, showed that they were optimally clustered into the four types of teacher behaviour (stages of teaching) that are described in detail below.

### **Type 1 of Teacher Behaviour: Basic Elements of Direct Teaching**

Teaching skills included in this stage refer to the quantitative characteristics of factors associated with the direct teaching approach. For example, the frequency dimension of the management of time, questioning, structuring and application were found to be situated in this stage. By looking at the teaching skills included in this stage, it may be suggested that teachers mastering this stage are able to use daily routines in their teaching effectively.

### **Type 2: Putting Aspects of Quality into Direct Teaching and Touching on Active Teaching**

Skills concerned with the qualitative aspects of three factors in the direct teaching approach (i.e. structuring, application and questioning) were found to be situated in this stage. In addition, this level refers to the frequency and stage dimensions of the factor involving the teacher's role in establishing interactions among students.

Although this factor is not exclusively associated with direct teaching, only the frequency and stage dimensions of this factor are included at this level. This implies that teachers at this level are not only able to introduce aspects of quality into the factors of the direct teaching approach but can also encourage interactions among students, which may then facilitate active involvement in learning.

### **Type 3: Achieving Quality in Active Teaching and Reaching Out**

Teaching skills situated at this level generally refer to qualitative characteristics of active teaching. For example, the focus and quality dimensions of assessment, structuring and questioning were found at this level of effective teaching. It was also found that teachers at this level could create a learning environment in their classroom since all the dimensions of this overarching factor, apart from differentiation, are included in this type of teacher behaviour. A new element at this level is concerned with the frequency dimension of two factors, teaching modelling and orientation, which are associated with the new teaching approach. This implies that these teachers are able not only incorporate strategies related to direct and active teaching effectively but also to use techniques in their instruction which are associated with constructivism. The fact that teachers at this level make use of both active teaching and constructivist approaches provides further support for the integrated approach of effective teaching adopted by the dynamic model.

### **Type 4: Achieving Quality and Differentiation in Teaching Using Different Approaches**

All the remaining teaching skills included in the dynamic model were found to be situated at this final level. More specifically, teaching skills at this level are concerned with the qualitative characteristics of factors related to the new teaching approach and to the establishment of the classroom learning environment.

This study provides some support for the assumption of the dynamic model that teacher-level factors are interrelated and thus should not be treated as isolated. Moreover, the use of specific ways to describe both the quantitative and qualitative characteristics of these factors assists in classifying these skills into types of teacher behaviour, which range from relatively easy to more advanced. The four types of behaviour which emerged from this study are similar to the five levels identified by the study conducted in Cyprus. However, skills associated with the differentiation of teaching were not found to belong to a single level. The results of this study also provide support for the dynamic model's attempt to describe effective teaching using an integrated approach. Specifically, skills associated with both direct teaching and the new teaching approaches were found to belong to the same levels. Moreover, the types of teacher behaviour identified support the idea of combining teaching skills within each type of behaviour, rather than treating each skill or factor in isolation. These findings appear to provide support for the use of a dynamic approach for

teacher improvement purposes. However, further research is needed to ascertain whether teachers in Canada who use more advanced types of behaviour are more effective than those demonstrating the easier types; this question was taken into account when designing the second phase of this project. Nevertheless, its first phase can be seen as a step towards the development of a comparative research programme, seeking to identify stages of teaching skills by using the dynamic model as a theoretical framework. Although we need further research on the use of the dynamic model to identify stages of effective teaching, the results of this first phase provide some support for the cross-cultural validity of the dynamic model.

## **A Dynamic Approach to Teacher Professional Development**

In the first two parts of this book, it has been shown that research on teacher training and EER have been conducted apart from, and without much reference to, one another. Few researchers examining teacher training methods rationalise their selection of teaching skills in terms of EER, and very few evaluate the impact of teacher professional development on student learning. At the same time, investigators of teacher effectiveness spend little time speculating about the methods that may be used to improve teaching practice. In this context, the dynamic model of educational effectiveness has been developed in order to establish links between EER and improvement of practice (Creemers & Kyriakides, 2008b). In this chapter, we present two projects providing support for the assumption of the model, namely, that teacher factors are interrelated and that stages of effective teaching can be defined by taking into account the eight factors of the dynamic model and their five dimensions. Thus, specific strategies for improving effectiveness that are more comprehensive in nature may emerge by investigating at the grouping of teacher factors in the dynamic model.

This grouping of factors emphasises the need to establish a dynamic integrated approach (DIA) to teacher professional development. This approach lies between the two dominant approaches (i.e. the CBA and the HA), which have been presented in Chaps. 2 and 3, respectively, and aims to overcome their main weaknesses (see Chap. 4). In particular, the dynamic dimension of this approach is attributed to the fact that its content derives from the grouping of teaching skills included in the dynamic model and it is differentiated to meet the needs and priorities of teachers at each developmental stage. The integrated dimension of this approach is also attributable to the fact that although the content of the DIA refers to teaching skills that were found to be positively related to student achievement, the participants were also engaged in systematic and guided critical reflection on their teaching practices. In this section, beyond presenting the main steps of the DIA, we also refer to the assumptions upon which each step is based. In the next chapter, we refer to the main results of an experimental study which managed to compare the impact of the DIA and the HA upon teaching skills and student achievement. This study provides suggestions for readers about how to design a summative evaluation of teacher professional development programmes based on the proposed dynamic approach.

## ***The Main Steps of the DIA***

This section demonstrates the basic steps which have been utilised to develop a DIA to teacher professional development. This approach takes into account research findings on the grouping of factors in the dynamic model and their relation to student outcomes. In addition, the DIA is based on the assumption that INSET courses are offered by an A&RTeam. Each teacher is expected to develop his/her own strategies and action plans for improvement, but it is acknowledged that support for teachers should also be offered by an A&RTeam, which is able to provide technical expertise and the available knowledge base on improvement of teaching factors. Although a teacher is treated as being responsible for designing and implementing his/her own improvement strategies and action plans, he/she is not left alone to design and implement the strategies and actions but is encouraged to make use not only of the A&RTeam but also of other available resources within and outside the school. Therefore, a systematic research-based approach to design, implementation and evaluation of teacher improvement programmes is promoted.

### **Identify Needs and Priorities for Improvement Through Empirical Investigation**

The first step of the proposed approach is based on the assumption that teacher improvement efforts should refer to the development of teaching skills found to be related to student outcomes. Research on teacher effectiveness refers to specific factors concerned with teacher behaviour in the classroom that are found to be associated with student outcomes (see Part II of this book), and thus, the DIA refers to the development of INSET courses addressing the teacher factors in the dynamic model. This implies that the DIA is based on the assumption that the ultimate aim of any improvement effort should be to promote student learning and its outcomes (see Creemers & Kyriakides, 2010b). To achieve this, INSET courses are expected to help teachers improve their teaching skills and therefore become more effective. The DIA goes further in suggesting that evaluation data are needed in order to identify the needs of each teacher participating in the improvement project. In any effort to train teachers, an initial evaluation of their teaching skills should be conducted to investigate the extent to which they possess certain teaching skills while identifying their needs and priorities for improvement. The results of the initial evaluation can provide suggestions for the content of training that is offered to different groups of teachers. The teaching skills of the participants can be evaluated by the A&RTeam. For this reason, they can make use of the research instruments applied in studies testing the validity of the dynamic model at the teacher level (see Kyriakides & Creemers, 2008). The observation data of the initial evaluation are analysed in order to group teachers into corresponding developmental stages, according to their teaching skills. In the first part of this chapter, it was shown that by using the Rasch and Saltus models, teachers were classified into

specific stages of effective teaching. This is important because the content and development of educational material for the training programmes should correspond to the professional needs and *proximal development* of each group of teachers, as denoted by the stage of teaching skills they have reached. According to Berliner (1988), it may not be possible to shorten the pathway because extensive experience is fundamental to development, but it would be beneficial to assist those willing to progress by providing training and feedback appropriate to their stage of development. For example, teachers must master simple but necessary routines such as teaching skills related to the 'direct teaching approach' in order to move to higher stages involving the use of 'new teaching approaches' and differentiation. As Combs, Blume, Newman, and Wass (1974, p. 4) argue, 'In the first place, it is a fallacy to assume that the methods of the experts either can or should be taught directly to beginners'. Furthermore, the DIA supports the view that the effort to identify teachers' needs and priorities for improvement should be guided by the knowledge base of EER, as it is described in the dynamic model. This is an important issue that needs to be taken into account in conducting the initial evaluation, especially since the dynamic model refers to teaching skills found to be related to student achievement. On the other hand, the HA to teacher professional development supports the idea that teachers are able to identify a problem in relation to the improvement of student outcomes, which they consider important, without the need to justify their selection; this is irrespective of their initial competencies or developmental stage. However, in Chap. 4, the major weaknesses of this approach are explained. Thus, an initial evaluation of teaching skills by making use of the available knowledge base of EER is considered as the first step of the DIA, which is based on the assumption that an evidence-based and theory-driven approach to teacher professional development should be used in designing, implementing and evaluating teacher professional development programmes.

### **Provide Guidelines for Improvement: The Role of the A&RTeam**

Having identified teachers' needs and priorities for improvement, the second step of this approach relates to the provision of appropriate material and specific guidelines for designing their improvement action plans. The A&RTeam is expected to support teachers as they design and implement their improvement action plans. Specifically, the team is expected to provide the teachers of each group with supporting literature and research findings related to the teaching skills of their developmental stage, with clear instructions about the area on which each group should concentrate for improvement. For example, the teachers in the first stage of teaching skills should receive guidance on the distribution of teaching time so that students can effectively construct and implement new knowledge. A case study could be administered to the teachers in this group, in order to encourage them to discuss the importance of the quantity of teaching time. In addition, material from the literature could be provided regarding the management of the classroom as an efficient learning environment, in



order to maximise engagement rates (Creemers & Reezigt, 1996; Wilks, 1996). Through discussion, it is expected that teachers attending this course will realise that learning takes place within restricted time limits during which many important activities must be implemented. Extracurricular administrative activities, such as making announcements, dealing with discipline problems and commenting on irrelevant issues, could further reduce the time available for learning. Thus, the teachers attending the course may understand that actions should be taken in order to improve their time-management skills and find out how to allocate sufficient time to each learning activity.

The A&RTeam is also expected to provide the teachers in this group with guidelines related to their improvement priorities, supplemented by research literature material. For instance, for the improvement area related to the '*provision of application activities*', the A&RTeam may recommend some general principles, such as (a) the teacher should provide the opportunity for students to practise the implementation of knowledge and skills involved in each lesson, (b) feedback should be provided for students while they are working on application activities, and (c) the teacher should raise questions with individual students in the course of their work on application activities to identify and deal with misunderstandings. Following this, examples of teaching specific material from the school curriculum may be provided for teachers. In this way, they are encouraged both to reflect on these aspects of their teaching practice and to provide their own examples of implementing the principles of the school curriculum.

Subsequently, under the guidance of the A&RTeam, each teacher should develop his/her own action plan for improvement. This allows teachers to adopt and customise the provided guidelines in relation to the specific context of their classroom. The basic elements of a general plan of action should also be discussed. It should be agreed that action plans will include:

1. A revised statement of the general idea underpinning the purpose of improvement.
2. A statement of the factors and dimensions the teacher plans to improve.
3. Specific actions the teacher will undertake to achieve the improvement. For example, one teacher situated at level 2 may decide to modify the way he/she retrieves and relates prior knowledge to new knowledge by asking questions, assigning a relevant problem and asking students to interpret a map or tree diagram which requires knowledge from previous lessons.
4. A statement of the resources required in order to undertake the proposed courses of action (e.g. materials, rooms, equipment).
5. Evaluation: Teachers should use various techniques and methods for gathering evidence on the effectiveness of their action plans. For this reason, teachers are encouraged to keep a reflective diary. This diary could contain personal accounts of observations, feelings, reactions, interpretations, reflections, hunches, hypotheses and explanations. Teachers could also ask their pupils to keep diaries. As Brophy and Good (1986) argue, this enables the teacher to compare their experiences of the

situation with those of the pupils. Moreover, other teachers at the school could observe their teaching (e.g. acting as ‘critical friends’).

### **Establish Formative Evaluation Mechanism**

The next step of the teacher professional development programme, based on the grouping of the factors of the dynamic model, comprises the establishment of formative evaluation procedures. Formative evaluation is the method of ongoing and concurrent evaluation which aims to improve the programme. The formative evaluation procedures developed for the teacher professional development programme can be carried out on a regular basis (e.g. once a month) throughout the programme to provide information and feedback for improving (a) the quality of teachers’ learning, (b) the extent to which they implement the teaching skills in their classrooms and finally and (c) the quality of the programme itself.

The formative evaluation procedures should involve the identification of the learning goals, intentions or outcomes and criteria for achieving them; the provision of effective, timely feedback to enable teachers to advance their learning; the active involvement of teachers in their own learning and, lastly, improvement in teaching skills as a result of teachers responding to identified learning needs and priorities. These procedures could be accomplished by the A&RTeam and participating teachers.

In particular, for the purposes of the study reported in Chap. 9, after the development of teachers’ initial action plans, one session was scheduled each month until the end of the school year. This provided the teachers with sufficient time to implement the activities included in their action plans in their teaching and also to reflect on the effectiveness of these activities. Furthermore, the monthly sessions provided teachers at each stage with the opportunity to revise and develop their action plans further on a systematic basis, based on their own and others’ experiences, and also research on effectiveness factors which corresponded to their developmental stage. This was achieved with the assistance and guidance of the A&RTeam.

In the course of formative evaluation in each monthly session, teachers had the opportunity to (a) report and comment on teaching practices, (b) identify effective and non-effective teaching practices, (c) understand the significance of the teacher factors which corresponded to their developmental stage and (d) understand how these factors could be linked with effective teaching and learning. At the same time, the teachers received systematic feedback and suggestions from the A&RTeam at each stage in the form of materials related to the application of teaching skills to specific content. To achieve this, relevant case studies were used extensively (see Antoniou, 2009).

During this time, members of the A&RTeam visited teachers at their schools to discuss emerging issues related to the implementation of their action plans in their everyday teaching, providing support and feedback. Through close observation of teachers and the frequent collection of feedback on teachers’ skills, the A&RTeam

were able to identify how teachers implemented their action plans and developed their teaching skills.

### **Establish Summative Evaluation Mechanism**

The final step of the proposed approach to the teacher professional development programme is concerned with the summative evaluation of the project. The emphasis of the summative evaluation should not be on comparing teachers with each other but on identifying the overall impact of the programme on the development of teachers' skills and its indirect effect on student learning. The results of summative evaluation assist in measuring the effectiveness of the DIA and allow subsequent decisions to be made regarding the continuity of the programme.

This implies that at the end of the school year, teaching skills and student outcomes should be measured. Specifically, the teaching skills of the participating teachers should again be evaluated by focusing on the eight factors of the dynamic model concerning teacher behaviour in the classroom. In this way, we will be able to identify the impact of the DIA on improving the skills of teachers who have made use of the DIA. Data on student achievement should also be collected, in order to measure the effectiveness of the DIA in terms of student achievement gains.

This chapter advocates the use of an evidence-based and theory-driven approach to teacher training and professional development. Specifically, we argue that the dynamic model can be used to establish such a DIA, combining research on teacher effectiveness with that on teacher training and professional development. The main characteristics of this approach are described in this chapter. The next chapter provides a detailed description of the group randomisation study that was conducted in order to compare the impact of the teacher professional development approach, which is based on the dynamic model (DIA), with the holistic (or reflective) approach. The purpose is not only to consider the impact of the DIA but also to provide readers with a detailed description of the study and facilitate their efforts to replicate or design their own research on teacher professional development based on the DIA.

## Chapter 9

# An Experimental Study of Teacher Professional Development Based on the Dynamic Integrated Approach

### Introduction

The experimental study presented in this chapter investigated how teachers can develop their skills and move from one stage to the next by gradually developing more complex skills, such as those concerned with new teaching approaches and differentiation of teaching. The four phases of the study are described, and their main findings are presented. The findings of this study refer to the impact of an intervention which is in line with the proposed DIA upon three dependent variables: (a) the development of teaching skills, (b) teachers' attitudes towards teaching and (c) the learning outcomes of their students. Specifically, the study reported here attempted to compare the impact of the DIA and the HA to teacher professional development upon each of the above three dependent variables.

To achieve this aim, all primary teachers in two districts of Cyprus (i.e. Nicosia,  $n = 1,488$ ; Larnaca,  $n = 815$ ) were invited to participate in this project. A total of 130 primary teachers volunteered to participate in the professional development programme that was offered at the University of Cyprus during after-school hours. Data were also collected for all students ( $n = 2,356$ ) of the teacher sample. Collection of data took place both at the beginning and at the end of the intervention. Students who lacked prior attainment or background data comprised less than 7% of the original sample and were consequently excluded from each analysis. In the teacher sample, only seven teachers left the experimental study and were equally distributed between the two intervention groups and appropriate stages of development. The four phases of the experimental study are elaborated upon below to help the reader to see how the DIA can be applied in designing and implementing a professional development programme.

## **Phases of the Study**

### ***Phase 1: Initial Evaluation***

At the beginning of the 2008–2009 school year, the teaching skills of the participants were evaluated by external observers. Data on student achievement were collected using external written forms of assessment designed to assess the knowledge and skills in mathematics which are identified in the Cyprus Curriculum (Ministry of Education, 1994). Teacher questionnaires were administered to collect data on teachers' background characteristics and measure their perceptions of teaching. In addition, a student questionnaire was administered in order to collect information related to students' background characteristics. Observation data were then analysed using the same procedure described by Kyriakides, Creemers, and Antoniou (2009) in order to classify teachers into developmental stages according to their teaching skills. Using the Rasch and Saltus models, it was found that teachers could be classified into the same five developmental stages which emerged from the previous study (see Table 9.1).

### ***Phase 2: The Formation of the Two Experimental Groups***

The teachers in each developmental stage were randomly allocated into two groups of equal size. The first group employed the dynamic approach presented in the previous section, while the second group used the HA. For example, the 32 teachers in stage 1 were randomly allocated to the two experimental groups, each one consisting of 16 teachers.

### ***Phase 3: The Establishment of the Training Sessions***

In the third phase of the study, the teachers in each experimental group began to work towards improving their teaching skills. This phase sought to initiate changes in educational practices, working with the teachers throughout the curriculum. It was also concerned with whether, and to what extent, teachers were able to develop their teaching skills and integrate them into a more self-consciously articulated model of classroom pedagogy. The interventions offered to the two experimental groups are described below.

### **Experimental Group A: Intervention Based on the DIA**

Teachers participating in the experimental group A (employing the DIA) were engaged in activities which corresponded solely to skills appropriate to their

**Table 9.1** The five stages of teaching skills included in the dynamic model

Stages	Teaching skills
1. Basic elements of direct teaching	Frequency management of time Stage management of time Frequency structuring Frequency application Frequency assessment Frequency questioning Frequency teacher-student relation
2. Putting aspects of quality in direct teaching and touching on active teaching	Stage structuring Quality application Stage questioning Frequency student relations Focus application Stage application Quality of questions
3. Acquiring quality in active/direct teaching	Stage student relations Stage teacher-student relation Stage assessment Frequency teaching modelling Frequency orientation Focus student relations Quality: feedback Focus questioning Focus teacher-student relation Quality structuring Quality assessment
4. Differentiation of teaching	Differentiation structuring Differentiation time management Differentiation questioning Differentiation application Focus assessment Differentiation assessment Stage teaching modelling Stage orientation
5. Achieving quality and differentiation in teaching using different approaches	Quality teacher-student relation Quality student relations Differentiation teacher-student relation Differentiation student relations Focus orientation Quality orientation Differentiation orientation Quality of teaching modelling Focus teaching modelling

developmental stage. The teachers in both groups were required to attend eight sessions. The content and purpose of each session are described below.

*First Session:* The first session could be perceived as equivalent to the first step of the DIA since it aimed to build consensus in relation to the main aims of the improvement initiative. In particular, in the first session, the rationale of the professional development programme, as well as the main characteristics and value assumptions of the DIA, was analysed. In addition, the main aims of the programme were discussed (i.e. the improvement of teaching practices and student outcomes) as well as the programme procedures and other administrative issues. The importance of evaluating the impact of the programme on teacher behaviour and student outcomes was emphasised, and the relevant procedures for the classroom observations, questionnaires and test administration at both time points were explained. It was also made clear to the participants that provision had been taken to ensure the anonymity of participants and confidentiality of the results of the evaluation.

*Second Session:* In the second session, the teachers employing the DIA were assigned to four groups according to their own developmental stage, based on the results of their teaching skills evaluation. Following this, the research team provided for the teachers of each group supporting literature, which was related to teaching skills appropriate to their developmental stage, and identified specific areas for improvement (see [Appendix A](#)).

*Third–Seventh Sessions:* After the second session and the development of teachers' initial action plans, one session was scheduled each month until the end of the school year. This provided the teachers with sufficient time to implement the activities in their action plans into their teaching whilst reflecting on the effectiveness of these activities. The monthly sessions also provided teachers with the opportunity to revise and further develop their action plans on a systematic basis with the assistance of the A&RTeam. This was based upon their own and others' experiences, as well as on research concerning the effectiveness factors associated with their developmental stage (see Antoniou, 2009). In each monthly session, teachers' training was based on 'active teaching' and was not restricted solely to lecturing. Thus, the participating teachers had the opportunity to report teaching practices and comment on them, to identify effective and non-effective teaching practices, to understand the significance of the teacher-level factors relating to their stage of the dynamic model and to comprehend how these factors could be linked to effective teaching and learning.

At the same time, the teachers received systematic feedback and suggestions from the A&RTeam, with additional reading materials and tasks concerning how teaching skills could be used to teach specific content. To achieve this, guidelines were developed and distributed to teachers. According to Desimone, Porter, Garet, Yoon, and Birman (2002), professional development is more effective in changing teachers' classroom practices when it has the collective participation of teachers who share the same priorities. Finally, members of the A&RTeam visited teachers at their schools to discuss issues regarding the implementation of their action plans into their everyday teaching and also to provide support and feedback.

### **Experimental Group B: Intervention Based on the HA**

Teachers who participated in the experimental group employing the HA were engaged in activities involving the whole spectrum of teaching elements, attitudes and perceptions; these were not specific to their initial competences or development stage. Reflection, as defined by Schon (1987), was the basis of this intervention. It involves thoughtfully considering one's own experiences and beliefs in applying knowledge to practice while being coached by professionals in the discipline. This intervention was based on the argument that professional development programmes need not always focus on specific teaching methods and strategies; they can also focus on teacher attitudes which affect practice (see Chap. 3). As Wilhelm, Coward and Hume (1996) report, the curriculum of this professional development programme was based on providing teacher interns with an opportunity to explore attitudes and reflect on the ethical implications of practice in classrooms whilst also focusing on their previous experiences. Given its nature, this method of professional development causes teachers to step back and critically reflect not only on how they teach but also on why they teach in a particular way. Teachers participating in the HA were required to attend eight sessions, in the same way as the teachers employing the DIA in group A. The content of the *first session* was the same for both groups (see first session on the section concerned with the DIA).

*Second Session:* In the second session, the teachers employing the HA (experimental group B) were assigned to groups according to their own preferences. The elements of an action plan were described to teachers in all four groups, who then created their own action plan under the supervision of the A&RTeam. Through discussion, the teachers identified problems they considered important, which led to the formulation of action plans to tackle them.

*Third–Seventh Sessions:* After this second session, one session was scheduled each month until the end of the school year. The primary aim of reflective practice was for teachers to gain a deeper understanding of their own teaching style. Specifically, teachers were encouraged to make use of journals, observation notes, transcribed conversations and self-reports. The aim was to enable individuals to evaluate their own beliefs and practice critically and help them to transform experiences from a past event into an ongoing learning process. Moreover, the intervention was designed to engage participating teachers in writing narrative stories of their experiences and participate in guided reflective questioning as part of the process of teacher inquiry and professional development.

The monthly sessions also provided the teachers at each stage with the opportunity to revise and further develop their action plans. The participating teachers could report and comment on their own teaching practices and identify both effective and non-effective teaching practices, attitudes and beliefs. For example, the teachers were asked to reflect on what they perceived to be successes and failures in terms of effective teaching and learning. They were then encouraged to focus on and write down the story of one critical incident, whether positive or negative, which had occurred in their classrooms. They were asked to describe the incident in detail (e.g. situation, people involved, feelings, reasoning), what they had learned about teaching



as a result, how their perspectives had changed and the resulting changes in how they taught. In each monthly meeting, the A&RTeam encouraged teachers within the same group to co-operate and share both ideas and teaching materials, to exchange and discuss their experiences and generally to share the results of their exploration (see Antoniou & Kyriakides, 2011). Finally, as with the teachers in experimental group A, the A&RTeam visited teachers in their schools during this period to discuss emerging issues related to the implementation of their action plans in their everyday teaching. They provided consistent support and feedback for all teachers.

### ***Phase 4: Final Evaluation and 8th Session: Measurement of Teaching Skills, Teacher Perceptions Towards Teaching and Student Outcomes***

This was the last phase of the teacher professional development programme, which corresponds to the last step of the DIA (see Chap. 8). By the end of the school year, the teaching skills, teacher perceptions and student achievement in mathematics were measured using the same procedures and instruments as in Phase 1. Following the data analyses, a common final meeting was held with participating teachers in the two experimental groups. During this meeting, the teachers were firstly invited to express their views and comments about the developmental programme in which they had participated. This enabled the collection of data concerning the formative evaluation of the project. The overall results of the summative evaluation were then presented to the teachers, and they were asked to reflect on these results.

## **Measures**

In this section, we refer to the main variables of the study and provide information on how each of them was measured. Some information about the validity and reliability of each measure is also provided.

### ***Student Achievement in Mathematics***

For each year group of students, criterion-reference tests in mathematics were constructed in order to measure their knowledge of, and skills in, mathematics in relation to the objectives of the national curriculum of Cyprus. The written tests were subject to control for reliability and validity (see Antoniou, 2009). None of the respondents achieved a full score. Moreover, less than 4% of the students achieved over 80% of the maximum score, and less than 10% of the students produced over 70% of the maximum score. Therefore, there was less likelihood of a ceiling effect. The floor effect was not real in the data because no student produced a full zero performance.

## **Equating of Tests**

The test administered to grade 6 students at the end of the school year was obviously more difficult than that administered to grade 2 students at the beginning of the school year. Prior to making comparison of test scores meaningful, the scores have to be made comparable. They were equated using item response theory (IRT) modelling. The method follows the same procedure as that used in PISA (Programme for International Student Assessment) studies. However, in PISA, equating was conducted horizontally (equating the different versions of tests), whereas in this study, it was vertical. Specifically, the scores were transformed into the same scale on the basis of characteristics of IRT models that students' latent level of ability ( $\theta$ ) and difficulty level of an item ( $\beta$ ) are identical, when certain preconditions are fulfilled (Bond & Fox, 2001). The latent ability level for each student can be determined in every version as long as there are so-called anchoring items connecting the versions. For the purposes of this study, we use enough common items (i.e. approximately 8% of anchoring items across the tests) with representative content to be measured (Kolen & Brennan, 1995). Estimation was made using the Extended Logistic Model of Rasch (Andrich, 1988) which revealed that each scale had satisfactory psychometric properties (see Antoniou, 2009). Thus, for each assessment period, achievement in mathematics was estimated by calculating the Rasch person estimates.

## ***Student Background Factors***

Information was collected in relation to two student background factors: sex (0=boys, 1=girls) and socio-economic status (SES). Five SES variables were available: father's and mother's education level, the social status of father's job, the social status of mother's job and the economic situation of the family. Using the classification of occupations used by the Ministry of Finance, it was possible to classify parents' occupation into three groups of relatively similar sizes: occupations held by working-class (32%), middle-class (39%) and upper-middle-class (29%) parents. Standardised values for the above five variables were calculated, resulting in the SES indicator.

## ***Opportunity to Learn***

Time spent doing homework and on private tuition were seen as measures of the opportunity to learn factor. Private tuition in Cyprus is common, and a high percentage of students attend private lessons. Thus, students were asked to report the average amount of time spent on homework and on private tuition in mathematics, especially since these variables were found to be associated with student achievement gains in Cyprus (e.g. Kyriakides, 2005b; Kyriakides, Campbell & Gagatsis, 2000).

### ***Contextual Factors at Teacher/Classroom Level***

Variables concerned with the context of each classroom, such as the average score at the beginning of the intervention, the average SES score and the percentage of girls, were taken into account. The contextual factors were aggregated from the student-level data. We were also able to collect data about three teacher background variables: gender, position (i.e. teacher or deputy head) and teaching experience.

### ***Quality of Teaching***

Quality of teaching was measured through classroom observations by independent observers, both at the beginning (September 2008) and at the end (May 2009) of the intervention. Two low- and one high-inference observation instruments were used. The instruments were designed to collect data concerned with the teacher factors of the dynamic model and were used in a series of studies conducted in Cyprus in order to test the validity of the dynamic model. The construct validity of these instruments had already been tested by using SEM approaches (see Kyriakides & Creemers, 2008).

Observations were carried out by three members of the research team who attended a series of seminars on how to use the three observation instruments. During the 2008–2009 school year, the external observers visited each class four times, and a generalisability study provided support for the use of data that emerged from different observations as indicators of the teaching skills of each teacher (see Antoniou, 2009). Moreover, for each scale of the instruments, the alpha reliability coefficient was higher than 0.83. Since 26% of the lessons were observed by pairs of observers, the inter-rater reliability coefficient ( $\rho^2$ ) was estimated and was found to be higher than 0.81.

## **Results**

The results of the analysis evidenced the impact of the two approaches to teacher professional development on the improvement of teaching skills, teacher perceptions and student academic outcomes. These are presented in this section. Additional technical information emerged from analysing the results of the study, and this is also presented below for information. In addition, a summary of the main findings is provided at the end of this section.

### ***Impact on Teaching Skills***

The observational data of each time period were analysed separately following the procedure described by Kyriakides et al. (2009). Specifically, the Rasch model was

used in order to identify the extent to which the five dimensions of the eight teacher factors (i.e. the 44 first-order factor scores) could be reduced to a common unidimensional scale. The Rasch model not only tested for the unidimensionality of the scale but was also able to ascertain whether the tasks could be ordered according to their degree of difficulty. Furthermore, it assessed whether the people completing these tasks could be ordered according to their performance in the specific construct under investigation.

The Rasch model was applied to the data of the baseline measure (i.e. the teaching skills of teachers participating in the study). It was found that all of the teaching skills included in the dynamic model were appropriately targeted against the person measures (i.e. the skills of teachers participating in the study) since Rasch person estimates ranged from  $-3.06$  to  $3.12$  logits, and the estimates of the difficulties of teaching skills ranged from  $-2.93$  to  $3.16$  logits. Moreover, the reliability of each scale (teachers and teaching skills) was higher than  $0.93$  and thus deemed satisfactory. Finally, the fitting of the Rasch model with the data was tested against alternative item response theory models (i.e. the 2PL and the 3PL models) and was found to be statistically preferable (see Antoniou, 2009).

Having established the reliability of the scale, it was decided to investigate whether teaching skills could be grouped into the five stages described in the previous chapter. The procedure for detecting pattern clustering, developed by Marcoulides and Drezner (1999), was used. This procedure segments the observed measurements into constituent groups (or clusters) so that the members of any one group are similar to those of the others, according to a selected criterion that stands for difficulty. Applying this method to segment the teaching skills on the basis of their difficulties that emerged as a result of using the Rasch model showed that they were optimally clustered into the same five clusters proposed by previous research findings (see Kyriakides et al., 2009).

Pattern clustering was also applied to data which emerged from the final measurement of teaching skills. The Rasch model revealed that all participants fitted the model and all teaching skills were well matched to measures of the teachers since the scores for the latter ranged from  $-2.99$  to  $3.24$  logits. It was also found that the difficulties of the teaching skills could be considered invariant across the two measurement periods within the measurement error (i.e.  $0.10$  logits). Applying the aforementioned clustering method, it was found that teaching skills could once again be optimally clustered into the five stages described in Chap. 8 (see Antoniou, 2009).

Considering the results of the analyses of initial and final data related to teaching skills, we can conclude that on both occasions the results validated the five developmental stages of teaching skills proposed by previous research findings (Antoniou, 2009; Antoniou, Creemers & Kyriakides, 2009; Kyriakides et al., 2009). Since the teachers were grouped into the same five stages of teaching competencies, a decision was made to compare the initial and final stages of each teacher. This aimed to identify the extent to which some teachers improved their teaching skills and progressed to the next stage. By comparing the classification of teachers into stages at the beginning and end of the intervention, the analysis found that none of the teachers of the group employing the HA moved from one stage to another. On the other hand,

21 out of 65 teachers employing the DIA progressed to the next stage. Specifically, eight teachers of this group move from stage 1 to stage 2, eight teachers of stage 2 managed to move to stage 3, and five teachers of stage 3 were found to be situated at stage 4 at the end of the intervention.

In order to measure the impact of the two professional development programmes upon teaching skills, the Rasch person estimates were also compared. This comparison revealed that the final scores of teachers employing the DIA (mean=0.36, SD=1.05) were higher than their initial scores (mean=-0.28, SD=1.01), and this difference was statistically significant ( $t=4.14$ ,  $df=64$ ,  $p<.001$ ). On the other hand, the final scores of teachers employing the HA (mean=-0.25, SD=1.04) were not higher than their initial scores (mean=-0.26, SD=1.05), and the paired samples  $t$ -test did not reveal any statistically significant differences in progress ( $t=0.87$ ,  $df=64$ ,  $p=0.38$ ).

### ***Impact on Teacher Perceptions and Attitudes***

In the first stage of the analysis, two independent samples  $t$ -tests were employed to identify any statistically significant differences between the teachers of the two experimental groups at the beginning and at the end of the interventions, but no such differences at 0.05 level were found. Finally, a paired samples  $t$ -test revealed no statistically significant changes at 0.5 level in perceptions, either for the teachers who employed the DIA or for those who employed the HA.

### ***Impact on Student Achievement***

The results of the multilevel analysis to measure the impact of each of the two approaches to teacher professional development on student achievement are presented in this section. In particular, this analysis aimed to identify the extent to which student achievement gains were significantly different for teachers participating in the DIA as compared to those employing the HA. It is also important to note that other explanatory variables, such as teacher qualification and student SES, were taken into consideration in the multilevel analysis. Although the teachers were randomly assigned to the experimental groups, this procedure was still conducted in order to identify the net impact of each approach on students' academic progress (see Creemers, Kyriakides & Sammons, 2010).

In the data analysis presented below, the variables related to the interventions were added at the last stage of the multilevel modelling analysis. This procedure enabled the authors to supplement the analysis with data concerning teachers' personal characteristics and perceptions in order to check for possible variation both within and between groups. The models presented in Table 9.2 were estimated without the variables that had no statistically significant effect at 0.05 level.









In model 1 of Table 9.2, the variables related to the student context were added to the empty model (model 0). This model explained 23.4% of the variance, most of which was situated at the student level. All of the student context variables (i.e. *prior achievement in mathematics*, *gender*, *SES*, *cultural capital*) had statistically significant effects upon student achievement. Nevertheless, *prior knowledge* was the strongest predictor of student achievement at the end of the school year. In addition, *prior achievement* was the only contextual variable which had a consistent effect upon achievement when aggregated either at the classroom or the school level.

In model 2, the explanatory variables of the student level, related to the opportunity to learn, were added to the previous model. The amount of time students spent doing their homework showed a statistically significant effect on student achievement. In the third model, all variables related to teachers' background factors, perceptions and attitudes were added to model 2. The *years of teaching experience* had a statistically significant effect on student achievement.

In model 4, the variable related to the quality of teaching was added to model 3. Quality of teaching was measured through classroom observations, with teachers then assigned to one of four developmental stages according to their teaching skills. In order to measure the effect of each developmental stage on student outcomes, teachers at stage 3 were treated as the reference group (i.e. stage 3=0), and three dummy variables were entered into model 4. The results revealed that the developmental stage in which a teacher was situated had a reasonably large and significant effect on student achievement. In particular, we observed that the students of teachers at stage 1 showed the lowest achievement, whereas students of teachers at stage 4 had higher achievement levels than those within the first three stages. This finding provides support for the developmental nature of the four stages since students of teachers situated at higher stages performed better than those of teachers at lower stages. It is important to note that similar results were found at the beginning of the intervention and also in previous research (e.g. Kyriakides et al., 2009). Finally, we can observe that model 4 explained 35.8% of the variance, while the  $\chi^2$  test revealed a significant change between model 3 and model 4 ( $p < 0.001$ ). This suggests that a teacher's developmental stage is an important predictor of student outcomes.

In model 5, the effect of each approach to teacher professional development was investigated. A dummy variable representing the approach (0=HA) was entered into the analysis. The DIA showed a statistically significant effect on student achievement, compared to the HA which had no significant effect. The effect of this DIA variable was 0.24 (0.08), indicating that the students of teachers employing this approach had better results than those whose teachers employed the HA.

Finally, in model 6, the effect of teachers moving to the next developmental stage was investigated. As previously mentioned in the analysis of observational data related to teaching quality, all teachers employing the DIA improved in their teaching skills. Moreover, 21 out of 65 teachers made progress to such an extent that they advanced to the next developmental stage of teaching skills. It was therefore necessary to investigate the impact of this 'movement' to the next developmental stage on student academic outcomes. A dummy variable indicating whether teachers

progressed to the next developmental stage was entered into the analysis (0=no movement observed, 1=moving to the next stage of teaching competences). The results indicated that such progress had a statistically significant effect upon student achievement (see Table 9.2).

The results of the multilevel analysis presented above provide evidence that the DIA yields better results in terms of student achievement. However, it is not clear whether this approach is equally effective for teachers situated at different levels. It could be claimed that the DIA is more suitable for teachers with lower levels of teaching competence. To test this assumption, four separate multilevel analyses were conducted. Each analysis was applied only to the teachers of the same stage, not the overall teacher sample. In this way, we could compare the effect size of the variable concerned with the use of the DIA upon achievement of students who were taught by teachers situated at different stages of teaching competence. Table 9.3 illustrates the figures of the final model of each of the four separate multilevel analyses which were conducted. Each analysis revealed similar effect sizes for the variable concerned with the use of the DIA upon student achievement. The fixed effects obtained with multilevel analysis can readily be converted to standardised effects or 'Cohen's d' by dividing them by the standard deviations in the 'treatment groups' (see Table 9.4). Thus, the relative strength of the effects can be compared more easily across the four groups of teachers who are at different stages. When the effects of the DIA that are presented in Table 9.3 are expressed in this way, they turn out to be at the same level and can also be considered as medium effect sizes (see the effect sizes reported in Table 9.4). This implies that this intervention was equally beneficial to teachers situated at different stages of teaching.

## Implications

This section provides a brief review of the research findings and discusses the relevant implications for policy and practice.

### *Summary of Results*

Firstly, the results of the analysis of both the initial and final data related to teaching skills suggest that the five stages of teaching skills were formulated in a consistent manner. This provides support for the generalisability of the five developmental stages of teaching skills proposed by previous research findings (Antoniou et al., 2009). In addition, it was found that teachers demonstrating higher level competencies were more effective than those situated at the lower stages in terms of student outcomes. Secondly, the results indicated that for all teachers, the DIA is more effective than the HA in improving teaching skills. By comparing the two experimental groups, it was found that, overall, teachers employing the HA neither made statistically significant progress nor moved from one stage to another. On the other

**Table 9.3** Parameter estimates and (standard errors) that emerged from analysing separately the achievement of students taught by teachers situated at the same level

Factors	Stage 1	Stage 2	Stage 3	Stage 4
<b>Fixed part (intercept)</b>	0.65 (0.20)	0.50 (0.20)	0.20 (0.10)	0.30 (0.08)
<b>Student level</b>				
<i>Context</i>				
Prior achievement in maths	0.71 (0.12)	0.76 (0.12)	0.79 (0.11)	0.72 (0.11)
Grade 3	-1.08 (0.33)	-1.08 (0.30)	-1.11 (0.33)	-1.14 (0.33)
Grade 4	-0.62 (0.25)	-0.59 (0.25)	-0.67 (0.25)	-0.67 (0.25)
Grade 6	0.56 (0.26)	0.50 (0.25)	0.57 (0.26)	0.58 (0.26)
Sex (0=girls, 1=boys)	0.10 (0.04)	0.10 (0.04)	0.11 (0.04)	0.10 (0.04)
SES	0.33 (0.14)	0.36 (0.14)	0.31 (0.13)	0.31 (0.14)
<i>Opportunity to learn</i>				
Homework	0.11 (0.03)	0.15 (0.03)	0.09 (0.03)	0.09 (0.03)
Private tuition (0=no, 1=yes)	N.S.S.	N.S.S.	N.S.S.	N.S.S.
<b>Classroom level</b>				
<i>Context</i>				
Average achievement	0.34 (0.09)	0.30 (0.09)	0.33 (0.09)	0.34 (0.09)
Average SES	N.S.S.	N.S.S.	N.S.S.	N.S.S.
Percentage of girls	N.S.S.	N.S.S.	N.S.S.	N.S.S.
<i>Teacher background</i>				
Gender (0=male, 1=female)	N.S.S.	N.S.S.	N.S.S.	N.S.S.
Years of experience	N.S.S.	N.S.S.	N.S.S.	N.S.S.
Position	N.S.S.	N.S.S.	N.S.S.	N.S.S.
Experimental group (0=HA, 1=DIA)	0.27 (0.08)	0.25 (0.08)	0.25 (0.08)	0.22 (0.05)
Teachers moving to the next stage (0=no change, 1=moving to the next stage)	0.14 (0.06)	0.12 (0.05)	0.14 (0.06)	N.A
<b>Variance components</b>				
Class (%)	6.5	6.9	5.9	5.8
Student (%)	51.8	52.1	52.0	52.6
Explained (%)	41.7	41.0	42.1	41.6

N.S.S. = No statistically significant effect at level 0.05

N.A=All teachers at stage 4 belong to the reference group

**Table 9.4** Effect of employing DIA rather than HA expressed as Cohen's d per group of students taught by teachers situated at the same stage and for the whole sample

Stage	Effect	Pooled SD	Cohen's d
Teachers at stage 1	0.27	0.69	0.39
Teachers at stage 2	0.25	0.64	0.39
Teachers at stage 3	0.25	0.63	0.38
Teachers at stage 4	0.22	0.60	0.37
Whole sample	0.33	0.89	0.37

hand, statistically significant progress in teaching skills was found for the teachers employing the approach based on the grouping of teaching skills in the dynamic model. Thirdly, it was found that employing the DIA had a reasonable and statistically significant effect on student achievement, compared with employing the HA. Finally, the findings revealed that teachers' perceptions and attitudes towards teaching did not change, regardless of the approach they employed. In addition, teachers' perceptions of teaching were not found to be related to student achievement gains in mathematics. This finding supports the idea that the DIA can develop improvement programmes focused on enhancing teaching skills, rather than on changing perceptions of teaching.

### ***Implication of Research Findings***

The above findings seem to support the idea that teachers can improve and ultimately progress to the next developmental stage of teaching skills by undertaking appropriate interventions and participating in effective professional development programmes. As this study demonstrated, teachers employing the DIA improved their teaching skills, whereas those employing the HA did not. In addition, the use of the DIA had a significant impact upon student achievement gains in mathematics. A similar argument was made by King and Kitchener (1994). They argued that stage growth was most apparent for teachers who continued their informal education and participated in effective professional development programmes. This provides an important reminder that teacher improvement and stage growth do not unilaterally unfold, but also require a stimulating and supportive environment.

The issue concerning the content of teacher professional development programmes has been addressed in this study by drawing on a validated theoretical model of EER. In particular, the dynamic model of educational effectiveness emphasises not only the importance of specific factors but also the grouping of factors when addressing the complex nature of effectiveness. This implies that improvement of teacher effectiveness cannot be focused solely on the acquisition of isolated skills or competencies (Gilberts & Lignugaris-Kraft, 1997), nor on reflection on the whole teaching process to help teachers gain 'greater fulfilment as a practitioner of the art' (of teaching) (Clarke & Hollingsworth, 2002, p. 948).

At the same time, the results of this study indicate that reflection is more effective when teachers' priorities for improvement are taken into account and when they are encouraged to develop action plans which address their professional needs; these were identified through a relevant empirical investigation. Although both interventions encouraged and utilised teachers' critical reflections on their teaching practices, teachers employing the DIA were asked to reflect on those aspects which related to their priorities for improvement, based on their developmental stage. These stages were defined by taking into account the knowledge base of EER, especially the teacher factors found to be associated with student achievement. On the other hand, teachers employing the HA adopted a less focused reflection strategy, which

allowed them to reflect on any aspect of their teaching practice, irrespective of the stage at which they were situated. For example, some teachers at stage 1 employing the HA developed action plans which aimed to differentiate their instruction; yet their attempts to incorporate this into their teaching were not successful. This may be attributed to the fact that they did not possess the basic skills corresponding to their stage, such as classroom management and structuring, which could be considered prerequisites for the differentiation of teaching. Therefore, the HA does not take into account research evidence supporting the grouping of teacher factors and their dimensions, grouped into stages, structured in a developmental order and associated with student outcomes. It must be emphasised that thinking and critical analysis are important, and thus, those aspects of the HA were utilised in the development of the DIA. However, complementing reflection with the knowledge base of EER, which addresses the needs of specific groups of teachers, could help us establish more effective approaches to teacher professional development.

Moreover, the findings of this study revealed that teachers' perceptions of teaching did not change, either for the teachers employing the DIA or those using the HA. This finding is in line with that of many studies which support the view that changing teacher perceptions is difficult to achieve (Goodrum, Cousins & Kinnear, 1992; Joyce & Showers, 1980; Sharon, 1987). For example, research was conducted in the USA in a district offering 'a myriad of choices of professional development from workshops on particular strategies to development of small learning communities' (Alger, 2009, p. 8). Yet, it was surprising that only one teacher out of 110 indicated that professional development was responsible for a shift in their perceptions of teaching. As research has shown, teachers' beliefs about teaching and learning are resistant to change because they are at the core of a student teacher's world view (Pajares, 1992; Phelan & McLaughlin, 1995). An alternative explanation may be that teacher perceptions are mitigated by other less tangible context variables in individual schools, such as school size and school climate (Grossman & Stodolsky, 1995). In addition, this might be attributed to the fact that the study only took place over the course of 1 year. Longitudinal studies are needed to explore further the potential and characteristics of professional development programmes capable of improving teachers' perceptions of teaching (see also Chap. 11 for suggestions about further research on the DIA). Yet, although teachers' perceptions of teaching did not change in this study, those teachers employing the DIA did improve in their teaching skills and their students' outcomes. This might imply that improving teachers' perceptions and attitudes towards teaching should not necessarily be considered a prerequisite for improving teacher effectiveness.

Although further research is needed to test the generalisability of the findings of this study, one could claim that this study reveals that the DIA can at least have a significant short-term impact on improving teaching skills and teacher effectiveness, as measured through student learning outcomes. In the next chapter, we refer to projects investigating further the impact of the DIA. These projects also attempt to broaden the scope of this approach by concentrating not only on teaching but also on assessment practice and by investigating the added value of using the DIA to organise school-based INSET courses. In the final chapter of this book, suggestions

for the development of this approach in order for it to be used not only for designing INSET courses but also for initial teacher training programmes are provided. This chapter also refers to the importance of conducting further research on using the DIA for teacher training and professional development purposes by taking into account the crucial role that the A&RTeam has to play, what should be required of its members and the training they should receive.

## **Appendix A: Description of the Content of the Teacher Professional Development Programme Based on DIA**

This appendix presents the content of the teacher professional development programme based on the DIA. The teachers employing the DIA were assigned to the four groups according to the developmental stage in which they were found to be situated, based on the results of their teaching skills evaluation. The members of the A&RTeam provided the teachers in each group with supporting literature and research findings, which were solely related to the teaching skills corresponding to their developmental stage. They also made it clear which area each group should concentrate their efforts on for improvement. Therefore, this appendix refers to the area in which each group aimed to effect improvement.

### ***First Group (Stage 1): Basic Elements of Direct Teaching***

The area of interest in this stage was the distribution of teaching time, the aim of which was to enable students to construct and implement new knowledge effectively. The opportunity to learn is related to student engagement and time spent on task, and engagement has been used as a criterion variable in classroom management studies (Emmer & Evertson, 1981). Therefore, effective teachers are expected to organise and manage the classroom as an efficient learning environment and thus maximise engagement rates (Creemers & Reezigt, 1996). It was explained to the teachers that learning takes place within restricted time limits, during which many important activities have to be implemented. Extracurricular administrative activities such as announcements, dealing with discipline problems and commenting on irrelevant issues could further reduce the time available for learning. Finally, the teachers should allocate sufficient time to each important activity for learning. The areas of activities were related to:

- (a) *Lesson structuring*: Issues discussed concerned the extent to which each lesson is connected with previous ones, the structure of the lesson is explained to students when appropriate, the activities taking place in the lesson are linked to previous ones, the lesson is developed on the basis of ideas proposed by the students and the main points and important elements of each lesson are both identified and emphasised.

- (b) *Use of application activities/exercises*: Issues discussed were related to the following: the teacher provides the opportunity for students to practise the implementation of knowledge and skills in each lesson, feedback should be given to students while they are working on application activities and the teacher could raise questions with individual students while they work on application activities in order to identify and tackle misunderstandings.
- (c) *Questioning and providing feedback*: Issues discussed concerned the extent to which effective teachers ask many questions and involve students in class discussion and also whether students are given sufficient time to think about their answers after a question has been put to them.

### ***Second Group (Stage 2): Incorporating Aspects of Quality and Touching on Active Teaching***

The area of interest in this stage was the distribution of learning activities throughout the lesson or unit (stage dimension), focusing on when an activity takes place. The areas of activity were related to:

- (a) *Stage of the application tasks*: When should they be assigned and what should the content include? Issues discussed concerned the following: the application tasks should take place at different times during each lesson, not necessarily at the end of the lesson; the application activities should be part of every lesson; application activities could involve knowledge and skills taught during the lesson, which the student might also need to apply to new contexts; and application tasks could also involve learning targets and knowledge from previous lessons or units.
- (b) *Quality of the lesson structuring*: Issues discussed were related to the following requirements: structuring should take place at different times during a lesson, the lesson or activity should be linked to previous ones, the main points and important elements of each lesson should be identified and stressed and regular revision should take place (e.g. through questioning).

### ***Third Group (Stage 3): Acquiring Quality in Direct Teaching and Reaching Out***

The area of interest here was the development of the classroom learning environment, with particular emphasis on the active involvement of students in the construction of new knowledge. The areas of activities were related to:

- (a) *Orientation of the students to the learning goals and objectives of the lesson activities*: Issues discussed were related to involvement of students in identifying the objectives and learning goals of the lesson, the need for the teacher to

explain the purposes and objectives of the lesson or activity when appropriate, the students being asked by the teacher to think and explain why certain activities take place during the lesson and the need to 'sum up' at the end of each lesson with a review of the initial learning goals.

- (b) *Development of the classroom as a learning environment*: Issues discussed were concerned with the extent to which interactions between the teacher and students, as well as between students, take place regularly and at different times; the purpose of the interactions is for learning; the teacher encourages the students to express different and opposing views and opinions; the teacher challenges the students to defend their arguments from opposing standpoints; students are encouraged to find different ways of solving problems; and students are encouraged to interact in order to discover knowledge (e.g. finding a solution to a given mathematical problem by drawing their own diagrams).

#### ***Fourth Group (Stage 4): Differentiation of Teaching and Putting Aspects of Quality into New Teaching***

The area of interest for this group was the differentiation of teaching in relation to the application tasks, questioning, lesson structuring and orientation of the students to the lesson's learning objectives. The areas of activities were related to:

- (a) *Differentiation of teaching*: The teachers should shape their teaching by taking into account all the factors associated with students' attainment, personal characteristics and background variables in order to maximise each student's learning potential. These factors include students' readiness, pre-existing knowledge, interests, learning profile, self-esteem and socio-economic level. Issues discussed were related with the extent to which differentiation exists in the type and difficulty level of teacher questioning; certain questions may be directed to specific students and not to the whole class; the teacher considers the type of questions they raise with certain groups of students (convergent/divergent thinking); the teacher is aware of the feedback they give to certain groups of students; differentiation takes place in the application tasks; the teacher might not assign the same application tasks to all students in their classroom; and the teacher organises anchor activities to manage students who often finish their application tasks first.
- (b) *Orientation of the students to the learning goals and objectives of the lesson activities*: Issues discussed were related with the extent to which groups of students could be asked to identify different lesson objectives and learning goals of different activities, and the teacher also asks different students to consider and explain why certain activities take place in the lesson. Following this, each teacher developed his or her own action plan under the supervision and guidance of the research team.



## Chapter 10

# Broadening the Scope of the Dynamic Integrated Approach to Teacher Professional Development

### Introduction

In this chapter, two projects on the use of the DIA for the improvement of teacher effectiveness are discussed. Each study explored ways to expand the scope of the DIA by taking into account areas of concern addressed by teacher professional development research. The first was an attempt to suggest how the DIA can be used to improve the assessment skills of teachers. The stages of teachers' skills in conducting assessment were first of all identified. We also examined whether the DIA could be used to design courses on assessment, which would support the formative function of assessment. Although the formative purpose of assessment has been widely promoted by the educational community (Gipps, 1994; Popham, 2006; Shepard, 2000; Stiggins, 1999; Stobart, 2004), assessment research literature has failed to impact upon teachers' everyday assessment practices, which still appear to be outcome-oriented (Earl & Katz, 2000; Lock & Munby, 2000). This study was also an attempt to demonstrate how the DIA could be used to offer courses concerned with specific teacher factors.

The second project attempted to identify the added value of using the DIA to develop school-based INSET courses. Specifically, two main strands of research in teacher education can be discerned. The first is concerned with the focus of teacher education on the development of specific competencies (Berliner, 1994) and the other with the provision of a more HA. The latter not only addresses specific knowledge and skills but also reflects on experiences and beliefs (Calderhead & Shorrock, 1997). The other strand is related to the question of where teacher in-service training should take place and its impact on the SLE (Ponte, Matos, Guimaraes, Leal & Canavarro, 1994). The projects described in this chapter attempted to expand the DIA by providing answers to questions emerging from research on these strands of teacher education. They also investigated the importance of using the DIA to offer courses internally (school-based in-service training) or externally, and the relative impact of DIA compared to that of either the HA or the CBA.

## **Searching for Stages of Teacher Skills in Assessment: Implications for Research on Teacher Professional Development**

### *The Theoretical Background of the Study*

Teacher assessment is considered an integral part of teaching (Broadfoot & Black, 2004; Delandshere, 2002; Gipps, 1994; Harlen & James, 1997; Linn, 1993). Assessment is defined as the systematic process of gathering information about student learning (Shepard, 2000). It involves making our expectations explicit and public; setting appropriate criteria and high standards for learning quality; systematically gathering, analysing and interpreting evidence to determine how well performance matches those expectations and standards; and using the resulting information to document, explain and improve performance (Angelo, 1995). Teacher assessment's impact on learning has been widely documented in the literature (Boud, 1995; Butler & Winne, 1995; Crooks, 1988; Nicol & Macfarlane-Dick, 2006; Sadler, 1989). Consequently, the dynamic model refers to teacher assessment as an important teacher factor. It also is stressed that assessment should serve a formative purpose, and research evidence shows that teachers and schools which make use of assessment data for formative reasons are more effective (Brookhart, 2004; Delandshere, 2002; Krasne, Wimmers, Relan & Drake, 2006; Kyriakides, 2005a). However, there is little research investigating teachers' assessment skills, either for formative or summative purposes (Mok, 2010; Wiliam, Lee, Harrison & Black, 2004). This project attempted to find out not only whether teacher assessment skills could be grouped into different developmental levels but also whether teachers who master higher-level skills were more effective than others. This project moved a step further by investigating the extent to which the DIA could be used to help teachers develop their assessment skills.

### *A Framework for Investigating Teachers' Skills in Assessment*

In order to examine teachers' skills in assessment, a framework based on the assessment process, as described in the literature, was developed. Firstly, the necessary skills across the main phases of the assessment process were identified in order to create a comprehensive view of what teachers should be able to do in relation to classroom assessment. Traditional as well as alternative assessment techniques were taken into consideration since the literature supports the use of a combination of assessment techniques to assess student learning. Finally, a measurement framework developed within the field of EER was adopted. A brief description of the three aspects follows.

**Fig. 10.1** The assessment cycle illustrating the four phases of assessment



**Main Phases of the Assessment Process**

Classroom assessment is frequently presented in the literature as a cycle subdivided into a number of phases (e.g. Birenbaum, 2007; Bright & Joyner, 1998; Calfee & Masuda, 1997; National Council of Teachers of Mathematics (NCTM), 1995), the most common of which being planning, gathering and interpreting evidence and use of results. In addition, other important and distinctive aspects of the process are also discussed in the literature, such as the construction of assessment tools (Brookhart, 1997; De Lange, 1993), assessment administration (Anderson, 2003; Shepard, 2007), recording of assessment information (Goldhaber & Smith, 2002; Kroeger & Cardy, 2006; Schmoker, 2006) and communicating assessment results (Anderson, 2003; Stiggins, 2004). In order to measure teachers’ assessment skills, this study took into account four distinctive phases of the assessment cycle (see Fig. 10.1) which showed that teachers should make sure that (a) appropriate assessment instruments are used to collect valid and reliable data, (b) appropriate procedures in administering these instruments are followed, (c) the data that emerge from assessment are recorded in an efficient way without losing important information and (d) the results of assessment are reported to parents and students, and they are helped to take decisions on how support for students can be provided in order to improve their learning outcomes.

**Planning and Construction of Assessment Tools**

This phase is concerned with skills relating to the planning and design of assessment as well as the construction of the assessment tools, as these are recognised in the literature. Therefore, the skills included cover decisions concerning the purpose that an assessment aims to serve (Brookhart, 2003; Gipps, 1994; Pellegrino, Chudowsky & Glaser, 2001; Torrance & Pryor, 1998), the definition of learning goals against which a student will be assessed (Herman, Osmundson, Ayala, Schneider & Timms, 2006; Sadler, 1989) as well as the selection and/or development of quality assessment tools by means of which the purpose and goals of the assessment will be achieved (Green & Mantz, 2002; Shepard, 2000).

### Administration of Assessment Instruments

The second phase concerns skills associated with the administration of the assessment instruments. Skills included refer to decisions regarding the timing of an assessment, assessment's link to instruction, the variety of techniques used as well as the teachers' role during assessment administration (Anderson, 2003; Black & Wiliam, 1998; Shepard, 2007).

### Recording and Analysing Data

This phase refers to skills associated with the documentation of assessment results (Goldhaber & Smith, 2002; Kroeger & Cardy, 2006; Schmoker, 2006), eliciting information (Duschl & Gitomer, 1997; Schafer, 1991; Schmoker, 2006) as well as how this information is used (Stiggins & Chappuis, 2008; Stiggins & DuFour, 2009).

### Reporting Results to Students and Parents

The last phase refers to skills related to the communication of assessment results to intended users. Therefore, skills included in this phase refer to decisions concerning the purpose of reporting (Guskey & Bailey, 2001; Harlen & James, 1997), the audience of reporting (Stiggins, 2004) the instruments used to report data (Guskey & Bailey, 2001) as well as the quality of teacher communication with parents and students (Stiggins, 2004).

### Assessment Techniques

Assessment techniques play an important role in ensuring the quality and effectiveness of assessment since they usually have an influence on how and what students learn. Choosing an assessment technique depends on the target to be assessed since student achievement in relation to certain targets can be more appropriately measured by using specific techniques (Stiggins, 1992). For example, valid assessment of students' skills in oral communication requires the use of different oral assessment techniques rather than the use of written tests. In addition, the use of a variety of techniques allows students to demonstrate different types of learning. Given the development of alternative assessment methods as well as the re-conceptualisation of existing traditional methods (Green & Mantz, 2002; Shepard, 2000), it was considered necessary to examine assessment skills in relation to the four most common types of assessment techniques: (a) written assessment, (b) oral assessment, (c) observation and (d) performance assessment. For example, there was examination of whether different types of written questions were included in teacher tests and also whether formal and/or informal oral assessment was used to measure student achievement in mathematics.

**Table 10.1** The theoretical framework for measuring teacher assessment skills

Assessment phases	Assessment techniques	Measuring dimensions of the dynamic model
(1) Planning/construction of tools	(1) Written assessment	(1) Frequency
(2) Assessment administration	(2) Oral assessment	(2) Focus
(3) Recording of assessment information	(3) Observation	(3) Stage
(4) Reporting	(4) Performance assessment	(4) Quality
		(5) Differentiation

## Measurement Dimensions

The dimensions used to measure teacher skills in assessment draw on methodological and theoretical developments in the area of educational effectiveness (Creemers, Kyriakides & Sammons, 2010). Previous studies in the field of EER focused mainly on measuring the frequency dimension of factors associated with student achievement (see Creemers & Kyriakides, 2006). However, recent studies have shown that qualitative characteristics of effectiveness factors should also be taken into account (e.g. Heck & Moriyama, 2010; Kyriakides & Creemers, 2008). In this context, the dynamic model of educational effectiveness was developed, and a measurement framework using both quantitative and qualitative characteristics of effectiveness factors was proposed (see Chap. 7). Given that the dynamic model treats teacher assessment as a factor associated with student achievement, it was considered relevant to make use of the measurement framework proposed by this model in measuring assessment skills. Specifically, the following five dimensions used in the model to measure the functioning of each classroom factor were employed: (a) *frequency*, (b) *focus*, (c) *stage*, (d) *quality* and (e) *differentiation*. These dimensions are supposed to contribute to the effects that a factor is expected to have on student outcome measures. Moreover, they help us describe in better way the functioning of a factor. Specifically, frequency is a quantitative way to measure the functioning of each effectiveness factor, whereas the other four dimensions examine qualitative characteristics of the functioning of the factor operating at the system/school/classroom level (see Chap. 7). The dimensions are important not only from a measurement perspective but also, and even more so, from a theoretical point of view. Actions of teachers associated with each factor can be understood from different perspectives and not only by giving emphasis to the number of cases the actions occur in their assessment practice. In addition, the use of these dimensions may help us develop strategies for improving teaching and assessment since the feedback given to teachers can refer not only to quantitative but also to qualitative characteristics of their teaching and assessment practice.

Table 10.1 shows the theoretical framework that was used in measuring assessment skills. Specifically, each of the four assessment phases was defined by taking into account the five dimensions of the dynamic model and in relation to the teacher ability to use each of the four most common assessment techniques.

### ***Research Design and Results of the First Phase of the Study***

By taking into account the theoretical framework and its dimensions, a teacher questionnaire was developed and administered to a representative sample of 10% of Cypriot primary teachers at the beginning of the 2010–2011 school year. Of the 240 teachers approached, 178 responded, a response rate of 74.2%. The questionnaire was concerned with their skills in assessment of mathematics in grades 3–6 of primary school. In order to examine the internal validity of the questionnaire data, semi-structured interviews with eight teachers were also conducted. These qualitative data were analysed using the constant comparative method. Comparing the results from each interviewee with their responses to the questionnaire provided support for the internal validity of the study (see Christoforides & Kyriakides, 2011).

The extended logistic model of Rasch (Andrich, 1988) was used in order to identify the extent to which the assessment skills measured by the questionnaire could be reducible to a common unidimensional scale. The Rasch model not only tests the unidimensionality of the scale but is also able to find out whether the tasks can be ordered according to the degree of their difficulty. At the same time, the people who carry out these tasks can be ordered according to their performance in the construct under investigation. This procedure is justified theoretically and has been used in studies on teacher evaluation (e.g. Burry & Shaw, 1988; Wang & Cheng, 2001; Wright & Linacre, 1989). For this study, specifying the position of one assessment skill on the scale provided exact information about the individuals (teachers) who were able to perform sufficiently (i.e. those scoring higher than the position of this assessment skill on the scale) or insufficiently (those scoring lower than the position of this assessment skill). This analysis also made it possible to make statements about the relative difficulty of each assessment skill. Similarly, specifying an individual teacher's position on this continuum provided information about the probability of this teacher showing assessment competence below or above this position (Bond & Fox, 2001).

Thus, the Rasch model was applied to the whole sample of teachers and all 87 measures concerned with their assessment skills, using the computer program Quest (Adams & Khoo, 1996). Figure 10.2 illustrates the scale for the 87 measures of assessment skills with item difficulties and teacher measures calibrated on the same scale. Eighty-seven questionnaire items measuring teacher assessment skills had a good fit to the measurement model, indicating strong agreement among the 178 teachers located at different positions on the scale across all 87 items. Moreover, the questionnaire items were well targeted against the teachers' measures since teachers' scores ranged from  $-3.14$  to  $3.11$  logits, and item difficulties ranged from  $-3.11$  to  $3.34$  logits. Furthermore, Table 10.2 provides a summary of the scale statistics for the whole sample and the two subgroups (female and male teachers). Reliability was calculated using the Item Separation Index and the Person Separation Index. Separation indices represented the proportion of the observed variance considered to be true. A value of 1 represented high separability in which errors were



**Table 10.2** Statistics relating to the questionnaire measuring assessment skills that emerged from each administration period based on the whole sample and the two groups

Statistic	Before			After		
	Whole sample (n = 178)	Female (n = 109)	Male (n = 69)	Whole sample (n = 163)	Female (n = 96)	Male (n = 67)
Mean						
Items <sup>a</sup>	0.00	0.00	0.00	0.00	0.00	0.00
Persons	0.08	0.10	0.07	0.38	0.39	0.37
Standard deviation						
Items	1.12	1.02	1.05	1.09	1.04	1.07
Persons	1.02	0.96	0.93	1.01	0.99	0.95
Separability						
Items	0.99	0.98	0.99	0.99	0.99	0.99
Persons	0.95	0.94	0.93	0.96	0.95	0.94
Mean infit mean square						
Items	0.99	1.00	0.99	1.00	1.02	0.99
Persons	1.00	1.00	1.00	1.01	1.02	0.98
Mean outfit mean square						
Items	1.03	1.02	1.03	1.03	1.05	1.04
Persons	1.04	1.07	1.03	1.02	1.07	0.98
Infit t						
Items	0.04	0.05	-0.01	-0.03	-0.03	-0.02
Persons	0.02	-0.04	-0.03	0.02	-0.04	0.06
Outfit t						
Items	0.01	0.03	-0.05	0.01	0.02	0.04
Persons	0.06	0.05	0.04	0.06	0.03	0.05

<sup>a</sup>L = 87 items

The results of the various approaches used to test the fitting of the Rasch model to our data also revealed that there was a good fit to the model when teachers' performance in these assessment skills was analysed. Specifically, all assessment skills were found to have item infit with the range 0.85–1.16 and item outfit with the range of 0.76–1.40. All the values of infit t for both persons and assessment skills were greater than -2.00 and smaller than 2.00. Finally, the procedure proposed by Yen (1993) was also used to test for local independence, and it was found that this was generally not violated (see Kyriakides & Christoforides, 2011).

### Using Cluster Analysis to Specify Levels of Difficulty

Having established the reliability of the scale, the procedure for detecting pattern clustering in measurement designs developed by Marcoulides and Drezner (1999) was used to find out whether assessment skills were grouped into levels of difficulty that might be taken to stand for types of teacher behaviour in evaluating student achievement in mathematics which move from relatively easy to more difficult. Applying this method to segment, the assessment skills on the basis of their



difficulties that emerged from the Rasch model showed that they were optimally grouped into four clusters. Specifically, the cumulative D for the four-cluster solution was 59%, whereas the fifth gap added only 2%. A description of the four different stages/types of teacher assessment behaviour is given below.

#### Type 1: Using Written Tests to Measure Basic Skills in Mathematics for Summative Reasons

The assessment skills included in this stage revealed that teachers ( $n=56$ ) demonstrating this type of behaviour used everyday assessment routines. Type 1 teachers enriched or altered ready-made written tests and used a variety of types of written questions to assess students' performance. However, they did not use oral assessment and/or observation to assess their students' performance in a systematic way. Finally, records were kept only in relation to written assessment results, whereas results were reported only to parents for summative purposes.

#### Type 2: Using Different Techniques of Assessment to Measure Basic Skills in Mathematics

The assessment skills included in this stage revealed that teachers ( $n=48$ ) demonstrating this type of behaviour were able to use the various techniques of assessment in an appropriate way in order to measure basic skills in mathematics. Specifically, type 2 teachers created a specification table before developing their written tests. In this way, they tried to ensure that their tests were representative of what had been taught in the classroom. They also included test items which measured the students' ability to give a correct answer to a question and items which investigated the process that was used by each student in his/her attempt to find an answer to a problem (i.e. process questions were included). In designing test items, they also took into consideration their students' abilities. In addition, they reported that they offered clarification to students during assessment administration and that they planned oral assessment and observation. With regard to the recording of assessment data, they used descriptive comments to give feedback to their students. Finally, they reported to parents the assessment results of their students.

#### Type 3: Using Assessment Techniques to Measure More Complex Educational Objectives for Formative Reasons

Teachers demonstrating this type of behaviour ( $n=47$ ) were able to use assessment techniques to measure more complex educational objectives in mathematics, such as their ability to communicate by using mathematics. Thus, observation was used in a systematic way by setting specific goals and creating observation tools in relation to these goals. Recording was carried out for data deriving from all assessment

techniques, not merely written assessment (as with type 2 teachers), and took the form of goal- and/or exercise-specific documentation. In addition, reporting was conducted for formative reasons and was expanded to cover all assessment techniques. Teachers at this stage also reported presentation of assessment information not only to parents but also to their students. Finally, group assessment was used in a systematic way and was concerned with each student's contribution to the team work rather than with the team's overall performance.

#### Type 4: Differentiation in Assessment: Applying Assessment in and for Different Occasions and Students

Based on the assessment skills included in this type of behaviour, it appeared that type 4 teachers ( $n=27$ ) were able to differentiate assessment procedures and tools based on their students' needs. Therefore, teachers at this stage did not use the same written tests to measure the achievement of different groups of students, and they were more flexible during the administration process (e.g. they gave extra tasks to those who finished earlier and more time to slow learners). They also differentiated reporting of assessment information to both parents and students (e.g. reporting was done more often to those needed it; they used different forms/languages that were in line with the educational level of parents) and ensure that teacher-parent communication took place, especially when the latter were not in the habit of visiting the school.

### *The Second Phase of the Project*

Having identified the four developmental stages of teacher assessment skills, a decision was taken to investigate the extent to which the DIA could be used for improving teachers' skills in assessment. In order to achieve this, an experimental study was conducted using a similar approach to that of the study reported in Chap. 9. Specifically, this second phase of the study aimed to compare the impact of a teacher professional development programme in mathematics assessment, based on the DIA, with the impact of a programme using the CBA. For this reason, teachers who participated in the first phase of the study ( $n=178$ ) were invited to attend a teacher professional development programme offered at the University of Cyprus. The programme was to be completed through seven three-hour meetings which took place between November 2010 and May 2011. All meetings were scheduled in non-working time and volunteer participation applied. Of the 178 teachers, 76 agreed to use their free time to attend this course. The fact that more than two out of five of the teachers who were invited agreed to participate in the programme and spend their own free time for professional development reasons revealed the interest that teachers had in improving their assessment skills. This group of teachers was

divided into two experimental groups. Teachers who did not attend any INSET course ( $n = 102$ ) were treated as members of the control group. During this phase, data on student achievement in mathematics were collected, at both the beginning and the end of the intervention (i.e. school year 2010–2011). In addition, the teacher questionnaire (measuring assessment skills) was administered to all teachers at the end of the school year. In this way, we were able to compare the impact of each programme on both improving the assessment skills of teachers and also on student achievement gains in mathematics. The added value of each experimental group could also be identified by comparing each group with the control group. It is finally important to note that only eight teachers left the programme, but only four were from the experimental groups (two from group 1 and two from group 2). In addition, students whose data about prior or final attainment were missing were less than 5% of the original sample, and therefore, they were excluded from each analysis. The four steps of the intervention are elaborated below.

### **Step 1: Initial Evaluation of Teachers' Assessment Skills and Student Outcomes**

During the first step of the intervention, teachers' assessment skills were evaluated in order to examine whether specific types of assessment behaviour could be identified. Thus, a teacher questionnaire was administered to all participating teachers, and a number of structured interviews were conducted. In addition, data on student achievement were collected using external written forms of assessment designed to assess knowledge and skills in mathematics. A detailed description of the instruments used is provided in the next part of this section. Using the Rasch model, questionnaire data were analysed, and four types of assessment behaviour were identified. Based on the analysis, participating teachers were grouped into the four stages of assessment skills mentioned above.

### **Step 2: Allocation of Teachers into Treatment Groups**

During the second step of the intervention, two treatment groups were formed. In particular, the teachers who, according to the evaluation of their assessment skills, were found to be in a certain developmental stage were randomly allocated evenly into two groups. For example, the 10 teachers who proved to be at stage 1 were randomly allocated into the two experimental groups, each one consisting of five teachers. Each group employed a different professional development approach in order to improve participating teachers' assessment skills. The first treatment group employed the DIA, whereas the second employed the CBA. Therefore, teachers in the first group received training only in the assessment skills associated with their developmental stage, whereas teachers in the second group received training in the assessment skills associated with all four developmental stages.

### **Step 3: Training Sessions**

The third step of the intervention took place between November 2010 and May 2011. During this time, teachers participated in a series of seven training sessions aimed at improving their assessment skills using the relevant professional development approach. The first session was the same for both groups, whereas the rest of the sessions were held separately for each group. A description of the sessions for each group is provided below.

#### Session 1

The first session was common to both groups, and therefore, all 72 teachers attended. It served as an introductory session aimed at presenting the overall scope, goals and procedures of the programme to the participants. Particular emphasis was also placed on the programme's evaluation procedures. Teachers were informed that the focus of the evaluation was going to be the impact of the programme on the assessment skills of teachers and on student outcomes. It was made clear that provision had been made to ensure the anonymity of the participants and confidentiality of the evaluation results. Finally, training in how to develop an action plan was provided.

#### The DIA Group Sessions

During this second session, teachers were distributed into four smaller groups, each group consisting of teachers at the same developmental stage. The working groups established were used for all sessions until the end of the programme. The members of the research team provided an overall description of the focus of each working group, making clear the skills on which each team had to work to improve. Specific areas of activity were identified for each team. At the same time, supporting material related to these areas was provided. Finally, each teacher developed his/her own action plan by exchanging ideas with the research team and the members of his/her group. Since sessions were held once a month, sufficient time was available for teachers to pursue the goals set in their action plan. During the subsequent sessions, each working group worked separately. With the support of the research team, teachers in each group were asked to reflect on their experiences and identify effective or non-effective practices related to their area of focus, share comments on the activities implemented and receive and provide feedback. Additional material was also provided in each session. Furthermore, teachers were asked to complete exercises in the areas of activity relating to their focus area. The purpose of these exercises was to encourage collaboration within the team while providing practical examples of new knowledge and skill application. Teachers were also encouraged

to revise their action plans on the basis of their own and others' experiences and the material provided.

### The CBA Group Sessions

The primary aim of these sessions was to improve teachers' competence in assessment by providing the necessary knowledge associated with all the identified assessment skills. In particular, teachers received training in each skill separately. Initially, the programme was concerned with the easiest assessment skills (i.e. those with the negative logit scores in the Rasch scale) and gradually moved on to the most difficult ones. In this way, all of the skills in the four focus groups were covered, and it was expected that every teacher could master all the assessment skills. Opportunities for application of this knowledge were also given in the practical part of the session. Teachers were also expected to create a new action plan for each focus area. Teachers in the CBA group were also distributed into four smaller groups, but all groups were given the same training and the same material and application activities in each session.

### **Step 4: Final Evaluation of Teachers' Assessment Skills and Student Outcomes**

During the fourth and final step of the intervention, teachers' assessment skills and student outcomes in mathematics were measured using the same procedures and instruments as in phase I. In particular, teachers' assessment skills were measured using the same questionnaire, and structured interviews were conducted. Student outcomes in mathematics were measured using the same pool of written assessment instruments. Then, a final meeting took place in order to present the results of the study to participating teachers and obtain feedback for the programme. Positive and negative aspects were identified, and suggestions for improving the training programme were made. In particular, teachers in experimental group A (DIA) recognised as positive the fact that the training offered was addressing their improvement needs and thus provided them with a more comprehensive view of the skills involved. Opportunities to examine the skills in depth were provided as well as the time to put them into practice. However, teachers in this group felt that with this approach they had missed the opportunity to receive training in other skills not included in their focus area. On the other hand, teachers in experimental group B (CBA) recognised as positive the fact that their training provided them with an overall view of assessment skills. Starting from the basic and moving on to the more advanced skills helped them to understand better what effective assessment practice entails. However, they also viewed as negative the fact that due to the large number of skills involved, it was difficult to find ways to apply them all in their classroom practice. Teachers from both groups expressed their wish for a follow-up professional development programme during the next school year.

## ***Research Instruments***

In order to examine the impact of the DIA and the CBA, data concerning teachers' assessment skills, as well as student performance in mathematics, were collected. The instruments used were (a) teacher questionnaire, (b) teacher interviews and (c) written tests in mathematics. A brief description of the instruments used follows:

### **Teacher Questionnaire**

In order to measure teachers' assessment skills, a questionnaire developed and used during the first phase of the study was administered (see Christoforides & Kyriakides, 2011). The use of the questionnaire had two major aims: firstly, to validate the four stages identified in the first phase of the study and secondly, to evaluate teachers' assessment skills at the beginning and at the end of the intervention in order to examine the impact of each intervention. Data analysis provided further support for the identification of the four stages, and thus, the use of the questionnaire in this study was justified.

### **Teacher Interviews**

In addition to the questionnaire, semi-structured interviews were conducted at the beginning and at the end of the intervention in order to match responses using different research instruments and ensure the internal validity of the results. Qualitative data that emerged from interviews were analysed by using the constant comparative method (Maykut & Morehouse, 1994) in order to conduct 'within-case analysis' (Denzin & Lincoln, 1998) of each teacher's responses to the interview and link them with his/her responses to the questionnaire. For this reason, transcripts were read with the intention of identifying integrating themes, foci, frequently used metaphors and possible incongruities. Matching teachers' responses from the interviews with the questionnaire data provided support for the internal validity of the study (see Christoforides & Kyriakides, 2011).

### **Written Tests in Mathematics**

Criterion-referenced equated tests were used to assess students' achievement at the beginning and at the end of the intervention. The tests used had been developed and validated in other studies conducted in Cyprus (e.g. Antoniou, 2009; Kyriakides, 2005b; Kyriakides & Creemers, 2008). None of the respondents achieved a full score, and none showed a zero performance. Moreover, less than 5% of the students achieved over 80% of the maximum score, and less than 10% of the students achieved over 70% of the maximum score. Based on the range of the results, the ceiling and floor effects in the attainment data were not observed.

*Equating of Tests.* Equating was carried out using IRT modelling. The method of equating follows the same procedure as that used in the PISA studies. However, in PISA, equating is horizontal (equating the different versions of tests), whereas in this study, the equating was vertical (see also Chap. 9). Specifically, the scores were transferred onto the same scale on the basis of characteristics of IRT models in which students' latent level of ability ( $y$ ) and difficulty level of an item ( $b$ ) are identical when certain preconditions are fulfilled. The latent ability level for each student can be determined in every version as long as there are so-called anchoring items connecting the versions. For the purposes of this study, we used sufficient common items (i.e. approximately 8% of anchoring items across the tests) with representative content to be measured (Kolen & Brennan, 1995). Estimation was made by the extended logistic model of Rasch (Andrich, 1988), which revealed that each scale had satisfactory psychometric properties (see Antoniou, 2009). Thus, for each assessment period, achievement in mathematics was estimated by calculating the Rasch person estimates.

### ***The Main Results of the Second Phase of the Project***

Results concerned with the impact of each intervention on assessment skills are presented in the first part of this section. In the second part, the effect of each intervention on student achievement in mathematics is examined.

#### **Impact on Teacher Assessment Skills**

Firstly, the questionnaire data were analysed in order to validate the identification of the four types of assessment behaviour. The extended logistic model of Rasch (Andrich, 1988) was used in order to confirm that the dimensions of the skills measured by the questionnaire could be reducible to a common unidimensional scale. Specifically, the Rasch model was applied to the whole sample of teachers and all 87 measures concerned with their assessment skills, using the computer program Quest (Adams & Khoo, 1996). The results of the various approaches used to test the fitting of Rasch model to our data revealed that there was a good fit to the model when teachers' performance in these assessment skills was analysed (see Christoforides & Kyriakides, 2011). Having confirmed the reliability of the scale, the procedure for detecting pattern clustering in measurement designs developed by Marcoulides and Drezner (1999) was used to examine whether assessment skills could be grouped into levels of difficulty that might be taken to stand for types of teacher behaviour in assessment. Applying this method to segment the assessment skills on the basis of their difficulties that emerged from the Rasch model confirmed that they were optimally clustered into four clusters.

The analysis procedure described above was also used to analyse data from the final measurement. All teaching skills were found to have item infit with the range

0.88–1.15 and item outfit with the range of 0.79–1.38. All the values of infit  $t$  for both persons and assessment skills were greater than  $-2.00$  and smaller than  $2.00$ . By comparing the difficulty index of all items in the scales that emerged from the two data collection phases (i.e. at the beginning and at the end of the school year), it was found that most items had difficulties that could be considered invariant across the two administration periods, within measurement error (0.13). This implies that person estimates that emerged from the two Rasch analyses could be considered as comparable. By applying the procedure for detecting pattern clustering in measurement designs, it was discovered that assessment skills could be grouped into the same four levels of difficulty identified through the analysis of which emerged from the first measurement. Specifically, the cumulative  $D$  for the four-cluster solution was 64%, whereas the fifth gap adds only 2%.

In order to measure the impact of the two professional development programmes upon teachers' skills in assessment, the Rasch person estimates of each group were compared. Table 10.3 presents the means and standard deviations of teacher scores in each experimental group and the control group, which emerged by measuring assessment skills at the beginning and at the end of the intervention. Firstly, we can observe that the initial mean scores of the three groups were almost the same. One-way analysis of variance revealed no statistically significant difference among the three groups with regard to the initial Rasch person estimates ( $F=0.011$ ,  $p=0.989$ ). Secondly, the final score of teachers employing the DIA (mean= $0.43$ ,  $SD=0.99$ ) was bigger than their initial score (mean= $-0.05$ ,  $SD=1.03$ ), and the  $t$ -test paired sample revealed that this difference was statistically significant ( $t=7.81$ ,  $df=35$ ,  $p=0.001$ ). This finding reveals that teachers employing the DIA managed to improve their assessment skills. On the other hand, the mean final and initial scores of the control group were almost the same, and the  $t$ -test paired test revealed that teachers in the control group did not manage to improve their assessment skills ( $t=0.103$ ,  $df=97$ ,  $p=0.92$ ). Thirdly, the  $t$ -test paired sample test revealed that teachers employing the CBA also managed to improve their assessment skills ( $t=3.89$ ,  $df=35$ ,  $p=0.001$ ).

In order to identify whether each intervention had an impact on the assessment skills of teachers, a regression analysis was also employed. The final score of teachers was treated as a dependent variable, whereas the initial score, as well as two dummy variables measuring the impact of each intervention, was treated as independent variables. In this way, the control group was treated as the reference group. The model that was found to fit better with the data was able to explain a very large percentage of the variance in the final score for teachers skills in assessment (82%), and all three variables were entered into the equation that emerged, which is given below:

$$\text{Post-score} = -0.002 + 0.868 * \text{pre-score} + 0.474 * \text{DIA} + 0.216 * \text{CBA} + r$$

It is finally important to note that by comparing the standardised beta coefficients, we can see that the impact of the DIA (0.200) was bigger than that of the CBA (0.091). This implies that teachers employing the DIA managed to improve their skills at a statistically higher level than those employing the CBA. Furthermore, by



**Table 10.3** Means and standard deviations of teacher scores measuring assessment skills of the control and the experimental groups before and after the intervention

Group	Before		After	
	Mean	SD	Mean	SD
Control group ( <i>n</i> =98)	-0.05 <sup>a</sup>	1.00	-0.04	0.97
Employing DIA ( <i>n</i> =36)	-0.05	1.03	0.43	0.99
Employing CBA ( <i>n</i> =36)	-0.06	0.97	0.17	0.88

<sup>a</sup>Rasch person estimates in logits

comparing the classification of teachers into different stages at the beginning and at the end of the intervention, it was found that 13 out of 36 teachers in the group employing the DIA managed to move on to the next more demanding stage, whereas the other 23 teachers remained at the same stage. Specifically, four teachers in this experimental group moved from stage 1 to stage 2, six teachers at stage 2 managed to move on to stage 3 and three teachers situated at stage 3 were found to be at stage 4 at the end of the intervention. On the other hand, only five teachers in the group employing the CBA managed to progress to the next most demanding stage, whereas almost all teachers of this group (i.e. 31 out of 36) remained at the same stage. More specifically, four teachers managed to move from stage 1 to stage 2, and one teacher progressed from stage 2 to stage 3. Finally, by using the *t*-test paired sample, it was found that teachers situated at stages 3 and 4, who made use of the CBA, did not make any statistically significant progress in their skills ( $t = 1.13, df = 13, p = 0.279$ ), whereas teachers in these two stages employing the DIA managed to improve at a statistically significant level ( $t = 6.05, df = 18, p = 0.001$ ).

### Impact on Student Outcomes

The results of the multilevel analysis conducted in order to measure the impact of each of the two approaches to teacher professional development on student achievement are presented in this part. Empty models with all possible combinations of the levels of analysis (i.e. student, teacher and school) were established, and the likelihood statistics of each model were compared (Snijders & Bosker, 1999). An empty model consisting of student, teacher and school level represented the best solution. Statistical power is also an issue that has to be taken into account in using multilevel modelling approaches to analysing nested data (Cools, De Fraine, Van den Noortgate & Onghena, 2009). It is typically recommended that at least 40 higher-level units be sampled in order to tap sufficient variance. In this study, the sample consisted of 174 teachers employed at 62 different schools, and therefore, the three-level model was considered appropriate. The empty model revealed that 74.3% of the total variance was situated at the student level, 16.7% of the variance was at the classroom level and 9.0% was at the school level. In subsequent steps, explanatory variables at different levels were added, starting at the student level. Explanatory variables, but not grouping variables, were centred as *Z*-scores with a mean of 0 and a standard deviation of 1.

This is a way of centring around the grand mean (Bryk & Raudenbush, 1992) and yields effects that are comparable. Grouping variables were entered as dummies with one of the groups as the baseline (e.g. girls=0). The models presented in Table 10.4 were estimated without the variables that had no statistically significant effect at level 0.05.

In model 1, the context variables at each level and the teacher background information were added to the empty model. The following observations arise from the figures of the third column of Table 10.4. Firstly, model 1 explained 33.0% of the variance, most of which was attributed at the student level. Secondly, all student background variables had statistically significant effects on student achievement. Prior knowledge had the strongest effect in predicting student achievement at the end of the school year. In addition, prior knowledge was the only contextual variable which had a consistent effect on achievement when aggregated either at the teacher or the school level. Finally, length of teaching experience was the only teacher background factor which had a statistically significant effect on student achievement.

In model 2, the impact of teacher assessment upon student achievement was investigated. Since teachers were assigned to four developmental stages according to their assessment skills, we investigated the extent to which the classification of teachers into these four stages could explain variation in student achievement. Thus, teachers at stage 3 were treated as a reference (or baseline) group, and three dummy variables were entered in model 1. The developmental stage at which a teacher was situated was found to have a statistically significant effect on student achievement. Specifically, students of teachers at stage 1 had the lowest achievement, whereas those of teachers at level 4 showed higher achievement than students of teachers at the first three levels. Finally, in model 3, the effect of each approach employed with regard to teacher professional development in assessment was investigated. Thus, teachers in the control group were treated as the reference (or baseline) group, and two dummy variables indicating the teacher professional approach employed (i.e. DIA and CBA) were entered into model 2. Only the effect of the dummy variable measuring the impact of the DIA was found to be statistically significant at 0.05 level.

The results of the multilevel analysis presented above provide evidence that only the DIA yielded better results in student achievement than those produced by the control group. However, it is not clear whether this approach was equally effective for teachers situated at different levels. To test this assumption, four separate multilevel analyses were conducted. Each analysis was concerned only with the teachers at the same stage and not the overall teacher sample. In this way, we could compare the effect size of the variable associated with the use of the DIA and of the CBA upon achievement of students who were taught by teachers situated at different stages of teaching competences. Table 10.5 illustrates the figures of the final model of each of the four separate multilevel analyses which were conducted. In analysing the data that emerged relating to teachers at stage 1, we can observe that not only the DIA but also the CBA had a statistically significant impact on student achievement. In all the other cases, only the DIA was found to have a

**Table 10.4** Parameter estimates and (standard errors) for the analysis of student achievement in mathematics (students within classes, within schools)

Factors	Model 0	Model 1	Model 2	Model 3
<b>Fixed part (intercept)</b>	2.19 (0.40)	1.20 (0.12)	0.66 (0.10)	0.34 (0.10)
<b>Student level</b>				
<i>Context</i>				
Prior achievement in maths		0.64 (0.12)	0.64 (0.11)	0.64 (0.12)
SES		0.41 (0.14)	0.41 (0.14)	0.40 (0.14)
Gender (0=boy, 1 = girl)		0.12 (0.04)	0.11 (0.03)	0.11 (0.03)
<b>Classroom level</b>				
<i>Context</i>				
Average achievement		0.40 (0.10)	0.40 (0.10)	0.40 (0.10)
Average SES		0.21 (0.10)	0.21 (0.10)	0.21 (0.10)
Percentage of girls		N.S.S.	N.S.S.	N.S.S.
<i>Teacher background</i>				
Gender (0= male, 1 = female)		N.S.S.	N.S.S.	N.S.S.
Years of experience		0.14 (0.04)	0.10 (0.04)	0.10 (0.04)
Position (0= teacher, 1 = deputy head)		N.S.S.	N.S.S.	N.S.S.
<i>Quality of assessment</i>				
Stage 1			-0.34 (0.07)	-0.33 (0.07)
Stage 2			-0.19 (0.07)	-0.18 (0.07)
Stage 4			0.18 (0.07)	0.17 (0.07)
DIA group				0.16 (0.06)
CBA group				N.S.S.
<b>School level</b>				
<i>Context</i>				
Average achievement		0.10 (0.04)	0.10 (0.04)	0.09 (0.04)
Average SES		N.S.S.	N.S.S.	N.S.S.
Percentage of girls		N.S.S.	N.S.S.	N.S.S.
<b>Variance components</b>				
School (%)	9.0	7.8	7.1	6.9
Class (%)	16.7	14.2	10.5	9.2
Student (%)	74.3	45.0	44.1	44.0
Explained (%)		33.0	38.3	39.9
<b>Significance test</b>				
$X^2$	1033.4	810.1	705.0	651.3
Reduction		223.3	105.1	53.7
Degrees of freedom		7	3	1
<i>p</i> -value		0.001	0.001	0.001

N.S.S. = No statistically significant effect at level 0.05

statistically significant impact on student achievement. The fixed effects obtained with multilevel analysis could readily be converted to standardised effects or ‘Cohen’s d’ by dividing them by the standard deviations in the ‘treatment groups’. Thus, the relative strength of the effects could be compared more easily across the four

**Table 10.5** Parameter estimates and (standard errors) that emerged from separately analysing achievement of students taught by teachers situated at the same level

Factors	Stage 1	Stage 2	Stage 3	Stage 4
<b>Fixed part (intercept)</b>	0.65 (0.20)	0.58 (0.20)	0.62 (0.10)	0.63 (0.08)
<b>Student level</b>				
<i>Context</i>				
Prior achievement in maths	0.64 (0.12)	0.65 (0.12)	0.68 (0.11)	0.63 (0.11)
Sex (0=girls, 1=boys)	0.10 (0.04)	0.10 (0.04)	0.11 (0.04)	0.10 (0.04)
SES	0.33 (0.11)	0.30 (0.12)	0.35 (0.11)	0.31 (0.12)
<b>Classroom level</b>				
<i>Context</i>				
Average achievement	0.35 (0.09)	0.37 (0.09)	0.35 (0.09)	0.36 (0.09)
Average SES	0.21 (0.09)	0.22 (0.09)	0.21 (0.09)	0.20 (0.09)
Percentage of girls	N.S.S.	N.S.S.	N.S.S.	N.S.S.
<i>Teacher background</i>				
Gender (0=male, 1=female)	N.S.S.	N.S.S.	N.S.S.	N.S.S.
Years of experience	N.S.S.	N.S.S.	N.S.S.	N.S.S.
Position	N.S.S.	N.S.S.	N.S.S.	N.S.S.
<i>Intervention</i>				
DIA	0.11 (0.05)	0.15 (0.05)	0.19 (0.08)	0.18 (0.05)
CBA	0.10 (0.05)	N.S.S.	N.S.S.	N.S.S.
<b>School level</b>				
<i>Context</i>				
Average achievement	0.08 (0.04)	0.08 (0.03)	0.07 (0.03)	0.07 (0.03)
Average SES	N.S.S.	N.S.S.	N.S.S.	N.S.S.
Percentage of girls	N.S.S.	N.S.S.	N.S.S.	N.S.S.
<b>Variance components</b>				
School (%)	7.1	7.2	6.8	6.7
Class (%)	8.3	9.5	8.7	9.4
Student (%)	44.5	44.3	44.6	44.0
Explained (%)	40.1	39.0	39.9	39.9

N.S.S. = No statistically significant effect at level 0.05

**Table 10.6** Effect of employing each approach expressed as Cohen's d per group of students taught by teachers situated at the same stage and for the whole sample

Stage	Effect	Pooled SD	Cohen's d
<i>Employing CBA</i>			
Teachers at stage 1	0.10	0.76	0.13
<i>Employing DIA</i>			
Teachers at stage 1	0.11	0.77	0.14
Teachers at stage 2	0.15	0.74	0.20
Teachers at stage 3	0.19	0.73	0.26
Teachers at stage 4	0.18	0.72	0.25
Whole sample	0.16	0.96	0.17

groups of teachers who were situated at different stages. When the effects of the DIA that are presented in Tables 10.4 and 10.5 were expressed in this way (see Table 10.6), they turned out not to be at the same level. The impact of the DIA on student achievement was found to be small when teachers at the first two stages were taken into account, whereas relatively higher effect sizes were identified when teachers at stages 3 and 4 were considered (see Cohen, 1988, pp. 19–27). In addition, the two approaches were found to have almost the same effect size when data from teachers at stage 1 were taken into account. This implies that the DIA was as beneficial as the CBA for teachers situated at level 1, but only the DIA was helpful to teachers situated at the higher stages.

### ***Implications for Research on Teacher Professional Development***

The results of this study appear to provide support for the assumption that teacher assessment skills can be grouped into different developmental levels. The use of a specific measurement framework to describe not only quantitative but also qualitative characteristics of classroom assessment helped us define specific assessment skills that are grouped into four types of teacher assessment behaviour. These four types of teacher assessment behaviour are described in a distinctive way and move from relatively easy to more advanced. Starting from skills associated with everyday classroom routines with a mainly summative orientation, we can observe a gradual movement towards skills associated with the use of assessment for formative purposes. This is in line with recent literature supporting the idea that effective teachers use formative-oriented assessment in everyday classroom practice (Creemers & Kyriakides, 2008b).

Moreover, the second measurement of teacher skills in assessment provided support for the generalisability of the results that emerged from the initial administration of the questionnaire. The developmental scale was identified in both measurement periods, thereby addressing one of the most serious weaknesses of previous studies investigating stage identification over a period of time. Indeed, one of the main criticisms against stage-related studies refers to their cross-sectional methodology (Kyriakides, Creemers & Antoniou, 2009). Cross-sectional studies are very likely to give rise to a stage notion of development because they focus on measuring skills at different levels of experience. However, finding differences among teachers in their teaching skills does not necessarily imply that transition from one level to the other can occur in a step-wise manner. Problems are likely to arise when cross-sectional studies which do not explore the development of teaching skills over time provide the basis for assumptions about how development occurs. However, in this study, teacher assessment skills were measured twice within a period of a year, using the same population of teachers. As the data indicate, there was a strong correlation between the skills of teachers at these two points of time, and most teachers were found to be at the same stage.

Furthermore, taking student outcomes as criteria of effectiveness, it was found out that teachers who use more advanced types of assessment behaviour were more effective than those demonstrating the relatively easy types (see Table 10.4). These results provide further support for the major assumption of the DIA, namely, that teachers can be classified into different stages on the basis of both their teaching skills and their skills in assessing students, and thus, an initial evaluation of teachers' skills can help us identify improvement priorities (either in teaching or assessment) that can be taken into account in designing teacher professional development programmes.

The results of the second phase of the project also reveal that teachers can improve and ultimately progress to the next developmental stage of assessment skills by undertaking appropriate interventions and participating in effective professional development programmes. This argument is supported by the fact that the teachers in the control group did not manage to improve their assessment skills, and all of them remained at the same stage at which they were found to be situated at the beginning of the school year. On the other hand, teachers employing either the DIA or the CBA managed to improve their assessment skills. In addition, a statistically significant difference between the two groups was identified, implying that teachers using the DIA managed to improve their skills more than those employing the CBA. However, the differences in the effect sizes measuring the added value of using the DIA rather than the CBA were very small. This can be attributed to the differential impact of the DIA. Specifically, the  $X^2$  test was used to compare the progress made by teachers situated at the same level but employing different professional development approaches. Statistically significant differences in favour of the DIA were identified among teachers at stages 2, 3 and 4. This could be attributed to the fact that teachers situated at the higher stages needed broader interventions which are not focused on specific individual skills. Further research is needed to examine the generalisability of the results of the experimental study, especially since the number of teachers involved in the project was relatively small, and thus, the power of the study to identify the differential effects of these two interventions was relatively small. Another issue that needs further investigation is concerned with the long-term effect of the two interventions. In the literature, the short-term effect of the CBA was found to be small, and long-term effects have not been identified. Thus, the third phase of the study is currently being undertaken in order to identify the long-term effects that each intervention may have 1 year after the programme.

## **The Added Value of Using DASI to Provide Inset Courses on a School Basis: A Group Randomisation Study**

### ***The Theoretical Background of the Study***

This second project 'Establishing a knowledge-base for quality in education: Testing a dynamic theory of educational effectiveness' (2009–2012) is funded by the European Science Foundation (ESF/0308/01) and the Cyprus Research Promotion Foundation (08-ECRP-012) and is attempting to further expand the DIA to investigate

the extent to which INSET courses should be provided on a school basis (see also the web page of the project [www.ucy.ac.cy/esf](http://www.ucy.ac.cy/esf)). The main aim of this study is related to the various debates about teacher professional development which are occurring in different countries. In most countries, there is discussion about teacher quality, which research has shown to be one of the most important factors influencing learning and learning outcomes (Teddle & Reynolds, 2000; Townsend, 2007). Alongside questions regarding the selection of teachers and their working conditions, there is also a debate about how to improve teacher education, especially teacher professional development (Dall'Alba & Sandberg, 2006). Two main strands of research in teacher education related to this issue can be identified. One is concerned with the focus of teacher education on the development of specific competencies (Berliner, 1994) and the other with the provision of a more HA addressing not only specific knowledge and skills but also reflection on experiences and beliefs (Calderhead & Shorrock, 1997). The other strand is related to the question of where teacher in-service training should take place and its impact on the SLE (Ponte et al., 1994).

This project addresses teacher professional development by integrating findings of research on teacher education with the dynamic model and examines its use for teacher improvement purposes. The dynamic model is used as a theoretical framework to deal with policy and practice in teacher education because it emphasises the quality of teaching. It also utilises an integrated approach in defining effective teaching by focusing on factors found to be associated with student outcomes (see Chap. 7). The results of a longitudinal study conducted in Cyprus revealed that teacher factors and their dimensions could be grouped into five distinctive types of teacher behaviour, which move gradually from factors associated with direct teaching to those relating to more advanced skills in new teaching approaches and the differentiation of teaching (see Chap. 8). It was also found that students of teachers demonstrating more advanced types of behaviour showed better cognitive and affective student outcomes. This study provides empirical support for the grouping of teacher factors and highlights the need to help teachers progress gradually to more complex types of behaviour, which encompass specific teacher competencies. In addition, the experimental study reported in Chap. 9 showed that teachers using the DIA improved their teaching skills and progressed to a higher level of teaching, whereas those employing the HA did not improve their teaching skills. The DASI also had a significant impact upon student learning.

However, the two experimental groups were employed external in-service training. This project investigates the added value of using the DIA for providing in-service training within the school rather than externally. This is important because the dynamic model emphasises the relationship between school-level factors (i.e. policy on teaching and the SLE) and teacher professional development (see Chap. 7).

## ***Research Design and Methods***

A sample of 60 primary schools was selected. At the beginning of the school year 2010–2011, data on student background variables and achievement in mathematics and science were collected. The schools were then randomly assigned to four programmes of professional development, and a group randomisation study was

conducted. Two of the programmes were in line with the dynamic model in terms of grouping teacher skills into simpler or more complex types of teacher behaviour. Therefore, these two programmes were concerned with addressing the specific needs of teachers to help them progress from one level to the next. For example, teachers situated in level 1 who could only use the basic elements of direct teaching were trained to progress to level 2; the latter includes aspects of quality in direct teaching and encouragement of student interactions. The structure of the programme was similar to that of the INSET course employed to teachers in group A who participated in the study reported in Chap. 8. However, the difference between these first two programmes is that one was carried out externally, with teachers asked to attend courses provided by the research team at the University Of Cyprus. On the other hand, the second was provided internally; the research team helped each school to develop its own strategies for teacher professional development.

The other two programmes followed the HA to teacher professional development. The research team encouraged reflection and understanding of experiences and beliefs, without taking into account the different developmental levels of teachers' behaviour; this is explained further in Chap. 9 with reference to the treatment employed to teachers participating in the second 'holistic' group of the study. Once again, one of them was provided externally and the other internally.

In order to compare the impact of these programmes on teacher behaviour, changes in the behaviour of all grade 4–6 teachers in the school sample were measured. For this purpose, data regarding teacher behaviour, both at the beginning and at the end of the programmes (i.e. the 2010–2011 school year), were collected using the three observation instruments which refer to the teacher factors of the dynamic model (see Kyriakides & Creemers, 2008). Data were also collected on students' achievement in mathematics at the beginning and at the end of the school year. For each year group of students, criterion-referenced tests in mathematics were constructed in order to measure students' knowledge of, and skills in, mathematics in relation to the objectives of the national curriculum in Cyprus. The written tests were subject to control for reliability and validity. The test administered to grade 6 students at the end of the school year was obviously more difficult than the one administered to grade 2 students at the beginning of the school year. Prior to making comparison of test scores meaningful, the scores had to be made comparable. Equating was carried out using IRT modelling and following the same approach as that used in PISA studies (see previous section). Estimation was made using the extended logistic model of Rasch (Andrich, 1988) which revealed that each scale had satisfactory psychometric properties (see Antoniou, 2009). Thus, for each assessment period, achievement in mathematics was estimated by calculating the Rasch person estimates.

Information was also collected on two student background factors: sex (0 = boys, 1 = girls) and SES. Five SES variables were available: father's and mother's education level, the social status of father's job, the social status of mother's job and the economic situation of the family. Standardised values of the above five variables were calculated, resulting in the SES indicator.



## ***Main Results***

Results concerned with the impact of each intervention on improving teacher behaviour in the classroom are presented in the first part of this section. In the second part, the effect of each intervention on student achievement in mathematics is examined.

### **Impact on Teaching Skills**

The observational data of each time period were analysed separately following the procedure described by Kyriakides et al. (2009). Specifically, the Rasch model was used in order to identify the extent to which the five dimensions of the eight teacher factors (i.e. the 44 first-order factor scores) could be reduced to a common unidimensional scale (see also Chap. 9). The Rasch model was applied to the data of the baseline measure, and it was found that all of the teaching skills included in the dynamic model were appropriately targeted against the person measures (i.e. the skills of teachers participating in the study) since Rasch person estimates ranged from  $-3.11$  to  $3.08$  logits, and the estimates of the difficulties of teaching skills ranged from  $-2.98$  to  $3.12$  logits. Moreover, the reliability of each scale (teachers and teaching skills) was higher than  $0.94$  and thus deemed satisfactory. Finally, the fitting of the Rasch model to the data was tested against alternative IRT models (i.e. the 2PL and the 3PL models) and was found to be statistically preferable (see Kyriakides, Creemers & Panayiotou, 2012).

Having established the reliability of the scale, the possibility of grouping teaching skills into the five stages described in Chap. 8 was investigated. The procedure for detecting pattern clustering, developed by Marcoulides and Drezner (1999), was used. Applying this method to segment teaching skills on the basis of their difficulties, which emerged when using the Rasch model, showed that they were optimally grouped into the same five clusters proposed by previous research findings (see Kyriakides et al., 2009).

Pattern clustering was also applied to data which emerged from the final measurement of teaching skills. The Rasch model revealed that all participants fitted the model and all teaching skills were well matched to measures of the teachers. Applying the aforementioned clustering method, it was found that teaching skills could once again be optimally clustered into the five stages described in Chaps. 8 and 9 (see Kyriakides et al., 2012). Considering the results of the analyses of initial and final data related to teaching skills, we can conclude that on both occasions the results validated the five developmental stages of teaching skills proposed by previous research findings (Antoniou, 2009; Antoniou, Creemers & Kyriakides, 2009; Kyriakides et al., 2009).

In order to measure the impact of the four professional development programmes upon teaching skills, the Rasch person estimates of each group were compared. Table 10.7 presents the means and standard deviations of teacher scores for each experimental group, which emerged from measuring their teaching skills at the

**Table 10.7** Means and standard deviations of teacher scores measuring quality of teaching of each of the experimental groups at the beginning and at the end of the intervention

Group	Beginning of the intervention		End of the intervention	
	Mean	SD	Mean	SD
Employing DIA externally ( $n=84$ )	-0.74 <sup>a</sup>	1.43	-0.32	1.56
Employing DIA internally ( $n=85$ )	-0.74	1.47	-0.33	1.63
Employing HA externally ( $n=82$ )	-0.76	1.45	-0.76	1.44
Employing HA internally ( $n=83$ )	-0.75	1.46	-0.74	1.46

<sup>a</sup>Rasch person estimates in logits

beginning and at the end of the intervention. Firstly, we can observe that the initial mean scores of the four groups were almost the same. One-way analysis of variance revealed that there was no statistically significant difference among the four groups with regard to the initial Rasch person estimates ( $F=0.006$ ,  $p=0.999$ ). Secondly, the final score of teachers employing the DIA, either externally or internally, was bigger than their initial score, and the  $t$ -test paired sample revealed that the difference observed in each group was statistically significant (i.e. DIA provided internally:  $t=10.03$ ,  $df=84$ ,  $p=0.001$  and DIA provided externally:  $t=11.07$ ,  $df=83$ ,  $p=0.001$ ). This finding reveals that both groups of teachers employing the DIA managed to improve their teaching skills. On the other hand, the mean final and initial scores of the two groups employing the HA were almost the same, and the  $t$ -test paired test revealed that teachers in the two HA groups did not manage to improve their teaching skills (i.e. HA provided externally:  $t=0.32$ ,  $df=81$ ,  $p=0.75$  and HA provided internally:  $t=1.09$ ,  $df=82$ ,  $p=0.28$ ).

In order to identify whether each intervention had an impact on the teaching skills of teachers, a regression analysis was also employed. The final score of teachers was treated as a dependent variable, whereas the initial score, as well as three dummy variables measuring the impact of each intervention, was treated as independent variables. The group of teachers who employed the HA externally was treated as the reference group. The model that was found to fit better with the data was able to explain a very large percentage of the variance in the final score for teaching skills (87%), and the equation that emerged is given below:

$$\text{Post-score} = 0.031 + 0.932 * \text{pre-score} + 0.416 * \text{DIA External} \\ + 0.411 * \text{DIA Internal} + r$$

This implies that there was no statistically significant difference between the post-score of the group which employed the HA internally and that of the group using the same approach externally. On the other hand, those teachers who employed the DIA (either internally or externally) obtained a better score than those using the HA.

It is finally important to note that by comparing the standardised beta coefficients, we can see that the impact of the DIA, either internally or externally, was as great as the impact of each of the two groups employing the HA (DIA externally = 0.116 and DIA internally = 0.116). Although the effect size of the DIA was relatively small, the results reveal that providing the DIA either internally or externally helped teachers improve their skills, whereas those employing the HA did not manage to improve their skills. It can also be claimed that no added value was identified in terms of providing the DIA internally rather than externally since both approaches had the same impact on the teachers' final score. Similarly, there was no difference in the impact of the HA when it was provided internally rather than externally.

By comparing the classification of teachers into different stages at the beginning and at the end of the intervention, it was found that 22 out of the 84 teachers in the group employing the DIA externally managed to move on to the next more demanding stage, whereas the other 62 teachers remained at the same stage. Specifically, eight teachers in this experimental group moved from stage 1 to stage 2, eight teachers at stage 2 managed to move on to stage 3, and six teachers situated at stage 3 were found to be at stage 4 at the end of the intervention. Similar results were identified by comparing the classification of teachers employing DIA internally into stages of effective teaching before and after the intervention. Specifically, 24 out of 85 teachers in this group managed to progress to the next more demanding stage, whereas the other 61 teachers remained at the same stage. On the other hand, all teachers in the groups employing the HA remained at the same stage, irrespective of whether this approach was provided internally or externally.

### **Impact on Student Outcomes**

The results of the multilevel analysis conducted in order to measure the impact of each of the four approaches to teacher professional development on student achievement are presented in this part. The empty model revealed that 75.3% of the total variance was situated at the student level, 15.7% was at the classroom level and 9.0% was at the school level. In subsequent steps, explanatory variables at different levels were added, starting at the student level. Explanatory variables, but not grouping variables, were centred as Z-scores with a mean of 0 and a standard deviation of 1. Grouping variables were entered as dummies, with one of the groups as the base-line (e.g. girls = 0). The models presented in Table 10.8 were estimated without the variables that had no statistically significant effect at level 0.05.

In model 1, the context variables at each level and the teacher background information were added to the empty model. The following observations arise from the figures of the third column of Table 10.8. Firstly, model 1 explained 33.5% of the variance, most of which was attributed at the student level. Secondly, all student background variables had statistically significant effects on student achievement. Prior knowledge had the strongest effect in predicting student achievement at the end of the school year. With regard to the effect of the teacher background variables,

**Table 10.8** Parameter estimates and (standard errors) for the analysis of student achievement in mathematics (students within classes, within schools)

Factors	Model 0	Model 1	Model 2	Model 3
<b>Fixed part (intercept)</b>	-0.59 (0.10)	-0.39 (0.07)	-0.32 (0.07)	-0.25 (0.07)
<b>Student level</b>				
<i>Context</i>				
Prior achievement in maths		0.59 (0.12)	0.60 (0.11)	0.59 (0.12)
SES		0.31 (0.11)	0.31 (0.11)	0.30 (0.10)
Gender (0=boy, 1=girl)		0.09 (0.04)	0.09 (0.03)	0.09 (0.03)
<b>Classroom level</b>				
<i>Context</i>				
Average achievement		0.34 (0.10)	0.34 (0.09)	0.34 (0.09)
Average SES		0.21 (0.08)	0.20 (0.08)	0.20 (0.08)
Percentage of girls		N.S.S.	N.S.S.	N.S.S.
<i>Teacher background</i>				
Gender (0=male, 1=female)		N.S.S.	N.S.S.	N.S.S.
Years of experience		0.12 (0.03)	0.12 (0.03)	0.13 (0.03)
Position (0=teacher, 1=deputy head)		N.S.S.	N.S.S.	N.S.S.
<i>Quality of teaching</i>				
Stage 1			-0.31 (0.05)	-0.30 (0.05)
Stage 2			-0.20 (0.05)	-0.20 (0.05)
Stage 4			0.16 (0.05)	0.16 (0.05)
<i>Intervention</i>				
HA internally				N.S.S.
DIA externally				0.14 (0.06)
DIA internally				0.15 (0.06)
<b>School level</b>				
<i>Context</i>				
Average achievement		0.12 (0.04)	0.11 (0.04)	0.11 (0.04)
Average SES		0.09 (0.03)	0.09 (0.03)	0.09 (0.03)
Percentage of girls		N.S.S.	N.S.S.	N.S.S.
<b>Variance components</b>				
School (%)	9.0	7.2	7.0	5.8
Class (%)	15.7	14.3	9.5	8.2
Student (%)	75.3	45.0	44.5	44.0
Explained (%)		33.5	39.0	42.0
<b>Significance test</b>				
$X^2$	983.8	743.5	631.4	550.1
Reduction		240.3	112.1	81.3
Degrees of freedom		8	3	2
<i>p</i> -value		0.001	0.001	0.001

N.S.S. = No statistically significant effect at level 0.05

only length of teaching experience was found to be associated with student achievement.

In model 2, the impact of quality of teaching upon student achievement was investigated. Since teachers were assigned to four developmental stages according to their assessment skills, we investigated the extent to which the classification of teachers into these four stages could explain variation in student achievement. Thus, teachers at stage 3 were treated as a reference (or baseline) group, and three dummy variables were entered in model 1. The developmental stage at which a teacher was situated was found to have a statistically significant effect on student achievement. Specifically, students of teachers at stage 1 had the lowest achievement, whereas those of teachers at level 4 showed higher achievement than students of teachers at the first three levels. It is finally important to note that this model explains 39% of variance, and most of the unexplained variance is situated at the student level.

In model 3, the effect of each approach employed with regard to teacher professional development was investigated. Teachers in the group employing the HA externally were treated as a reference (or baseline) group, and three dummy variables indicating the teacher professional approach employed (i.e. HA provided internally, DIA provided externally and DIA provided internally) were entered into model 2. Only the effect of the two dummy variables measuring the impact of providing a DIA was found to be statistically significant at 0.05 level. This implies that students of teachers employing the HA internally had no better results than those using the HA externally. On the other hand, students of teachers employing the DIA either internally or externally managed to obtain better results than those of teachers employing the HA. It is finally important to note that the effect size of employing the DIA internally was no bigger than the effect size of employing the same approach externally. Thus, the results of the multilevel analysis provide evidence that only the DIA yielded better results in student achievement than those produced by the HA but did not provide support for the assumption that offering the DIA internally generated better results.

### ***Implications and Suggestions for Further Research***

This study provides further support for the assumption that the teacher factors of the dynamic model are not only related to each other but can also help us define the five stages of teaching skills. These stages were formulated in a consistent manner, and five investigations of teachers' skills revealed exactly the same stages (see also Chap. 9). In addition, this study also revealed that teachers who demonstrate competencies in relation to higher stages were more effective than those situated in the lower stages. Furthermore, some teachers were found to have improved their teaching skills and ultimately progressed to the next developmental stage. However, teachers who managed to make such progress had participated in a teacher professional development programme based on the DIA. The added value of using the DIA rather than the HA to design a teacher professional development programme

was identified by comparing the progress in teaching skills that each intervention group managed to achieve. Neither of the two groups using the HA managed to improve their skills, whereas both groups of teachers employing the DIA managed to enhance their teaching skills at a statistically significant level. Although the effect sizes indicating the progress that the teachers in these two groups had made were relatively small (i.e. 0.12), one should bear in mind that these courses were provided for a relatively short period, and only short-term effects were measured. One could expect even larger effects if the programmes had been made available for a longer period and/or the long-term effects of the interventions had been measured. It is finally important to stress that the use of the DIA had a significant impact on student achievement gains in mathematics. All these findings provide further support to the generalisability of the findings of studies reported in Chap. 9, in which the two approaches were offered only externally. This project seems also to reveal that irrespective of whether professional development programmes are offered internally or externally, the DIA can have a significant impact on improving teaching skills and student learning outcomes.

This study also reveals that providing the DIA at the school level rather than externally had no special benefit in terms of either improving teaching skills or student learning outcomes. However, one should bear in mind that both approaches were addressing the teacher factors only. One could assume either that the DIA could be equally effective, irrespective of whether it was offered internally or externally, or that the added value of offering the DIA on a school basis had to do not only with the elements of the DIA but also with some extra elements that explained the essential differences between external INSET programmes and school-based INSET ones. This implies that we need further research investigating whether the added value of using the DIA in a school-based INSET has to do with the fact that specific school factors are also addressed by means of this approach, whereas when the DIA is used externally, the school factors are not subject to its influence. In this context, our research team attempted to find out which school factors should be addressed by the school-based INSET and which approaches should be used in order to improve student learning outcomes to a greater extent than when the DIA is employed externally. More specifically, a meta-analysis of studies investigating the impact of school-based INSET on student outcomes is currently being undertaken. So far, the *Social Sciences Citation Index* database has been searched for relevant articles. During the search, there was no limit in terms of the year of publication, and therefore, the search concerned all the articles published during the years 1970–2011. The results comprised 2,464 articles on teacher professional development, of which only 35 were relevant to school-based INSET. Of the 35 relevant articles, only three examined the impact of school-based INSET on student achievement (see Kyriakides, Creemers & Panayiotou, 2012). We are currently aiming to extend the search for relevant papers by scanning the following databases: *Scopus*, *ERIC* and *ERA*.

Nevertheless, since very few studies have been identified, we are also conducting a qualitative synthesis of studies looking at different features of school-based INSET. Another task that has been undertaken is a group randomisation study

aiming to provide the head teacher with a role in providing the DIA at the school level. During the 2011–2012 school year, two experimental groups have been established, and one is employing the DIA externally. In the second group, teachers receive a school-based programme based on the DIA, and their head teachers are expected to take an active role in supporting them to implementing and improving their action plans. In this way, the intervention offered to the second group is expected to have a positive impact not only on quality of teaching at classroom level but also on the SLE.

In this chapter, the two reported projects aim to expand the DIA by illustrating its relevance not only to improving the quality of teaching but also to assessment and to searching for possibilities to combine the DIA with school-based INSET. The results of the first project show that the DIA can be used to improve assessment skills, but at the same time, they reveal that there is a need for further research to reveal the differential effects that the DIA has on teachers situated at different stages. The second project reveals the added value of using the DIA rather than the HA, both internally and externally. Teachers participating in professional development programmes based on the DIA managed to make statistically significant progress in terms of their teaching skills. In addition, the second project shows that when the DIA is provided externally, it is no less effective than when it is provided internally. This seems to indicate that there is a need for further research to identify how and under which circumstances the DIA offered at school level can maximise its effects. In this respect, a systematic review of the literature on school-based INSET is needed to identify its additional value in relation to improving not only the quality of teaching but also that of the SLE and the school policy on teaching. In this context, the final chapter of this book provides suggestions on further research aiming to broaden the scope of the DIA and identify which conditions can enable teachers and schools to become more effective.

# Chapter 11

## Implications for Research, Policy and Practice: A Way Forward

### Introduction

The principal objective of this book is to make a major contribution to knowledge and theory by drawing the implications of TER for the field of teacher training and professional development. For this purpose, the first two parts separately present the two fields of research, namely, research on teacher training and professional development and research on teacher effectiveness. More specifically, the first part of this book provides a critical review of research on teacher training and professional development and illustrates the limitations of the main approaches to teacher development, for example, the CBA and the HA. The second part of this book provides a critical review of TER. The main phases of TER and their findings are presented, in which it is shown that teacher factors are discussed in terms of being in opposition to one another. Another significant limitation of this field of research is that the whole process of identifying teacher effectiveness factors made no significant impact upon teacher training and professional development. For this reason, maintaining a dynamic perspective on policy and practice in teacher training and professional development is advocated in the third part of this book. This perspective is characterised by making use of validated theoretical models of teacher effectiveness and helping student teachers and teachers move gradually from simple to more complex types of teacher behaviour, encompassing specific teacher competences. In this part of this book, we also refer to studies conducted in different countries illustrating how the proposed approach may be used in policy and practice in teacher education. Specifically, we provide evidence supporting the validity of the theoretical framework upon which this approach is based. Moreover, experimental and longitudinal studies supporting the use of this approach for improvement purposes are presented.

In the final chapter of this book, we make suggestions for the development of this approach and for further research on using this approach for teacher training and professional development. We advocate the use of both quantitative, experimental, longitudinal studies and case studies using mixed research methods. We also draw



implications for policy and practice in teacher training and professional development, especially how to design courses that address the professional needs of student teachers and teachers, and at the same time incorporate the main characteristics of the DIA. Finally, it is claimed that these two constituencies will contribute to the further development of the integrated approach and ultimately to the improvement of quality of education.

## **Implications for Research on Teacher Professional Development**

In this section, we draw implications for research on teacher professional development that can help us test the generalisability of the findings of studies reported here that provide support for the DIA. Suggestions for research on expanding the scope of the DIA are also made. We first of all stress the importance of conducting longitudinal studies in different countries that can provide further support for the assumptions upon which the DIA is based. Specifically, one of the basic assumptions has to do with the fact that teacher factors are interrelated and stages of effective teaching can be identified. Several experimental studies provided support for this view, but further studies are needed to test the generalisability of the stages that have been identified. In this context, the results of the study conducted in Canada (see Chap. 8) show that teachers in two different countries can be classified in terms of stages that are concerned with interrelated teacher factors. Although the stages which were identified were not exactly the same, in both studies they were distinctive and were concerned with factors associated with different approaches to teaching. Studies conducted in other countries, as well as comparative studies, can help us identify whether in each country we can identify stages of effective teaching with similar characteristics to those identified by the studies reported in this book. These findings will provide further support for the importance of using the DIA to develop teacher professional development programmes in different countries.

Secondly, another important feature of the DIA has to do with its attempt not only to take into account the stage to which each teacher belongs but also to offer training to each teacher in order to help him/her move on to the next, more demanding stage. The experimental studies reported in Chaps. 9 and 10 provide support for the assumption that a stepwise development of types of teacher behaviour can be achieved. However, the interventions which were offered were rather short since they only took place within one school year. Therefore, we need longitudinal studies which will last for more than 2 years to discover whether the progression is stepwise or whether in some cases we can identify teachers moving further up without mastering the skills included in some of the lower stages. These studies may also show whether teaching experience matters and whether teachers can move from one stage to a more demanding one without participating in a teacher professional development course. The studies reported here show that teaching experience is a factor that can partly explain why a teacher is situated at stage 1. However, amount of teaching

experience cannot explain why some teachers are situated at stage 2 rather than at a higher stage. This might be seen as an indication that experience helps teachers to use the daily routines of teaching effectively but not other types of teaching skill.

Thirdly, the experimental studies presented in the last two chapters were concerned with the short-term effect of the DIA upon the improvement of teaching skills and upon the student learning outcomes. This implies that there is a need for research investigating the long-term effects of the DIA and its added value, comparing it with more traditional approaches, such as the CBA or the HA. The sustainability over time of the effects of teacher professional development programmes based on the DIA could also be investigated by conducting experimental studies lasting for many school years. It is important to note here that sustainability of teacher professional development programmes has not been investigated to any great extent (Avalos, 2011). Some research findings indicate that teachers commonly do not apply either the problem-solving processes or teaching skills learned in professional development courses in their classrooms once the interventions or training courses have ended (e.g. Riley-Tillman & Eckert, 2001). In general, follow-up data do not indicate sustainability of skills. In a meta-analysis conducted by Rose and Church (1998), only 20 studies measuring the sustainability of the results of teacher professional development programmes have been found. In the majority of those studies, the period from post-test to follow-up tended to be short (i.e. 9 of the 20 studies collected follow-up data only 4 weeks after the post-test), and their results indicate that only eight studies were categorised as ‘complete maintenance’ indicating that performance of the target skills was sustained at or above levels attained during training. The studies which met this criterion had several things in common, including training of teachers in their own classroom with a practice and feedback component and a behavioural analysis approach to training. Nevertheless, as Roland (2011, p. 385) argues ‘In addition to initial implementation, sustainability of the intervention is important to the student’s continued success’. In this sense, it is critical to investigate further the sustainability of the effects of the interventions in terms of teacher professional development as changes due to interventions may revert to baseline after the intervention stimulus ends.

For this reason, a year after the intervention presented in Chap. 8, we decided to measure the skills of teachers. In this way, we acquired data on their teaching skills at the beginning (September 2008), at the end (May 2009) and 1 year after the end of the intervention (May 2010). It was not useful to carry out a similar follow-up measurement related to student achievement since every year Cypriot primary teachers have to teach new cohorts of students, and thus, the results of student achievement would not have been comparable with those of the previous years. At the beginning of the intervention, the *t*-test did not reveal any statistically significant difference between the two experimental groups ( $t=0.68$ ,  $df=129$ ,  $p=0.49$ ). During the implementation of the teacher professional development programmes, teachers employing the HA made no statistically significant progress ( $t=1.11$ ,  $df=60$ ,  $p=0.27$ ). Moreover, by measuring their initial quality of teaching and comparing this with the follow-up measurement (i.e. 1 year after the implementation of the programme), it was found that they made no progress during the year in which no

intervention had been provided ( $t=0.67$ ,  $df=60$ ,  $p=0.50$ ). On the other hand, teachers employing the DIA made statistically significant progress during the implementation of the intervention ( $t=20.46$ ,  $df=61$ ,  $p=0.001$ ). During the year in which no intervention took place, neither of the two intervention groups managed to make any statistically significant progress or show any decline in their teaching skills. This implies that the added value of using the DIA rather than the HA remained the same during the second year implying that the impact is sustainable. It also seems to reveal that progress cannot be achieved when no appropriate professional development programmes are offered to teachers. For this reason, teachers employing the HA did not manage to improve their skills, either during the year in which the intervention was offered or one when that no intervention took place. Although further research is needed to test the generalisability of the findings of this follow-up study, one could claim that teachers need to be continuously involved in appropriate professional development programmes. Another issue that needs to be examined is whether and how the DIA can be expanded in order to bring teachers to a stage at which they can further improve their skills without having external DIA support. In order to achieve this aim, we need to design experimental studies that last longer and which can test whether teachers can improve their skills themselves without external and systematic support, especially since research findings seem to indicate that improvement is more apparent in those teachers who participate systematically in effective professional development programmes (e.g. King & Kitchener, 1994). Such studies can also show whether stage growth does not unfold unilaterally but requires a stimulating and supportive environment that can be provided by the research team involved in a DIA teacher professional development programme.

Fourthly, another special characteristic of the DIA is that teachers who are at a certain stage are expected to develop action plans designing to help them achieve skills that are in line with the next, more demanding stage of effective teaching. In this context, the teachers employing the DIA were not given the opportunity to decide whether their action plans should be concerned with stages other than the one at which they were found to be situated. One could claim that the DIA does not give teachers the chance to identify by themselves areas which require improvement, and thus, they may not feel that they own the improvement project in which they are involved. However, teachers are expected to develop their own action plans and decide which activities they can use in order to develop teaching skills. In addition, the monthly sessions give them the opportunity to examine critically whether their action plans need to be modified. Nevertheless, multi-treatment experimental studies could be conducted in order to find out whether teachers should be encouraged to develop action plans that are in line with their stage but nevertheless allowing them to focus their attention on any other stage that they choose or whether the DIA should remain more focused and expect each teacher to develop action plans in line with his/her own stage. Such studies could help us develop further the DIA and understand better the essential differences between the DIA and both the HA and the CBA.

The suggestions provided in the next part of this section aim to find ways to expand the DIA. Firstly, in Chap. 10, we draw research implications of the findings of the project investigating the added value of offering the DIA internally rather

than externally. The fact that there was no bigger impact when the DIA was offered internally as opposed to externally could be interpreted in two ways. One could simply argue that the DIA should be offered externally since this approach is more cost-effective. On the other hand, one could attribute this finding to the fact that when the DIA is offered internally, it should not only be concerned with how to improve the teaching skills. Unless the special characteristics of internal professional development programmes are taken into account, their usage will have no extra beneficial effect. This implies that we need a better theoretical framework describing the special features of school-based INSET and how these contribute to the improvement of teacher effectiveness as measured through student achievement gains. A meta-analysis of studies investigating the impact of school-based INSET upon student achievement can help us find out in which conditions the school-based INSET can have a stronger impact on student achievement (see also Chap. 10). Syntheses of studies investigating the impact of school-based INSET can be used to develop the DIA further and identify how their respective basic elements and special features can be combined. At this stage, we will also need multi-treatment experimental studies to find out how to offer the DIA internally and achieve better results rather than when it is offered externally. For example, we may find out that by involving head teachers or other school stakeholders, we may be able to improve not only teaching practice but also school factors that are associated with student achievement, such as the school policy on teaching and the SLE.

Secondly, the DIA is concerned with the development of teaching skills that refer to generic teacher factors. Given that a recent meta-analysis (Seidel & Shavelson, 2007) shows that domain-specific teaching factors are associated with student achievement, further research is also needed to identify the extent to which the DIA can be expanded to cover not only generic but also domain-specific teaching skills, such as the provision of explanations in teaching mathematics (see Charalambous, Hill, & Ball, 2011). We can see two different types of research that are needed in order to discover ways to expand the scope of the DIA. Longitudinal studies can be conducted in order to identify the relationship between domain-specific and generic teaching skills. Such studies may also reveal possibilities for establishing stages of effective teaching that refer to combinations of generic and domain-specific skills. Experimental studies could also be conducted in order to find out whether incorporating domain-specific skills when offering teacher professional development programmes based on the DIA may have a stronger impact on student achievement than DIA programmes concerned only with generic skills.

Thirdly, experimental research investigating the extent to which the DIA may have differential effects on the improvement of teaching skills of different groups of teachers could also be conducted. The study reported in Chap. 10 comparing the impact of the CBA and the HA seems to provide support for the assumption that the DIA may have differential effects on teachers situated at different stages. For example, the DIA was found to have stronger impact than the CBA on teachers at stages 2 and 3, whereas the DIA had the same impact as the CBA on teachers situated at stages 1 and 4. The fact that no statistically significant difference was identified when comparing the progress of teachers situated at stage 4 can be attributed to the small statistical power of the study due to the very small number of teachers at this stage. With regard to the

fact that the DIA had no extra benefit when compared with the CBA for teachers at stage 1, it may be the case that less-experienced teachers may need a focused intervention to develop skills associated with everyday assessment routines. For this group of teachers, teacher professional development programmes may also have to focus on how to improve a specific skill in each session, whereas for more-experienced teachers situated at higher stages, the professional development programmes should be designed to encourage them to become engaged in more comprehensive areas of improvement. As a consequence, the DIA was found to be more effective for teachers at the higher stages. This differential effect of the DIA was not identified when it was compared with the HA. The study reported in Chap. 9 shows that the DIA was more beneficial than the HA for each group of teachers, and there was no difference in the reported effect sizes measuring the added value of the DIA. The findings concerned with the differential impact of the DIA on teachers situated at different stages can be seen as preliminary, and more studies are needed to discover if there is any differential effect, especially since the statistical power of the two studies was rather small for the purpose of investigating this issue.

Finally, case studies can be conducted to identify the difficulties that teachers experience in moving up to the next level and to clarify the barriers associated with the amount of gaps between levels, as well as the difficulty of promoting teacher professional development programmes based on the DIA, especially since the great majority of courses cover the same topics for all participating teachers. Introducing an approach to teacher professional development that expects participating teachers to be evaluated formatively may not always be welcomed by some teachers, especially those who may not like to be confronted with an evaluation process that reveals their weaknesses. Case studies of teachers who drop to a lower level for a variety of reasons (including burnout) could also be employed, especially since these studies may help us find out how to identify this group of teachers at an early stage. The findings of these studies may also help us expand the DIA and cover issues associated not only with the improvement of their teaching skills but also with other aspects that affect their professional careers. Such findings may also reveal that in helping teachers to improve their skills, other factors, such as their efficacy beliefs and attitudes towards the teaching profession, should be considered, particularly to encourage teachers to be involved in a teacher professional development programme based on the DIA. Teachers participating in the studies presented in Chaps. 9 and 10 were all volunteers, and this not only caused some problems in relation to the external validity of the study but also revealed the importance of finding ways to encourage them to participate in the DIA programmes.

## **Implications for Policy and Practice**

The previous section was concerned with suggestions for research aiming to expand the scope of the DIA rather than searching for its impact on improving teaching and promoting learning. The third part of this book provides evidence supporting the

validity of the theoretical framework upon which the DIA is based, and experimental and longitudinal studies supporting the use of this approach for improvement purposes are discussed. This implies that although many different types of study could be conducted seeking to identify possibilities for expanding the DIA, the evidence presented here provides support for the importance of using the DIA for teacher improvement purposes. For this reason, this section draws implications for policy and practice. We first of all refer to implications that the DIA has for the structure and content of initial teacher training and then provide suggestions as to how educational systems can organise their INSET programmes in order to improve the quality of teaching practice and achieve better learning outcomes.

One of the major aims of initial teacher training is to help student teachers develop their teaching skills. In this context, standards of teaching have been developed in several countries, and the quality of initial teacher training (ITT) programmes in some countries is evaluated by a national/state agency. For example, in England and Wales, the Education Act 2005 provides the remit for Her Majesty's Chief Inspector (HMCI) to inspect ITT. As a result, the Office for Standards in Education, Children's Services and Skills (Ofsted) is responsible for conducting inspections of all providers of programmes leading to qualified teacher status (QTS) for maintained schools, as well as programmes of further education teacher training validated by higher education institutions. Comparable systems of ITT evaluation are in place in other countries, which aim to improve the quality of education in schools. In this book, it is argued that there is a need to establish stronger links between ITT and research on teacher effectiveness. There should be an emphasis on research into effective teacher behaviour in the classroom in the ITT courses. In this way, student teachers will learn about effective teaching practices and gradually develop their teaching skills. Although student teachers should develop several competencies, not only the ability to teach (e.g. the ability to collaborate with other teachers in the school, work with other school stakeholders, especially parents), their teaching skills should be systematically developed through ITT. The importance of providing courses to help student teachers develop their teaching skills can be attributed to the fact that quality of teaching is the strongest factor associated with student learning outcomes.

In this context, the DIA can be used to provide a theoretical framework for the initial teacher training courses that are concerned with effective teaching. In addition, trainees can make use of the available instruments designed to measure the skills of student teachers (see Creemers & Kyriakides, 2012) and help them develop their own action plans to improve their skills. It should also be taken into account that most student teachers are likely to be situated at stage 1. This implies that the content of the ITT courses should be focused more on the skills found at this stage. A broader perspective on effective teaching practices should be provided for student teachers in order to help them develop relevant expectations about their career development. The theoretical framework of the DIA also promotes an integrated approach to teaching. This implies that student teachers will become aware of different teaching approaches, and they will not be restricted to either the direct and active teaching approach or the constructivist approach. Each approach has its



strengths and limitations, and this is reflected in the fact that specific teacher factors arising from each approach are included in the theoretical framework of the DIA. In this way, a more balanced view of effective teaching will be provided, and the courses will be designed by taking into account the available knowledge base of EER.

Teaching practice is another important element of any ITT programme that should be directly related to the development of student teachers' skills in teaching. Teaching practice provides the opportunity for student teachers to have their first contact with the teaching profession, and it should aim to improve the teaching skills of trainees (Caires & Almeida, 2005). It gives student teachers the opportunity to see how theory can be used to improve practice. Thus, the DIA can be used in designing the teaching practice of the ITT programmes, and the framework of the DIA can be employed to evaluate teaching skills and measure the impact of teaching practice on these skills (Charalambous, Philippou, & Kyriakides, 2008). Moreover, the framework of the DIA can be used to develop valid and reliable instruments for inspecting ITT, especially since in some countries the reliability of the evaluation of ITT courses is seen as problematic (e.g. Campbell & Husbands, 2000; Tymms, 1998). This could be attributed to the fact that they do not place sufficient emphasis on the development of student teacher competencies in teaching. It is argued here that the impact of ITT on improving teaching skills should be seen as an important evaluation criterion of the effectiveness of such programmes. If student teachers manage to develop all other required competencies but not their teaching skills, they will not make any significant impact on the learning of their students, and thus, the quality of education will be negatively affected. Therefore, ITT programmes should aim to improve the teaching skills of their students and create the basis for their future professional development.

This book has some significant implications for organising teacher professional development courses. The proposed approach is based on the assumption that teachers participating in INSET courses should be offered programmes that are in line with their stage. This implies that we should adopt differentiation of teaching in offering INSET courses. An additional implication is that the teaching skills of participating teachers should first of all be measured, and based on the evaluation findings, teachers should be classified into groups according to the stage at which they are found to belong. These two steps of the DIA reveal that INSET courses cannot be developed unless a clear framework of effective teaching is adopted and valid instruments measuring teacher behaviour in the classroom are available. This implies that tutors offering such courses should be able to use the observation instruments to collect data and analyse them in order to identify the stage at which each teacher is situated. In addition, tutors should be able to persuade teachers to allow them to observe them teaching in order to identify their needs. They should also persuade participating teachers to take seriously the results of initial evaluation since observations of teaching are used for formative reasons.

The results of the follow-up study investigating the sustainability of the impact of the DIA upon teaching imply that teachers should be continuously involved in systematic INSET courses. Teachers do not move from one stage to another without

being actively involved in an INSET course based on the DIA. During the year in which no intervention was offered for teachers employing the DIA, we were unable to identify any progress in their teaching skills. This shows how important is the role of the research team in organising the INSET course and supporting teachers in developing and implementing their action plans. Without a systematic effort on the part of teachers and without providing teachers with external support, educational systems should not expect improvement in the quality of teaching and achievement of better learning outcomes. For this reason, national/state policy-makers should develop a policy on teacher professional development and offer support to their teachers in order to promote their teaching skills. Since teachers are at different stages, it is recommended that a variety of different teacher professional development courses should be offered during the professional career of teachers, each concentrating on different types of teaching skills to help teachers gradually move from lower to higher stages. In this way, the policy on teacher professional development will have an impact on improving quality of teaching. It should be pointed out that such courses should be offered to teachers situated at the highest stage, especially since research has shown that teachers need to take actions to improve themselves in order to remain effective (see Creemers & Kyriakides, 2010a).

The suggestions given above refer to the role of the system-level policy-makers in promoting the DIA. This can be achieved both by organising external INSET courses and evaluating the impact of school-based courses offered to teachers. However, school stakeholders should also play an important role in promoting the DIA. They should not only provide the conditions for school-based INSET courses based on the DIA but should also be actively involved in these courses and through this improve the SLE and the school policy for teaching. The latter constitute two important school factors that are associated with student achievement, so in promoting the DIA, not only teacher effectiveness but also school effectiveness will be improved (see Creemers & Kyriakides, 2012).

It is finally important to acknowledge that more resources may be needed in order to organise a DIA rather than traditional INSET courses. Tutors may need more time in order to collect initial evaluation data by observing teaching. Unless the teaching skills of participating teachers are measured, improvement priorities cannot be identified, and action plans addressing these needs cannot be developed. The studies reported in this book reveal that although DIA courses may need more resources, they are also cost-effective since a significant impact on the quality of teaching and student learning was identified. Classroom organisation issues should also be considered when offering DIA courses. Participating teachers should work in groups, and the tutors should provide separate tasks for each group and be available to support them in developing their action plans. Both elements of the DIA are characteristics of effective teaching at school level as TER has shown. These characteristics should not be simply described by the tutors of INSET courses (as sometimes happens), but they should also show the participating teachers that they may be used in their teaching. So far, the majority of INSET courses on effective teaching practices are taught using traditional approaches, and so participating teachers may remain unconvinced about the possibility of applying such practices in the



classroom. Therefore, we advocate not only the importance of developing specific teaching skills but also the necessity for tutors to show that they already have the skills that they expect others to acquire.

In this final chapter, we would like to refer to the main arguments put forward in this book. Firstly, this book attempts to integrate research on teacher effectiveness with that on teacher training and professional development. Beyond providing a critical review of these two fields of education, an integrated approach to teacher training and professional development is proposed. By looking critically at these two areas of educational science, the importance of offering ITT and INSET courses based on the DIA has been identified. This book also attempts to establish links between teacher training and teacher professional development programmes by using a common theoretical perspective and showing how these two phases of teacher professional development can help student teachers and teachers move gradually from one stage of teacher competence to a more complex one. This can be done by improving not only their classroom behaviour but also their knowledge and ability to reflect upon their practices, collect data and design action plans to promote their professional development. It is also important to note that the theoretical framework of the DIA is not focused on only one approach to effective teaching but refers to teacher factors and dimensions that emerged from the main approaches to effective teaching, such as the direct and active teaching approach and the constructivist approach. Therefore, implications of these approaches for building teacher training and professional development programmes are drawn.

Beyond providing the theoretical background, and empirical support for the DIA, we also draw implications for practice and provide suggestions for how teacher trainers might develop effective professional development programmes. The results of projects that make use of this approach are also presented to help the reader to see how the DIA can be put into practice. Finally, in this book, we provide suggestions as to further research that can be conducted in order to expand this approach and the knowledge base concerning teacher training and teacher professional development. Therefore, we hope that readers with research interests will find this book useful when designing their own studies and a helpful contribution to this line of research on teacher training and professional development, which aims to improve teaching practice and, through that, student learning outcomes.

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