Chapter 5
Establishing a Comprehensive Theory of Teaching and Learning: The Contribution of the Dynamic Model of Educational Effectiveness

Leonidas Kyriakides, Anastasia Panayiotou, and Panayiotis Antoniou

Abstract The chapter refers to the evolvement of Educational Effectiveness Research (EER) during the last 40 years that begun from the mere identification of correlations among factors and led to the development of integrated models of effectiveness. Then, the chapter refers to the development of the dynamic model of educational effectiveness which emerged from a critical review of integrated models of effectiveness and a synthesis of studies testing the validity of these models. The teacher factors of the dynamic model are presented and their relations with theories of learning are identified. We also refer to longitudinal studies conducted in different countries to test the validity of the dynamic model. The findings of these studies generated empirical support to the main assumptions of the model. Stages of effective teaching were also identified. In the final section, issues of equity are discussed taking into consideration that EER has evolved beyond the sole search of 'what works' in education to also providing answers to questions such as 'for whom does it work' and 'under which conditions does it work'. Finally, we discuss the possibilities of developing a more comprehensive and dynamic theoretical framework of teaching and learning that can be used for improvement purposes.

Keywords Dynamic model of educational effectiveness · Educational effectiveness research · Teaching quality · Equity

L. Kyriakides (✉) · A. Panayiotou · P. Antoniou
University of Cyprus, Nicosia, Cyprus
e-mail: kyriakid@ucy.ac.cy; anas.panayiotou@gmail.com; antoniou.panayiotis@ucy.ac.cy

A.-K. Praetorius, C. Y. Charalambous (eds.), *Theorizing Teaching*,
https://doi.org/10.1007/978-3-031-25613-4_5

1 Educational Effectiveness Research: The Theoretical Development of the Field

Educational Effectiveness Research (EER) has long dealt with identifying factors operating at the different levels of education that may contribute in explaining the variation observed in student outcomes in an attempt to identify 'what works' in education. As similarly stated by Scheerens (this volume), "educational effectiveness would seek to determine the "net" effect of malleable educational conditions, defined at different levels, on outputs, while controlling for relevant antecedent conditions at the level of individual participants". Research during the past 35 years has led to the demonstration of a number of teaching factors that are positively related to student outcomes (e.g., Brophy & Good, 1986; Creemers, 1994; Doyle, 1986; Galton, 1987; Muijs & Reynolds, 2003). Originally, the attention given to EER was a result of the early sociological and psychological studies of Coleman et al. (1966) and Jencks et al. (1972), respectively, which concluded that education had a very small contribution on student outcomes especially when student background characteristics were taken into consideration. These results were also reinforced by the failure of large-scale programmes applied in schools, such as the "Headstart" and "Follow Through", which aimed at reducing the initial differences between students and address equity issues. These disappointing results led to reactions, both among practitioners as well as among researchers, who opposed the idea that schools had few to offer in improving student outcomes (Stringfield & Teddlie, 2011). These studies and the reactions their results caused were thus a catalyst for the development of a line of early studies in the field of EER which revealed that differences in school effectiveness exist even when controlling for student background characteristics, assuming that these differences could be attributed to differences in the quality of education offered by schools (Goldstein & Woodhouse, 2000). In spite of the methodological weaknesses of these studies, their optimistic results which showed that effective teachers and schools play an important role in student achievement, gave thrust to further research in the field of educational effectiveness which then raised questions towards explaining those differences (Creemers & Scheerens, 1994).

In the second phase of EER, researchers aimed at explaining the reasons for which these differences exist and identify factors that explain variation in student outcomes (Levine & Lezotte, 1990; Sammons et al., 1995; Scheerens & Bosker, 1997). Thus, a series of process-product studies have taken place and led to the identification of a list of factors that link specific teaching behaviors and characteristics to student outcomes (Doyle, 1986; Brophy & Good, 1986; Reynolds & Stoll, 1996; Borich, 1996; Galton, 1987; Evertson et al., 1980). One of the first studies that were conducted and has led to the identification of five factors which were considered to be correlated with each other and linked to better student outcomes was a study by Edmonds (1979). Edmonds' "five-factor model" included the following factors: (a) strong educational leadership, (b) high expectations of student achievement, (c) emphasis on basic skills, (d) safe and orderly climate and (e) frequent evaluation of student progress. However, the study was heavily criticized for

its methodological weaknesses (e.g., Ralph & Fennessey, 1983). The methodological criticism of the studies conducted during the first and second phase of EER had gradually shifted the focus of researchers to not only the possible identification of isolated factors which could explain variation in student outcomes, but also to the demonstration of causal relations between factors and achievement. This turn in focus was based on the framework developed by Scheerens and Creemers (1989), which called attention to the possible contribution of the different levels of education to student outcomes.

In the third phase of EER, researchers moved from identifying effectiveness factors to explaining why specific factors are associated with student achievement gains (Scheerens & Bosker, 1997). In this context, three basic approaches have been used to identify the reasons for which certain factors or characteristics contribute to educational effectiveness.

The first approach lies on the *economic aspects of education* and focuses on the relationship between schooling inputs and educational outputs controlling for the influence of several background characteristics (Monk, 1992; Hanushek, 1997). This approach places emphasis on the educational costs and attempts to identify their linkage with student outcomes assuming that increased inputs can lead to improved outcomes. However, education production studies were not in a position to reveal the school inputs that can contribute to maximizing student gains from education (Monk, 1992) especially since process variables, such as the quality of teaching, were not considered. This implies that the relationship between inputs and outputs in education is more complex than assumed (Creemers & Kyriakides, 2008).

The second approach focuses on the *sociological perspective* of EER. This approach refers to factors relating to students' background characteristics as well as other social and cultural factors which could possibly affect student outcomes. Based on this approach, the possibility of adjusting for these background and social differences through education is examined. Therefore, apart from quality in education, another aspect that gradually started to gain attention was the equity dimension which led to several studies searching for the differential effectiveness of schools in regard to different student populations (e.g., Campbell et al., 2004; Strand, 2010) and the effect of contextual factors on student outcomes (Opdenakker & Van Damme, 2006).

Finally, the third approach lies on the *psychological perspective* of EER that focuses on student background factors associated with motivation and learning aptitude, as well as with the learning process itself. Therefore, this approach called for more attention on the two main actors involved in the teaching and learning process (i.e., students and teachers), and led to a list of teacher behaviors in the classroom which were found to be related to student achievement gains. Such factors include management of the classroom, expectations of student performance, structuring of lessons, questioning skills, and immediate exercise after presentation, as well as evaluation, feedback, and corrective instruction (Creemers, 1994). Management of the classroom is linked with "opportunity to learn" (i.e., the opportunities given to students to engage with learning activities) and "time on task" (i.e., the time students are actually engaged with learning tasks) which have been consistently found

to positively influence learning (Brophy & Good, 1986). This implies that teachers who are effective in dealing with student misbehavior help their students to stay on task. Along with dealing with student misbehavior, research in the field of teacher effectiveness has indicated that the establishment of a well-structured and orderly climate, in which interactions among students are encouraged and learning occurs effortlessly through maximizing student collaboration and eliminating excessive competition among students, can contribute to maximizing student gains (Muijs & Reynolds, 2003). The focus during that time was to identify generic factors that may have an impact on student outcomes, meaning that they may have an impact in different contexts, subjects and age-groups of students.

In the fourth phase of EER, researchers have attempted to respond to a major criticism that was made against early EER concerning the failure of the field to substantially contribute to the establishment of strong links between research on effectivenessfactors and actual improvement in the quality of education. With respect to this, a dynamic perspective of education is now being incorporated more explicitly into the theoretical models of EER and the concepts of change and adaptation are more widely taken into consideration both in terms of theory development as well as to the use of theory for improvement purposes into changing contexts (Kyriakides et al., 2021; Scheerens, 2013).

In this chapter, we therefore discuss the possibilities of developing a comprehensive theoretical framework of teaching that may be used not only for addressing issues of "what works" in education, but also for "whom" and "under which conditions"and may also contribute to teacher and school improvement efforts. Thus, when referring to theories of teaching, we refer to factors that may depict characteristics of effective teaching, without however neglecting the impact that student and system level factors may have on the teaching and learning situation. We also expect that the ultimate aim of theories of teaching would be to help schools become more effective in terms of improving student outcomes. We also stress the need for developing such a comprehensive theoretical framework by using the knowledge base of EER and more specifically, by taking into consideration theories that have received sufficient empirical support and factors that have already been found to affect learning outcomes. At this point it is important to stress, that when considering the development of a comprehensive framework of teaching and learning we do not only refer to one single theory or model of teaching. We rather refer to the use of the different theories of teaching and learning within the field of EER from which the main elements that have received empirical support may be retrieved, to provide a basis for the development of a comprehensive framework. Regarding the characteristics of such a theoretical framework, we argue that these should be at least the following. First, it should take into account the nested nature of education and depict the role that different factors at the upper and lower levels of education play in explaining student learning outcomes. To identify factors operating at different levels, the comprehensive framework of teaching and learning should draw on all three dominant perspectives of educational effectiveness. Second, the comprehensive theory should explicitly provide information on the linkage between the factors included and student learning outcomes. Namely, reference to the relevant

theories of learning and schooling that are considered in defining each factor should be made. Third, the comprehensive theory of teaching and learning should refer to the impact that each factor may have across subject matters and student populations. The extent to which specific factors and their measurement dimensions matter more for specific groups of students should be made explicit. In this way, a comprehensive theory of teaching and learning could also address issues of equity and not only issues of quality, as most existing theories within the field of EER have done so far. Finally, the dynamic nature of education should be considered in developing a comprehensive theory of teaching and learning. Therefore, we argue that the dynamic model of educational effectiveness (Creemers & Kyriakides, 2008), which belongs to the fourth phase of EER, may be used as a starting point for developing a comprehensive theoretical framework of teaching and learning. We argue for the use of the dynamic model as it refers to factors that may affect student learning and it is based on empirical data. We therefore present its main characteristics in the next section.

2 The Dynamic Model of Educational Effectiveness

In this section the main elements and rationale upon which the dynamic model has been developed are presented. The factors included at the classroom level are analyzed and their main features are explained. Despite the fact that the dynamic model is multilevel in nature, in this chapter we only focus on the classroom level and present the teacher factors as these have been systematically shown to have a greater effect on student learning than factors located at the upper levels (i.e., school and system). For more information on the factors included in the dynamic model at the upper and lower levels see Creemers and Kyriakides (2008).

2.1 Main Elements and Rationale

The development of the dynamic model took into account the criticism on the earlier models of EER and incorporated the findings of studies conducted in regard to the factors that have an influence on student outcomes (Creemers & Kyriakides, 2006). It was developed based on the main principles of the Creemers' Comprehensive model (Creemers, 1994), providing however clearer definitions of the factors included at the different levels, as well as a more elaborated description of their measurement. In addition, the dynamic model takes into account the "new goals of education", which means that apart from its reference to the cognitive outcomes of schooling, it also refers to other outcomes, such as affective, psychomotor and new learning outcomes (e.g., metacognition). Additionally, the dynamic model is multilevel in nature. Specifically, it refers to factors operating at the four different levels shown in Fig. 5.1 (i.e., student, classroom, school and system). The dynamic model does not only refer to factors operating at the classroom level but also at the school

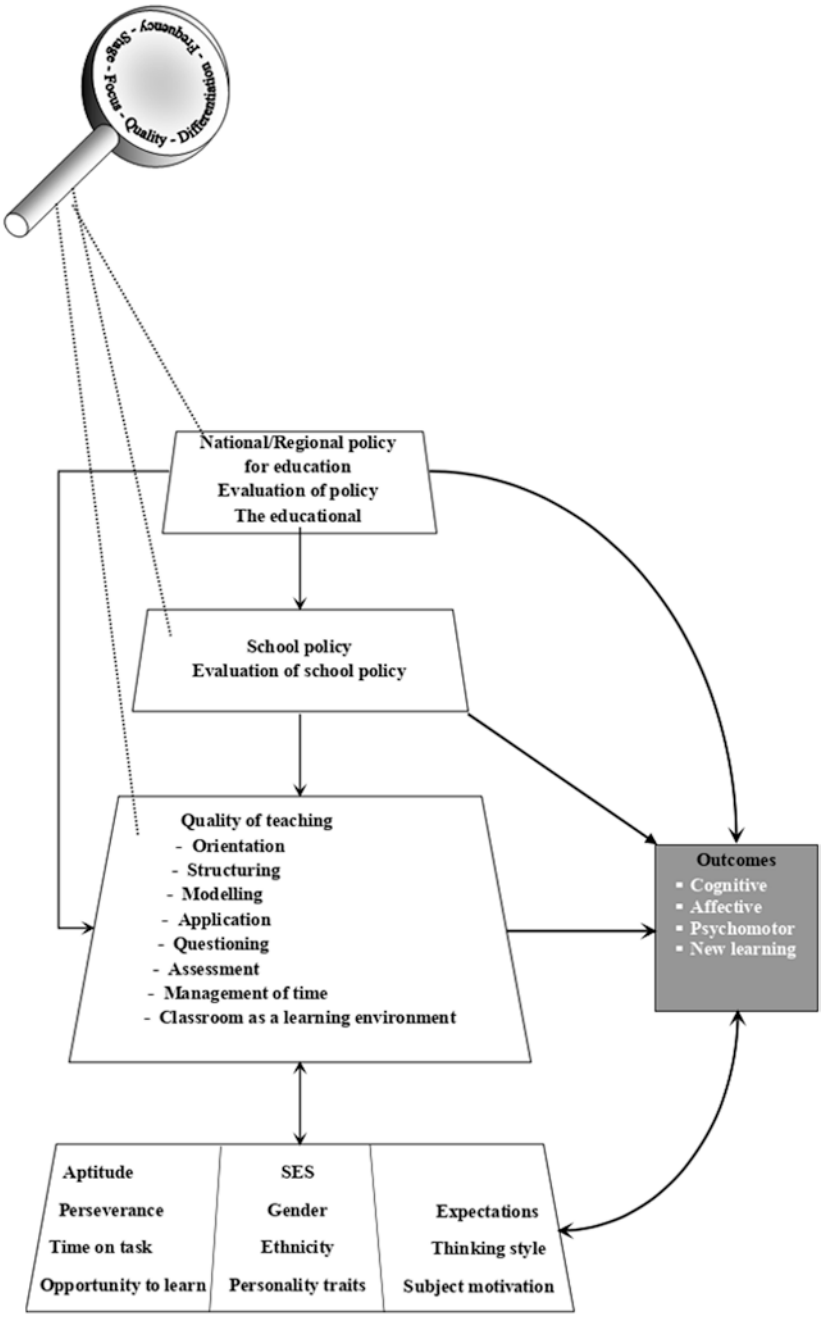

Fig. 5.1 The dynamic model of educational effectiveness

and system levels, recognizing on the one hand the direct effects of teachers' instructional behavior on student learning outcomes and on the other hand, the mainly indirect effects of the system and school factors, through facilitating quality of teaching. This implies that any attempt to develop a comprehensive theory of teaching should recognize the impact that the school and system level factors have on quality of teaching and should therefore have a multilevel structure. This impact is also acknowledged by Scheerens (this volume), who also refers to the need of considering the influences of factors located at the upper and lower levels of education, on the classroom level. In addition, the dynamic model was developed based on the notion that the basic aim of the school is the promotion of learning and therefore, includes factors that have been found through empirical studies to affect learning.

The dynamic model considers effectiveness factors as multidimensional constructs (Kyriakides & Creemers, 2008) and proposes the following five measurement dimensions which are assumed to provide more information concerning not only the quantitative, but also the qualitative aspects of the factors: *(a) frequency, (b) stage, (c) focus, (d) quality* and *(e) differentiation* (Creemers & Kyriakides, 2008). The five measurement dimensions will be further elaborated in the next section of this chapter.

In addition, the dynamic model gives emphasis on providing a clear description of quality of teaching through eight factors included at the classroom level and assumes that there are relations between factors operating both at the same and different levels. Such relations were also demonstrated through earlier models such as Walberg's (1984) who indicated that aptitude, instruction and the psychological environment influence one another and are also influenced by feedback on the amount of learning that occurs. Thus, the concept of grouping of factors was introduced.

Finally, the dynamic model was designed in such a way that can be used not exclusively for research and theory purposes, but also for promoting improvement in education (Creemers & Kyriakides, 2015; Savage, 2012). The practical use of the model for improvement purposes, both at the classroom and school level, has already been explored through several experimental studies (for a review of these studies see Kyriakides et al., 2021).

2.2 Classroom-Level Factors in the Dynamic Model

The dynamic model acknowledges the role that teacher has to play in order to initiate, promote and evaluate student learning (Scheerens & Bosker, 1997; Teddlie & Reynolds, 2000). Specific teaching activities that teachers perform during lessons are taken into consideration instead of teacher background characteristics, such as gender, age, education, beliefs and motivation. Despite the fact that the background characteristics of teachers are widely discussed in the literature, research findings provide contradictory results in relation to the magnitude and the nature of the impact of those characteristics (Creemers & Kyriakides, 2015). Therefore, these

characteristics are not included in the dynamic model since it is mainly concerned with teacher factors that were found to directly affect learning through research in the field of teacher effectiveness (e.g., Brophy & Good, 1986; Doyle, 1986; Emmer & Stough, 2001; Muijs et al., 2014; Muijs & Reynolds, 2001; Rosenshine & Stevens, 1986). Based on the main findings of TER, the eight factors included in the model are as follows: *orientation, structuring, questioning, teaching-modelling, application, time management, teacher role in making classroom a learning environment, and classroom assessment*. More information on the foundations and limitations of TER, can be found in Vieluf and Klieme (this volume). The eight factors do not only refer to one approach of teaching, such as structured or direct teaching (Joyce et al., 2000), or to approaches associated with constructivism (Schoenfeld, 1998). An integrated approach to defining quality of teaching is adopted (Elboj & Niemelä, 2010), similarly to other frameworks, such as the theory of basic dimensions of teaching quality (TBD) (see Vieluf & Klieme, this volume). 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 theories of teaching associated with constructivism. Particularly, these factors have been included in the model and defined by considering the main theories of learning such as behaviourism, cognitivism, constructivism and human/motivation theories. For example, orientation was treated as a teacher factor by taking into account motivation theories. Application was also used as a teacher factor by considering the cognitive load theory. It is also supported, that these factors are generic in nature, assuming that since they were found to promote the cognitive learning of students, they are also able to promote non-cognitive learning. Despite the fact that these factors can be considered generic in nature in terms of having an effect on student learning despite time, place, age and other student population characteristics, studies investigating differential teacher effectiveness have revealed that teacher factors may have a stronger impact on the learning of specific groups of students (Campbell et al., 2004). More information on the individual characteristics of each factor included in the dynamic model is provided below.

(A) Orientation: It refers to teacher behavior in providing the students with explanations in regard to the reason(s) for which a particular activity or lesson or series of lessons occur and/or actively involving students to the identification of the reason(s) for which a lesson includes a specific task. Through this process it is expected that the activities that take place during a lesson and/or series of lessons will become meaningful to students and consequently increase their motivation for participating actively in the classroom (e.g., De Corte, 2000; Paris & Paris, 2001). It is also supported that orientation tasks should take place in not only one part of the lesson but be evenly distributed among the different parts of a lesson or series of lessons (e.g., beginning, middle, and end).

(B) Structuring: It is a factor for which research in the field of educational effectiveness has had early indications in regard to its contribution to student learning. Even from the mid-80 s, attention was called to the fact that student learning is positively influenced when teachers actively present materials and

structure them by: (a) beginning with overviews and/or review of objectives; (b) outlining the content to be covered and signaling transitions between lesson parts; (c) calling attention to main ideas; and (d) reviewing main ideas at the end (Rosenshine & Stevens, 1986). In addition, research has shown that student outcomes can be amplified when teachers provide them with summary reviews, as they are expected to contribute to the grouping and outlining of main points (Brophy & Good, 1986). The fore mentioned structuring tasks aim at assisting students develop links between the different parts of lessons, instead of dealing with them as isolated units. Finally, the structuring factor is not limited to the mere linkage among the different parts of lessons and/or series of lessons, but also refers to the gradual increase of the lessons' difficulty level which is expected to provide all students, irrespective of their abilities, with the opportunity to engage in the lesson's processes (Creemers & Kyriakides, 2006).

(C) Questioning: This factor is defined according to five elements. Firstly, effective teachers are expected to not only provide a large amount of product questions which require students to respond in a single way, but also focus on expecting students to elaborate on their answers and provide details indicating the mental course they followed to reach their answer (i.e., by also posing process questions) (Askew & William, 1995; Evertson et al., 1980). Secondly, it is anticipated that teachers grant students with enough time to think before calling for their answers with the amount of time given depending on each question's level of difficulty. Thirdly, it should be established that the questions posed by the teacher are clear to the students so that no misconceptions or misinterpretations are caused. Fourthly, when posing a question, the teacher should consider students' ability to respond, avoiding too difficult questions that would inevitably cause complete failure to respond (Brophy & Good, 1986). Finally, it is outlined that an important aspect of this factor is the way teachers deal with student responses. Specifically, correct responses should be acknowledged so that it is established that all students are aware of the correct answer at the end of the discussion. In case a student's answer is not fully correct then the teacher should acknowledge whatever part may be correct, and assist the student in discovering the correct answer or provide an improved response, through the provision of clarification or helpful guidelines.

(D) Teaching-modeling: An aspect of education that has received increased attention in the last two decades is that of self-regulated learning due to the extensive policy emphasis given on the achievement of the new goals of education (Muijs et al., 2014). Taking the above into consideration, the teaching-modeling factor is included among the teacher factors of the dynamic model. This factor anticipates that effective teachers are promoting students' use of learning strategies and/or development of their own strategies in order to address different types of problems (Grieve, 2010) and develop skills promoting active learning. Thus, depending on the problem addressed, teachers may follow two alternative approaches. The first approach concerns the teacher's presentation of a problem-solving strategy without asking for any student input. The second approach demands more active student participation and

begins in a rather backward manner, since students are encouraged to describe ways of how they themselves would address a specific problem. Then the teacher is expected to make use of that information for promoting the idea of modeling and encourage the development of the students' own problem-solving strategies (Aparicio & Moneo, 2005; Gijbels et al., 2006).

(E) Application: Providing students with practice and application opportunities can enhance learning outcomes (Borich, 1996). Learning new information cannot be a constant process, since according to the Cognitive Load Theory the working memory can only process a limited amount of information at each given time (Kirschner, 2002; Paas et al., 2003). It is also argued that application tasks should not only constitute a repetition of the material that students were taught in classroom but should move a step forward adding more complex and mentally stimulating elements. Thus, application activities should provide the trigger for further knowledge, contributing to the linkage of the units taught in one lesson or series of lessons with the following. Effective teachers are expected to not only observe students engaging in application tasks, but also to actively contribute to their learning by supervising their progress and providing students with constructive feedback (Brophy & Good, 1986; Creemers et al., 2013).

(F) The classroom as a learning environment: This factor consists of five components: a) teacher-student interaction, b) student-student interaction, c) students' treatment by the teacher, d) competition between students, and e) classroom disorder. Classroom environment research has evidence showing that these five elements can be considered as important aspects of this factor. Specifically, the first two of these elements refer to the type of interactions that exist in a classroom and can be seen as important for measuring classroom climate (for example, see Cazden, 1986; Den Brok et al., 2004; Harjunen, 2012), especially since learning takes place through interactions. The other three elements refer to teachers' efforts to create a well-organized and accommodating environment for learning in the classroom (Walberg, 1986).

(G) Management of time: To address this factor the amount of time used per lesson for on-task behavior is investigated. It is anticipated that effective teachers are able to organize and manage the classroom environment reducing any purposeless loss of learning time, maximizing engagement rates. Thus, the main interest of this factor is whether students are on task and whethertheir teacher is able to deal effectively with any kind of classroom disorder without wasting the teaching time. It is also important to investigate whether teachers manage to decrease loss of time for different groups of students by taking into consideration their different learning needs and abilities (e.g., by allocating supplementing work to gifted students that finish work earlier than others).

(H) Assessment: Assessment is seen as an essential and integrated part of teaching (Stenmark, 1992). Especially formative assessment has been found to be 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, 2008; Shepard, 1989). Therefore, the dynamic model places emphasis on student assessment and argues that the information collected though assessment is expected to be

used by the teacher for at least two reasons. The first reason is related to the identification of particular student needs so as to proceed with the provision of feedback and corrective measures where needed. The second reason lies on the teachers' self-evaluation since student results may reflect possible weaknesses in teaching practice and indicate areas for improvement. It is thus stressed that assessment data should be examined in terms of quality (i.e., whether they are reliable and valid) in order to promote the formative rather than the summative purpose of assessment.

As has been mentioned in the first part of this section, the dynamic model assumes that each factor can be defined and measured according to five dimensions: *frequency, focus, stage, quality, and differentiation*. These dimensions may assist the more effective description of the functioning of a factor and make it easier to use the results of the evaluation of the functioning of each factor for improvement purposes. The importance of taking each dimension of the teacher effectiveness factors into account is illustrated below.

- *Frequency* is a quantitative means of measuring the functioning of each factor. However, the other four dimensions which refer to the qualitative characteristics of the functioning of the factors reveal that effectiveness is more complicated than assumed by previous theoretical models and studies.
- *Focus* can be defined by taking into account two different facets. The first one refers to the specificity of the activities associated with the functioning of a factor, namely whether they can be considered as specific in terms of solid activities or policies; or more general, in terms of not providing adequate details to the different stakeholders on the application processes of an activity. The second aspect refers to the purpose for which an activity takes place by looking whether an action aims at achieving one or several purposes. The dynamic model argues that there should be a balance in the specificity of the teaching tasks and this assumption is in line with the synergy theory (see Kyriakides et al., 2021).
- *Stage* is closely related to the time at which tasks associated with a factor take place. It is assumed that the application of a factor in only one point in time may not constitute an effective way of dealing with the factor in terms of increasing the positive effects resulting from its implementation. Thus, 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.
- *Quality* refers to the properties of the specific factor itself, as they are discussed in the literature. For instance, in regard to the assessment factor, as it is stated through literature, formative assessment is expected to be more beneficial to students than summative and facilitate both learning and teaching (Black & Wiliam, 2009; Hattie & Timperley, 2007; Wiliam et al., 2004).
- *Differentiation* refers to the extent to which activities associated with a factor are applied without any discretion for all the subjects involved with it (e.g., all the students, teachers, schools) irrespective of their needs and/or abilities. It is expected that adaptation to the specific needs of each subject or group of subjects will increase the successful implementation of a factor and will ultimately maxi-

mize its effect on student learning outcomes also addressing issues of equity (Creemers & Kyriakides, 2006). Taking in mind that students learn best when their teachers become accustomed to the differences in their readiness levels, interests and learning needs and make an effort to adjust their teaching in order to satisfy them (Tomlinson, 2005), the need for examining the functioning of the different factors in terms of differentiation is amplified.

In this section, the main assumptions and rationale upon which the dynamic model was developed were discussed. In the next section, a brief description of the main studies that have provided empirical support to the main assumptions of the model at the classroom level is provided.

3 Empirical Support Provided to the Main Assumptions of the Dynamic Model at the Classroom Level

Some research findings supporting the validity of the dynamic model have been produced since 2003, when the model was developed. Specifically, 16 empirical studies and one meta-analysis have been conducted to examine the main assumptions of the dynamic model at classroom level (for a review of these studies see Kyriakides et al., 2021). These empirical studies as well as the meta-analysis have provided support for the importance of factors included in the dynamic model at classroom level and their measurement dimensions. Empirical studies have also revealed relationships among factors operating at the classroom level, which help us define stages of effective teaching. Table 5.1 provides a summary of the findings of these studies, indicating the type of support that each of the assumption in the model has received. It is important to note that none of these studies or meta-analyses has generated negative results with regard to any assumption of the dynamic model. Moreover, all studies have provided empirical support to the multilevel nature of the dynamic model since factors operating at different levels have been found to be associated with student achievement.

Table 5.1 Empirical evidence supporting the main assumptions of the dynamic model at the classroom level emerging from empirical studies and a meta-analysis

Assumptions of the dynamic model	Empirical studies	Meta-analysis
1. Multilevel in nature	All	17
2. Five dimensions can be used to measure the teacher factors	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 16	
3. Impact of teacher factors on learning outcomes	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16	17
4. Relationships between factors operating at the same level: Stages of effective teaching (including assessment)	1, 4, 5, 6, 7, 8, 9	17
Negative results in relation to any assumption	None	None

Studies:

1. A longitudinal study measuring teacher and school effectiveness in different subjects (i.e., mathematics, language and religious education) and different learning domains (cognitive and affective) (Kyriakides & Creemers, 2008).
2. A study investigating the impact of teacher factors on achievement of Cypriot students at the end of pre-primary school (Kyriakides & Creemers, 2009).
3. A European study testing the validity of the dynamic model at teacher, school and system level (Panayiotou et al., 2014).
4. A study in Canada searching for grouping of teacher factors included in the dynamic model and revealing specific stages of effective teaching (Kyriakides et al. 2013a).
5. An experimental study investigating the impact upon student achievement of a teacher professional development approach based on the dynamic approach (Antoniou & Kyriakides, 2011).
6. Examining not only the impact but also the sustainability of the dynamic approach on improving teacher behaviour and student outcomes (Antoniou & Kyriakides, 2013).
7. Searching for stages of teacher's skills in assessment (Christoforidou et al., 2014).
8. The effects of two intervention programmes on teaching quality and student achievement revealing the added value of the dynamic approach (Azkiyah et al. 2014).
9. Using the dynamic model to identify stages of teacher skills in assessment in two different countries (Cyprus and Greece) (Christoforidou & Xirafidou, 2014).
10. Using observation and student questionnaire data to measure the impact of teaching factors on mathematical achievement of primary students in Ghana (Azigwe et al., 2016).
11. Examining the impact of teacher behaviour on promoting students' cognitive and metacognitive skills (Kyriakides et al., 2020).
12. Investigating the impact of teacher factors on slow learners' outcomes in language (Ioannou, 2017).
13. Integrating generic and content-specific teaching practices when exploring teaching quality in primary physical education (Kyriakides et al. 2018b).
14. A longitudinal study investigating for the short- and long-term effects of the home learning environment and teacher factors included in the dynamic model on student achievement in mathematics (Dimosthenous et al., 2020).
15. A case study of policy and actions of Rivers State, Nigeria to improve teaching quality and the school learning environment (Lelei, 2019).
16. Do teachers exhibit the same generic teaching skills when they teach in different classrooms (Kokkinou & Kyriakides, 2018)

Meta-analysis:

17. A quantitative synthesis of 167 studies investigating for the impact of generic teaching skills on student achievement (Kyriakides et al. 2013b).

3.1 The Impact of Teacher Factors on Student Learning Outcomes

Table 5.1 shows that the results of 16 empirical studies demonstrate that teacher factors in the dynamic model are associated with students' achievement gains. It is also important to note that different types of learning outcomes were used as criteria for measuring teacher effectiveness. Specifically, these studies were able to demonstrate the impact of teacher factors on promoting not only cognitive, but also affective (e.g., Kyriakides & Creemers, 2008) psychomotor (e.g., Kyriakides et al. 2018, b) and meta-cognitive learning outcomes (e.g., Kyriakides et al., 2020). One can also see that the studies presented in this table collected data on achievement in different subjects (i.e., language, mathematics, science, religious education, and physical education) and from students in different phases of education (i.e., pre-primary, primary, and secondary education). Therefore, these studies provided some empirical support for the assumption that teacher factors can be considered to be generic, especially since these factors were found to be associated with student achievement gains with respect to different learning outcomes and in different phases of education. It is finally important to note that these studies took place in different countries (mainly in Europe), and the significance of teacher factors when it comes to explaining variation in student achievement gains in different educational contexts has to some extent be demonstrated. It is important to note that one of these studies was conducted in Ghana and the teacher factors of the dynamic model were found to provide an even more convincing explanation for variation in student achievement rather than in any of the European countries from which data on teacher factors have been collected (Azigwe et al., 2016). The findings of these empirical studies seem to be in line with the results of the meta-analysis which was conducted in order to test the validity of the dynamic model at the teacher level (Kyriakides et al. 2013b).

3.2 Using a Multidimensional Approach to Measuring the Functioning of Teacher and School Factors

The studies that took place so as to assess the validity of the model, have revealed that the proposed dimensions should be taken into account in the field of EER. Namely, these studies made use of the proposed measurement framework to design instruments that would evaluate the functioning of the teacher factors in relation to the five dimensions. By employing structural equation modelling techniques, the construct validity of these instruments was demonstrated. It was therefore possible to treat each factor as a five-trait construct (consisting of each of the five dimensions of the model) and generate relevant scores rather than treating the factor as a unidimensional construct. In addition, the added value of using the five dimensions to measure teacher factors has been demonstrated, especially since, when all

five dimensions of teacher factors were considered, a much larger variance of student achievement gains could be explained rather than when only one or even some dimensions of the teacher factors were included in the multilevel model. What is, however, more important is that in some studies it was not possible to see the effects of some factors when only the frequency dimension was considered, but variation in student achievement was explained when the other four dimensions of these factors were taken into account (e.g., Kyriakides & Creemers, 2008, 2009). This implies that if these studies were only concerned with the frequency dimension of these factors, it would not have been possible to demonstrate the effects of these factors, and the importance of the factors could have been misinterpreted (Creemers & Kyriakides, 2015).

3.3 Searching for Relationships Among Teacher Factors: Establishing Stages of Effective Teaching

The dynamic model argues that factors operating at the same level are related to each other. Thus, the concept of grouping of factors is introduced. In this part, we refer to the main findings of studies investigating relationships among teacher factors, which were able not only to empirically support this assumption of the model, but also to identify stages of effective teaching. The first study that revealed relationships among the teacher factors (Kyriakides et al., 2009) was conducted in order toidentify the impact of the eight teacher factors and their dimensions on student achievement gains in different subjects (i.e., language, mathematics and religious education) and on different types of learning outcome (i.e., cognitive and affective). This study tested the validity of the measurement dimension framework proposed by the dynamic model and made use of the Rasch model to identify the extent to which the five dimensions of the teacher factors could be reducible to a common unidimensional scale. By analyzing the data that emerged from the observation instruments used to measure the performance of the teacher sample in relation to the eight teacher factors and their dimensions, it was discovered that the data fitted the Rasch model, and a reliable hierarchical scale of teaching skills was established. Then, by using cluster analysis, it was found that the teaching skills could be grouped into five levels of difficulty that could be taken to stand for different types of teacher behavior, moving from relatively easy to more difficult and spanning the five dimensions of the eight teacher factors included in the dynamic model. In the next step of the analysis, the Saltus model was used to discover the depth of the divide separating the five types of teacher behavior, which emerged from cluster analysis and which could be ordered into different levels according to their difficulty. Finally, the study examined whether classification of teachers into the five levels (identified through the cluster analysis) could help us explain variance of student achievement in relation to each outcome of schooling considered in this study.

The first three levels are mainly related to the direct and active teaching approach, moving from the basic requirements concerning 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. These skills also gradually move from the use of teacher-centered approaches to the active involvement of students in teaching and learning. The last two levels are more demanding since teachers are expected to differentiate their instruction (level 4) and also to demonstrate their ability to use the new teaching approach (level 5). Multilevel analysis of student achievement also showed that teachers situated at higher levels are more effective than those situated at the lower levels. This association is found with respect to achievement in all three different subjects and also both cognitive and affective outcomes (see Kyriakides et al., 2009).

Similar results emerged from a study conducted in Canada which made use of student ratings to measure the skills of teachers in relation to each teacher factor and its dimensions (Kyriakides et al., 2013a). In this case the stages which were identified also moved gradually from skills associated with direct teaching to more advanced skills involved in the constructivist approach and differentiation of teaching. This indicates that teachers may also move gradually from one type of teacher behavior to a more complex one. However, data that emerged from cross-sectional studies were more likely to identify differences in performance of teachers and that these findings do not necessarily imply that transitioning from one stage to another occurs in a stepwise manner. Given that the aim of these two studies was to test the validity of the dynamic model and illustrate the importance of grouping teacher factors into types of teacher behavior, teaching skill acquisition over two (or even more consecutive school years) was not investigated. Therefore, a question that arises is whether stepwise development of types of teacher behavior can be achieved through participation in programs of teacher development. An experimental study investigated the impact of offering the teacher improvement programs based on the dynamic approach for a longer period rather than just a single school year (Kyriakides et al., 2017). This study revealed that a stepwise progression of teachers' skills took place (over a period of three school years) and thus supported the generalizability of findings of the studies seeking to identify stages of effective teaching.

4 Establishing a Comprehensive Theoretical Framework That Can Be Used for Improvement Purposes

The historical review of EER presented in the first part of the chapter reveals that different models have been developed during each of the four phases of EER, aiming at first to answer the question of why specific factors are associated with student achievement gains and then to search for the conditions under which certain factors could contribute to student learning. Different approaches have also been used so as to identify the reasons for which certain factors or characteristics contribute to

educational effectiveness (i.e., the economic, sociological and psychological). Therefore, one may realize that when considering the development of a comprehensive framework of teaching and learning we do not only refer to one single theory or model of teaching but to the development of a framework that takes into consideration the different theories of teaching and learning that have been developed during the past years within the field of EER and which have received empirical validity in terms of their main assumptions and factors included. In the first section of the chapter, we also drew attention to the need of incorporating the three different approaches to educational effectiveness especially since teachers are not equally effective when they are expected to teach in different school settings. Factors that may influence teaching that are situated at the school and system level and are in line with either the sociological or the economic perspective of educational effectiveness need to be considered in developing the comprehensive framework of teaching and learning. For instance, organizational theories that derive from the field of sociology and – depending on their focus – refer to the structure, functioning and performance of an organization and the behaviour of individuals and groups within it, need to be taken into consideration when deciding on the school level factors that are to be included in such a comprehensive framework (Cheng & Tsui, 1999; Hoy & Miskel, 2005; Kuh, 1996; Scheerens & Bosker, 1997). The Human Capital Theory (Kiker, 1966), which lies under the economic approach and places emphasis on the investments that can be made for the evolvement of the individuals within an organization for example, through education and training, enabling improved levels of quality and production should also be considered as the influence of the Human Capital Theory is considerable (Gillies, 2015). In addition, theories of learning within the psychological approach, such as motivation theories, should be considered when taking decisions on the factors to be included in this framework, since factors such as orientation which derive from motivation theories and the field of psychology were found to be associated with student learning (Green et al., 2006; Weiner, 1990).

In addition, since studies have shown that factors beyond those located at classroom level may also affect the learning of students, either directly or indirectly, the multilevel character of education should be considered when developing a comprehensive framework of teaching and learning. In this way, the synergy theory will also be accounted for which, if translated at the educational setting, suggests that the combined value of taking into consideration factors deriving from different levels of education will be greater than in the case of considering the individual factors of each level separately for explaining effects on student learning (Liu & Jiang, 2018; Scheerens, 2016). When referring to learning, it should be clarified that recent theories do not only refer to cognitive, but also to non-cognitive, psychomotor and meta-cognitive outcomes. Thus, the importance of considering more than cognitive outcomes, should be taken into consideration when developing such a comprehensive framework.

In the previous section, we argued for the importance of developing not only an integrated multilevel model for describing effective teaching and learning, but also

on the need to consider the dynamic nature of education when doing so. In this context, the dynamic model of educational effectiveness was described which may be seen as a starting point for establishing a comprehensive framework of teaching and learning that can ultimately be used for promoting quality and equity in education. The dynamic model is proposed as a starting point for the development of the comprehensive framework since its main assumptions and the impact of the teacher factors on different student learning outcomes have received empirical support thought the studies and meta-analysis discussed earlier. The dynamic model also includes factors deriving from the different approaches discussed above and different theories (e.g., motivation theories, Cognitive load theory etc.) and therefore it may provide a starting point for the development of a comprehensive framework of teaching and learning. However, the limitations of the dynamic model should also be acknowledged and suggestions for further research to develop a comprehensive theory of teaching and learning are provided.

Firstly, it should be noted that the conditions under which specific effectiveness factors included in the dynamic model may be more important in promoting learning have not yet sufficiently been examined. Therefore, the issue of differential effectiveness which has been raised by researchers within the field of EER (e.g. Teddlie & Stringfield, 1993; Borich, 1996; Watkins & Mortimore, 1999; Hopkins & Reynolds, 2001; Muijs & Reynolds, 2001), should be considered when developing a comprehensive framework of teaching and learning. With regard to the effect of the teacher factors included in the dynamic model, by comparing the effect of each factor on each outcome at the primary and pre-primary school level it was shown that two of the factors of the dynamic model which are strongly associated with the constructivist approach to learning (i.e., modelling and orientation) were not found to be associated with achievement of pre-primary students. However, they were found to be associated with achievement in mathematics and Greek language at the end of primary school. This implies that the generic nature of these two factors could be questioned since an argument that these factors are not important for younger students could emerge. The effects of all dimensions of the application factor and also teacher assessment on achievement of pre-primary students in each outcome were found to be much stronger than those of the primary-school study. This implies that these factors are associated with achievement at both phases of schooling, but have a stronger effect for one group of students, indicating the possibility of having differential effects.

In addition, a study conducted by Kokkinou and Kyriakides (2018) which was concerned with differential teacher effectiveness in relation to classroom composition, searched for whether secondary teachers who teach in different classrooms exhibit the same teaching skills in regard to the factors included in the dynamic model irrespective of the classroom composition. Despite the fact that almost all teacher factors were found not to be influenced by any classroom context variable measuring student background characteristics (i.e., gender, ethnicity, and prior achievement), this finding should not imply that teachers should use the same teaching tasks in teaching different groups of students especially since differentiation is one of the five dimensions used to measure the functioning of each factor. However,

the results of this study provided further support to the generic nature of the factors included in the dynamic model at secondary education in terms of the impact that they have on promoting different types of learning outcomes of different groups of students (including age group). The results also stress the need to differentiate teaching in order to conform to the learning needs of each specific group of students. When establishing a comprehensive theory of teaching and learning, researchers should therefore take into consideration aspects of the classroom context which may influence the functioning of factors and use relevant designs to detect effects of student factors (especially background factors) on the functioning of teacher factors.

Secondly, apart from searching under which conditions certain factors may better promote the learning outcomes of different students or groups of students, issues of differential effectiveness should also be taken into consideration when establishing theories of teaching. In developing and testing a comprehensive theory of teaching and learning, one should take into consideration that effective teachers are not only those who manage to contribute to the promotion of learning outcomes for all (quality) but also those that manage to reduce differences in student learning outcomes between groups of students with different background characteristics (equity). This argument is in line with those who support the equalitarian view of equity which implies that the main responsibility for achieving equity in education should be that of society. However, another view of equity exists which refers to the meritocratic view. The meritocratic view assumes that student learning outcomes reflect each student's talents and the efforts being put into learning (Gulson & Webb, 2012; McCoy & Major, 2007). Despite, however, these assumptions EER revealed that the reasons causing variation in student learning outcomes are more complex and cannot simply be attributed to one's talents and efforts. This can be seen as especially important when considering that other student background factors, such as socioeconomic status (SES), gender and ethnicity may impact on a student's efforts or ability to evolve his/her talents. The egalitarian view of equity having acknowledged the background differences of students supports the notion that society – and to that respect national/state agencies and schools – can be considered primarily responsible for achieving equity through the provision of mediating measures and further support to disadvantaged groups of students who are more likely to obtain lower educational outcomes (Kelly & Downey, 2010). Quantitative syntheses of educational studies also revealed that the SES of students has a relatively strong impact on student achievement (Sirin, 2005; White, 1982). Therefore, we argue that teachers and schools should not only help students achieve learning outcomes but they also need to function in a way that students' success in learning is not determined by their background characteristics, including SES (Kyriakides et al., 2021).

Most studies in EER have however, focused on examining issues of quality rather than equity in education. This lack of interest in identifying factors associated with the equity dimension can be partly attributed to the fact that there is no consensus about the way that equity can be defined and measured (see Kelly, 2012; Nachbauer & Kyriakides, 2020). Similarly, studies conducted in order to test the validity of the dynamic model were exclusively dealing with issues of quality rather that equity

and therefore, the factors of the dynamic model (or even other factors not included in the model) that may be used to better promote issues of equity have yet to be determined (see Kyriakides et al. 2018a).

When developing a comprehensive framework of teaching and learning that could be the result of collaboration among researchers within the field of EER and merging of different existing theoretical models, factors of effectiveness should be treated as situational in character. Differential effects of these factors should, therefore, be investigated. The dynamic model which may be used as a starting point for the development of such a comprehensive theory assumes that the differentiation dimension of the eight factors included at the classroom level may affect aspects of equity and therefore relevant research questions can be raised. For example, is orientation or modelling equally productive in classes with a high variation in terms of student abilities or socioeconomic background? By providing answers to such questions, the impact of teacher factors on promoting both quality and equity could be better realized and factors deriving from different models of effectiveness which are able to promote equity may be used in developing a comprehensive framework of teaching and learning which will be able to move a step forward and expand the dynamic model.

Finally, it should be acknowledged that the dynamic model only refers to generic factors at classroom level and does not consider the effects of domain specific factors on teacher effectiveness. However, various frameworks and models have been developed during the past 30 years in the field of educational effectiveness which have taken into account the results of research in the field of TER, as well as the results of the dominant meta-analyses conducted in the field. These frameworks were either more generic in nature given that they aimed to describe teaching more universally or more domain-specific. Despite the mostly common starting point of these frameworks, one could notice that emphasis on different aspects of teaching have been placed. Therefore, the question of whether different models may be combined – either generic or domain-specific – so as to provide a more complete illustration of effective education and guide improvement actions has been raised by researchers (Charalambous & Praetorius, 2018). By acknowledging the limitations of existing models (including the ones of the dynamic model), a theory that may be used so as to provide a basis for educational improvement purposes can be developed. In addition, other models and theories within EER place emphasis on different generic factors which are considered important for learning. The possibilities of combining factors deriving from different models should thus by examined. For the measurement of the effectiveness factors included in the different models, different instruments are used. One should, therefore, examine whether using all of the instruments provided by each model to measure quality of teaching can provide a more comprehensive feedback to teachers for designing their own improvement actions. This may be seen as a crucial issue, especially since research has been often criticized for being developed without providing sufficient linkage with practice and, consequently school improvement.

By using a combination of instruments, which take into consideration different aspects of teaching, more information may be provided on the weaknesses and

strengths of the lessons and therefore the information collected may be more effectively used for designing teacher professional development activities. In addition, the use of different instruments deriving from different frameworks may overcome the weaknesses of instruments coming from just a single framework. For example, the dynamic model assumes that when measuring the functioning of a factor we should take into consideration both, its quantitative and qualitative characteristics. Apart from frequency therefore it also foresees the measurement of factors through four dimensions which examine the qualitative characteristics of the functioning of a factor. On the contrary other models and theories only take into account the frequency dimension when measuring the functioning of the different factors. Furthermore, combination of different models may provide a broader view of teaching and take into consideration a wider range of factors. Factors that may not be taken into consideration in assessing the quality of teaching by one model may be included in another and therefore using different models to develop a comprehensive framework of teaching and learning may provide a better linkage between different approaches to teaching. Despite the advantages of combining different models for measuring quality of teaching the weaknesses of this approach should also be acknowledged. For example, practical limitations may arise in using the classroom observation results for providing feedback to teachers for professional development purposes. By observing the functioning of a large number of factors the focus of the observation is widened and less specific suggestions could therefore be generated for improvement purposes. In addition, one could also argue that we need a more precise definition of the generic and domain-specific factors and a systematic comparison of these factors, which may reveal the extent to which there is an overlap between some generic and domain-specific factors. It should also be examined whether domain-specific factors could be included in generic models such as the dynamic model and also if these factors can also be grouped into stages of effective teaching. The possibilities of the development of a comprehensive framework for measuring quality of teaching through combining both generic and domain-specific factors should be examined.

It is however stressed in this chapter, that this comprehensive theory of teaching and learning is not only expected to refer to more factors rather than those included in a single model of educational effectiveness such as the dynamic model. This chapter argues that this theoretical framework should have at least four characteristics. First, it should be multilevel in nature by considering the impact that school and system level factors may have on teacher factors. To identify factors operating at different levels, all three dominant perspectives of educational effectiveness (presented in this chapter) should be considered. Second, the proposed theory should help researchers, policymakers, and practitioners understand why the factors included in this theory are associated with student learning outcomes. Therefore, the relevant theories of learning and schooling that are considered in defining each factor should be made explicit. Third, the comprehensive theory of teaching and learning should address two very important questions about the impact of each factor which have to do with the conditions under which each factor matters and the extent to which specific factors and their measurement dimensions matter more for

specific groups of students. In this way, a comprehensive theory of teaching and learning could refer to factors and their measurement dimensions that are related not only with the quality but also with the equity dimension of effectiveness. Finally, the dynamic nature of education should be considered in developing a comprehensive theory of teaching and learning. For this reason, the dynamic model of educational effectiveness could be considered as a starting point for establishing such a theory of teaching and learning. By considering the dynamic nature of education, the effort to establish a comprehensive theory of teaching and learning should not only help us develop a better understanding of the nature of educational effectiveness but also to identify ways of using that theory for improving quality of teaching and through that promoting both quality and equity in education.

References

Antoniou, P., & Kyriakides, L. (2011). The impact of a dynamic approach to professional development on teacher instruction and student learning: Results from an experimental study. *School Effectiveness and School Improvement, 22*(3), 291–311.

Antoniou, P., & Kyriakides, L. (2013). A dynamic integrated approach to teacher professional development: Impact and sustainability of the effects on improving teacher behavior and student outcomes. *Teaching and Teacher Education, 29*(1), 1–12.

Aparicio, J. J., & Moneo, M. R. (2005). Constructivism, the so-called semantic learning theories, and situated cognition versus the psychological learning theories. *Spanish Journal of Psychology, 8*(2), 180–198.

Askew, M., & William, D. (1995). *Recent research in mathematics education 5–16*. Office for Standards in Education.

Azigwe, J. B., Kyriakides, L., Panayiotou, A., & Creemers, B. P. M. (2016). The impact of effective teaching characteristics in promoting student achievement in Ghana. *International Journal of Educational Development, 51*, 51–61. https://doi.org/10.1016/j.ijedudev.2016.07.004

Azkiyah, S. N., Doolaard, S., Creemers, B. P. M., & Van Der Werf, M. P. C. (2014). The effects of two intervention programs on teaching quality and student achievement. *Journal of Classroom Interaction, 49*(1), 4–11.

Black, P., & Wiliam, D. (2009). Developing a theory of formative assessment. *Educational Assessment, Evaluation and Accountability, 21*(1), 5–31.

Borich, G. D. (1996). *Effective teaching methods* (3rd ed.). Macmillan.

Brophy, J., & Good, T. L. (1986). Teacher behaviour and student achievement. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 328–375). Macmillan.

Campbell, R. J., Kyriakides, L., Muijs, R. D., & Robinson, W. (2004). *Assessing teacher effectiveness: A differentiated model*. Routledge Falmer.

Cazden, C. B. (1986). Classroom discourse. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 432–463). Macmillan.

Charalambous, C. Y., & Praetorius, A. K. (2018). Studying mathematics instruction through different lenses: Setting the ground for understanding instructional quality more comprehensively. *ZDM, 50*(3), 355–366.

Cheng, Y. C., & Tsui, K. T. (1999). Multimodels of teacher effectiveness: Implications for research. *Journal of Educational Research, 92*(3), 141–150.

Christoforidou, M., & Xirafidou, E. (2014). Using the dynamic model to identify stages of teacher skills in assessment. *Journal of Classroom Interaction, 49*(1), 12–25. https://doi.org/10.13140/2.1.4511.2969

Christoforidou, M., Kyriakides, L., Antoniou, P., & Creemers, B. P. M. (2014). Searching for stages of teacher skills in assessment. *Studies in Educational Evaluation, 40*, 1–11.

Coleman, J. S., Campbell, E. Q., Hobson, C. F., McPartland, J., Mood, A. M., Weinfeld, F. D., & York, R. L. (1966). *Equality of educational opportunity*. US Government Printing Office.

Creemers, B. P. M. (1994). *The effective classroom*. Cassell.

Creemers, B. P. M., & Kyriakides, L. (2006). Critical analysis of the current approaches to modelling educational effectiveness: The importance of establishing a dynamic model. *School Effectiveness and School Improvement, 17*(3), 347–366. https://doi.org/10.1080/09243450600697242

Creemers, B. P. M., & Kyriakides, L. (2008). *The dynamics of educational effectiveness: A contribution to policy, practice and theory in contemporary schools*. Routledge.

Creemers, B. P. M., & Kyriakides, L. (2015). Developing, testing, and using theoretical models for promoting quality in education. *School Effectiveness and School Improvement, 26*(1), 102–119.

Creemers, B. P. M., & Scheerens, J. (1994). Developments in the educational effectiveness research programme. *International Journal of Educational Research, 21*(2), 125–140.

Creemers, B. P. M., Kyriakides, L., & Antoniou, P. (2013). *Teacher professional development for improving quality in teaching*. Springer.

De Corte, E. (2000). Marrying theory building and the improvement of school practice: A permanent challenge for instructional psychology. *Learning and Instruction, 10*(3), 249–266.

De Jong, R., Westerhof, K. J., & Kruiter, J. H. (2004). Empirical evidence of a comprehensive model of school effectiveness: A multilevel study in mathematics in the first year of junior general education in the Netherlands. *School Effectiveness and School Improvement, 15*(1), 3–31.

Den Brok, P., Brekelmans, M., & Wubbels, T. (2004). Interpersonal teacher behaviour and student outcomes. *School Effectiveness and School Improvement, 15*(3/4), 407–442.

Dimosthenous, A., Kyriakides, L., & Panayiotou, A. (2020). Short- and long-term effects of the home learning environment and teachers on student achievement in mathematics: A longitudinal study. *School Effectiveness and School Improvement, 31*(1), 50–79. https://doi.org/10.1080/09243453.2019.1642212

Doyle, W. (1986). Classroom organization and management. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 392–431). Macmillan. https://doi.org/10.1080/03057920701542057

Edmonds, R. R. (1979). Effective schools for the urban poor. *Educational Leadership, 37*(1), 15–27.

Elboj, C., & Niemelä, R. (2010). Sub-communities of mutual learners in the classroom: The case of interactive groups. *Revista de Psicodidactica, 15*(2), 177–189.

Emmer, E. T., & Stough, L. M. (2001). Classroom management: A critical part of educational psychology, with implications for teacher education. *Educational Psychologist, 36*(2), 103–112. https://doi.org/10.1207/S15326985EP3602_5

Evertson, C. M., Anderson, C. W., Anderson, L. M., & Brophy, J. E. (1980). Relationships between classroom behaviors and student outcomes in junior high mathematics and English classes. *American Educational Research Journal, 17*(1), 43–60.

Galton, M. (1987). An ORACLE chronicle: A decade of classroom research. *Teaching and Teacher Education, 3*(4), 299–313.

Gijbels, D., Van de Watering, G., Dochy, F., & Van den Bossche, P. (2006). New learning environments and constructivism: The students' perspective. *Instructional Science, 34*(3), 213–226.

Gillies, D. (2015). Human capital theory in education. In M. Peters (Ed.), *Encyclopedia of educational philosophy and theory*. Springer. https://doi.org/10.1007/978-981-287-532-7_254-1

Goldstein, H., & Woodhouse, G. (2000). School effectiveness research and educational policy. *Oxford Review of Education, 26*(3/4), 353–363.

Green, J., Nelson, G., Martin, A. J., & Marsh, H. (2006). The causal ordering of self-concept and academic motivation and its effect on academic achievement. *International Education Journal, 7*(4), 534–546.

Grieve, A. M. (2010). Exploring the characteristics of "teachers for excellence": Teachers' own perceptions. *European Journal of Teacher Education, 33*(3), 265–277.

Gulson, K. N., & Webb, T. (2012). Education policy racialisations: Afrocentric schools, Islamic schools, and the new enunciations of equity. *Journal of Education Policy, 27*(6), 697–709. https://doi.org/10.1080/02680939.2012.672655

Hanushek, E. A. (1997). Outcomes, incentives and beliefs: Reflections on analysis of the economics of schools. *Educational Evaluation and Policy Analysis, 19*(4), 301–308.

Harjunen, E. (2012). Patterns of control over the teaching–studying–learning process and classrooms as complex dynamic environments: A theoretical framework. *European Journal of Teacher Education, 34*(2), 139–161.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81–112.

Hopkins, D., & Reynolds, D. (2001). The past, present and future of school improvement: Towards the third age. *British Educational Research Journal, 27*(4), 459–475.

Hoy, W. K., & Miskel, C. G. (2005). *Educational leadership and reform*. Information Age.

Ioannou, C. (2017). *The dynamic model of educational effectiveness tested by investigating the impact of classroom level factors on slow learners' outcomes in language: An effectiveness study on a specific student population*. Unpublished doctoral dissertation, Department of Education, University of Cyprus.

Jencks, C., Smith, M., Acland, H., Bane, M. J., Cohen, D., Gintis, H., et al. (1972). *Inequality: A reassessment of the effects of family and schooling in America*. Basic Books.

Joyce, B. R., Weil, M., & Calhoun, E. (2000). *Models of teaching*. Allyn & Bacon.

Kelly, A. (2012). Measuring 'equity' and 'equitability' in school effectiveness research. *British Educational Research Journal, 38*(6), 977–1002. https://doi.org/10.1080/01411926.2011.605874

Kelly, A., & Downey, C. (2010). Value-added measures for schools in England: Looking inside the 'black box' of complex metrics. *Educational Assessment, Evaluation and Accountability, 22*(3), 181–198. https://doi.org/10.1007/s11092-010-9100-4

Kiker, B. F. (1966). The historical roots of the concept of human capital. *Journal of Political Economy, 74*(5), 481–499.

Kirschner, P. A. (2002). Cognitive load theory: Implications of cognitive load theory on the design of learning. *Learning and Instruction, 12*(1), 1–10.

Kokkinou, E., & Kyriakides, L. (2018, April). Do teachers exhibit the same generic teaching skills when they teach in different classrooms? In *Paper presented at the annual meeting of the American Educational Research Association (AERA) 2018*.

Kuh, G. D. (1996). Organizational theory. In U. Delworth & G. R. Hanson (Eds.), *Student services: A handbook for the profession* (3rd ed., pp. 269–294). Jossey-Bass.

Kyriakides, L. (2008). Testing the validity of the comprehensive model of educational effectiveness: A step towards the development of a dynamic model of effectiveness. *School Effectiveness and School Improvement, 19*(4), 429–446. https://doi.org/10.1080/09243450802535208

Kyriakides, L., & Creemers, B. P. M. (2008). Using a multidimensional approach to measure the impact of classroom level factors upon student achievement: A study testing the validity of the dynamic model. *School Effectiveness and School Improvement, 19*(2), 183–205. https://doi.org/10.1080/09243450802047873

Kyriakides, L., & Creemers, B. P. M. (2009). The effects of teacher factors on different outcomes: Two studies testing the validity of the dynamic model. *Effective Education, 1*(1), 61–86. https://doi.org/10.1080/19415530903043680

Kyriakides, L., Creemers, B. P. M., & Antoniou, P. (2009). Teacher behaviour and student outcomes: Suggestions for research on teacher training and professional development. *Teaching and Teacher Education, 25*(1), 12–23.

Kyriakides, L., Archambault, I., & Janosz, M. (2013a). Searching for stages of effective teaching: A study testing the validity of the dynamic model in Canada. *Journal of Classroom Interaction, 48*(2), 11–24.

Kyriakides, L., Christoforou, C., & Charalambous, C. Y. (2013b). What matters for student learning outcomes: A meta-analysis of studies exploring factors of effective teaching. *Teaching and Teacher Education, 36*, 143–152. https://doi.org/10.1016/j.tate.2013.07.010

Kyriakides, L., Christoforidou, M., Panayiotou, A., & Creemers, B. P. M. (2017). The impact of a three-year teacher professional development course on quality of teaching: Strengths and limitations of the dynamic approach. *European Journal of Teacher Education, 40*(4), 465–486. https://doi.org/10.1080/02619768.2017.1349093

Kyriakides, L., Creemers, B. P. M., & Charalambous, E. (2018a). *Equity and quality dimensions in educational effectiveness*. Springer.

Kyriakides, E., Tsangaridou, N., Charalambous, C., & Kyriakides, L. (2018b). Integrating generic and content-specific teaching practices in exploring teaching quality in primary physical education. *European Physical Education Review, 24*(4), 418–448.

Kyriakides, L., Anthimou, M., & Panayiotou, A. (2020). Searching for the impact of teacher behavior on promoting students' cognitive and metacognitive skills. *Studies in Educational Evaluation, 64*, 100810. https://doi.org/10.1016/j.stueduc.2019.100810

Kyriakides, L., Creemers, B. P. M., Panayiotou, A., & Charalambous, E. (2021). *Quality and equity in education: Revisiting theory and research on educational effectiveness and improvement*. Routledge.

Lelei, H. (2019). *A case study of policy and actions of Rivers State, Nigeria to improve teaching quality and the school learning environment.* (Unpublished doctoral dissertation). School of Education.

Levine, D. U., & Lezotte, L. W. (1990). *Unusually effective schools: A review and analysis of research and practice*. National Center for Effective Schools Research and Development.

Liu, J., & Jiang, Z. (2018). The Synergy Theory of Economic Growth. In *The Synergy Theory on Economic Growth: Comparative Study Between China and Developed Countries* (pp. 57–90). Springer.

McCoy, S. K., & Major, B. (2007). Priming meritocracy and the psychological justification of inequality. *Journal of Experimental Social Psychology, 43*(3), 341–351. https://doi.org/10.1016/j.jesp.2006.04.009

Monk, D. H. (1992). Education productivity research: An update and assessment of its role in education finance reform. *Educational Evaluation and Policy Analysis, 14*(4), 307–332.

Muijs, D., & Reynolds, D. (2001). *Effective teaching: Evidence and practice*. Sage.

Muijs, D., & Reynolds, D. (2003). Student background and teacher effects on achievement and attainment in mathematics. *Educational Research and Evaluation, 9*, 289–314.

Muijs, R. D., Kyriakides, L., van der Werf, G., Creemers, B. P. M., Timperley, H., & Earl, L. (2014). State of the art-teacher effectiveness and professional learning. *School Effectiveness and School Improvement, 25*(2), 231–256. https://doi.org/10.1080/09243453.2014.885451

Nachbauer, M., & Kyriakides, L. (2020). A review and evaluation of approaches to measure equity in educational outcomes. *School Effectiveness and School Improvement*, 1–26. https://doi.org/10.1080/09243453.2019.1672757

Opdenakker, M. C., & Van Damme, J. (2006). Differences between secondary schools: A study about school context, group composition, school practice, and school effects with special attention to public and Catholic schools and types of schools. *School Effectiveness and School Improvement, 17*(1), 87–117.

Paas, F., Renkl, A., & Sweller, J. (2003). Cognitive load theory and instructional design: Recent developments. *Educational Psychologist, 38*(1), 1–4.

Panayiotou, A., Kyriakides, L., Creemers, B. P., McMahon, L., Vanlaar, G., Pfeifer, M., et al. (2014). Teacher behavior and student outcomes: Results of a European study. *Educational Assessment, Evaluation and Accountability, 26*(1), 73–93.

Paris, S. G., & Paris, A. H. (2001). Classroom applications of research on self-regulated learning. *Educational Psychologist, 36*(2), 89–101.

Ralph, J. H., & Fennessey, J. (1983). Science or reform: Some questions about the effective schools model. *Phi Delta Kappan, 64*, 689–694.

Reynolds, D., & Stoll, L. (1996). Merging school effectiveness and school improvement: The knowledge base. In D. Reynolds, R. Bollen, B. Creemers, D. Hopkins, L. Stoll, & N. Lagerweij (Eds.), *Making good schools: Linking school effectiveness and school improvement* (pp. 94–112). Routledge.

Rosenshine, B., & Stevens, R. (1986). Teaching functions. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 376–391). Macmillan.

Sammons, P., Hillman, J., & Mortimore, P. (1995). *Key characteristics of effective schools: A review of school effectiveness research*. Office for Standards in Education and Institute of Education.

Savage, J. (2012). Improving quality in education: Dynamic approaches to school improvement. *Journal of Educational Administration and History, 44*(4), 396–398.

Scheerens, J. (2013). The use of theory in school effectiveness research revisited. *School Effectiveness and School Improvement, 24*(1), 1–38. https://doi.org/10.1080/09243453.2012.691100

Scheerens, J. (2016). *Educational effectiveness and ineffectiveness: A critical review of the knowledge base*. Springer. https://doi.org/10.1007/978-94-017-7459-8

Scheerens, J. (this volume). Theory on teaching effectiveness at meta, general and partial level. In A.-K. Praetorius & C. Y. Charalambous (Eds.), *Theorizing teaching: Current status and open issues* (pp. 97–130). Springer.

Scheerens, J., & Bosker, R. J. (1997). *The foundations of educational effectiveness*. Pergamon.

Scheerens, J., & Creemers, B. P. M. (1989). Conceptualizing school effectiveness. *International Journal of Educational Research, 13*, 691–706.

Schoenfeld, A. H. (1998). Toward a theory of teaching in context. *Issues in Education, 4*(1), 1–94. https://doi.org/10.1016/S1080-9724(99)80076-7

Shepard, L. A. (1989). Why we need better assessment. *Educational Leadership, 46*(2), 4–8.

Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of Educational Research, 75*(3), 417–453. https://doi.org/10.3102/00346543075003417

Stenmark, J. K. (1992). *Mathematics assessment: Myths, models, good questions and practical suggestions*. NCTM.

Strand, S. (2010). Do some schools narrow the gap? Differential school effectiveness by ethnicity, gender, poverty, and prior achievement. *School Effectiveness and School Improvement, 21*(3), 289–314.

Stringfield, S., & Teddlie, C. (2011). School effectiveness research, 1932–2008, including a call for future research. In C. Day (Ed.), *International handbook of teacher and school development* (pp. 379–388). Routledge/Falmer.

Teddlie, C., & Reynolds, D. (2000). *The international handbook of school effectiveness research*. Falmer Press.

Teddlie, C., & Stringfield, S. (1993). *Schools make a difference. Lessons learned from a 10-year study of school effects*. Teachers College Press.

Tomlinson, C. A. (2005). Grading and differentiation: Paradox or good practice? *Theory Into Practice, 44*(3), 262–269.

Vieluf, S., & Klieme, E. (this volume). Teaching effectiveness revisited through the lens of practice theories. In A.-K. Praetorius & C. Y. Charalambous (Eds.), *Theorizing teaching: Current status and open issues.* Springer.

Walberg, H. J. (1984). Improving the productivity of America's schools. *Educational Leadership, 41*(8), 19–27.

Walberg, H. J. (1986). Syntheses of research on teaching. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 214–229). Macmillan.

Watkins, C., & Mortimore, P. (1999). Pedagogy: What do we know. In P. Mortimore (Ed.), *Understanding pedagogy and its impact on learning* (pp. 1–19). Paul Chapman.

Weiner, B. (1990). History of motivational research in education. *Journal of Educational Psychology, 82*(4), 616.

White, K. (1982). The relation between socioeconomic status and academic achievement. *Psychological Bulletin, 91*(3), 461–481.

Wiliam, D., Lee, C., Harrison, C., & Black, P. J. (2004). Teachers developing assessment for learning: Impact on student achievement. *Assessment in Education: Principles Policy and Practice, 11*(1), 49–65.