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## Developing, testing, and using theoretical models for promoting quality in education

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This paper argues that the dynamic model of educational effectiveness can be used to establish stronger links between educational effectiveness research (EER) and school improvement. It provides research evidence to support the validity of the model. Thus, the importance of using the dynamic model to establish an evidence-based and theory-driven approach to school improvement is stressed. In this context, the dynamic approach to school improvement (DASI), which attempts to use the knowledge base of EER for improvement purposes, is presented. Beyond presenting the essential characteristics, assumptions, and stages of DASI, its relationship with the dynamic model is clarified. Moreover, studies investigating the impact of DASI on promoting student learning outcomes are presented. These studies reveal the conditions in which DASI can promote student learning outcomes. Finally, suggestions for further research are provided.

**Keywords:** educational effectiveness; school improvement; theory testing; evidence-based approach; school evaluation

### Establishing links between educational effectiveness research and school improvement: the contribution of the dynamic model

The dynamic model of educational effectiveness (Creemers & Kyriakides, 2008) is a multilevel model which refers to factors operating at four different levels: student, classroom/teacher, school, and system. The model places special emphasis on what is happening at the classroom level, and thereby the roles of the two main actors (i.e., teacher and student) are analysed. Since learning takes place primarily at the classroom level, factors situated at the school and system level are expected to influence primarily the teaching practice. Specifically, school-level factors are expected to influence the teaching-learning situation by developing and evaluating the school policy on teaching and the policy on creating the school learning environment (SLE). The system level refers to the influence of the educational system in a more formal way, especially by developing and evaluating the educational policy at the national/regional level. The teaching and learning situation is also influenced by the wider educational context in which students, teachers, and schools operate. Factors such as the values of the society in relation to 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. Moreover, the dynamic model is based on the assumption that each factor can be defined and measured using five dimensions:

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*frequency, focus, stage, quality, and differentiation.* Frequency is a quantitative way of measuring the functioning of each effectiveness factor, whereas the other four dimensions examine qualitative characteristics of the functioning of each factor at the system/school/classroom level. The use of different measurement dimensions reveals that looking at just the frequency dimension of an effectiveness factor does not help us identify those aspects of the functioning of a factor which are associated with student achievement. Thus, the five dimensions are not only important from a measurement perspective but also, and to a greater degree, from a theoretical point of view (Kyriakides, 2008).

Some material supporting the validity of the dynamic model has been produced since 2003, when the model was developed. Specifically, five longitudinal studies and two meta-analyses have been conducted in order to test the main assumptions of the model. Table 1 refers to the studies and meta-analyses which have been carried out and the type of support that each assumption of the model has received from these studies. The following observations arise from this table.

First, it is clear that none of these studies and meta-analyses has provided negative results in relation to any assumption of the dynamic model. Moreover, all studies have provided support for the multilevel nature of the model since factors operating at different levels were found to be associated with student achievement gains. These studies have also revealed that teacher and school factors included in the dynamic model are associated

Table 1. Empirical evidence supporting the main assumptions of the dynamic model emerging from empirical studies and meta-analyses.

Assumptions of the dynamic model	Studies	Meta-analyses
1. Multilevel in nature	All	All
2. Five dimensions can be used to measure		
(a) teacher factors	1, 2, 4, 5	
(b) school factors	1, 3, 4	1
3. Impact of teacher factors on learning outcomes	1, 2, 4, 5, 6	2
4. Impact of school factors on learning outcomes	1, 3, 4, 6	1
5. Situational character of school factors	1	
6. Relations among factors operating at the same level: stages of effective teaching	1, 2, 5, 6	2
7. Changes in the functioning of school factors predict changes in the effectiveness status of schools	3	
<i>Negative results in relation to any assumption</i>	None	None

**Studies:**

- (1) A longitudinal study measuring teacher and school effectiveness in different subjects (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 follow-up study testing the validity of the model at the school level (Creemers & Kyriakides, 2010a).
- (4) A European study testing the validity of the dynamic model (Panayiotou et al., 2013).
- (5) A study in Canada searching for grouping of teacher factors (Kyriakides, Archambault, & Janosz, 2013).
- (6) An experimental study investigating the impact upon student achievement of a teacher professional development approach based on DASI (Antoniou & Kyriakides, 2011).

**Meta-analyses:**

- (1) A quantitative synthesis of 67 studies exploring the impact of school factors on student achievement (Kyriakides, Creemers, Antoniou, & Demetriou, 2010).
- (2) A quantitative synthesis of 167 studies searching for the impact of generic teaching skills on student achievement (Kyriakides, Christoforou, & Charalambous, 2013).

with student achievement gains. It is important to note that different learning outcomes were used to measure the impact of factors, and thereby some support for the assumption that these factors are associated with student achievement gains in different learning outcomes has been provided. Second, the two meta-analyses have provided support for the assumption that teacher and school factors have an impact on student achievement and have also revealed that the great majority of effectiveness studies conducted during the last 3 decades have only been concerned with the impact of the quantitative characteristics of a given factor upon student achievement. However, the empirical studies which have been conducted in order to test the validity of the dynamic model have revealed that all five dimensions used to measure quantitative and qualitative characteristics of the functioning of factors should be used to explain variation in student achievement gains. Third, with regard to the attempt of the model to search for relationships among factors operating at the same level, four studies have revealed that teaching skills measured using the dynamic model can be grouped into specific stages of effective teaching. In this way, more comprehensive strategies for teacher professional development can be developed. Fourth, one of the studies has managed to examine the situational character of school factors, and empirical support for this assumption has been provided. Specifically, the development of a school policy for teaching and evaluation of the policy have been found to have stronger effects in schools where the quality of teaching at classroom level is low (Creemers & Kyriakides, 2009). Finally, a follow-up study testing the validity of the dynamic model was conducted during the school year 2008–2009 (Creemers & Kyriakides, 2010a). The methods used were identical to those followed by the first study, which had been conducted 5 years earlier. Since the follow-up study had been conducted in the same schools where the original study took place, changes in the effectiveness status of schools and in the functioning of effectiveness factors were identified. Discriminant function analysis reveals that changes in the functioning of school factors can help us classify the schools into those which have improved their effectiveness status, those which have remained equally effective, and those which have even reduced their effectiveness status (see Creemers & Kyriakides, 2010a). Thus, this study was able to test one of the essential differences between the dynamic model and the integrated models developed in the 1990s, which has to do with its attempt to relate changes in the effectiveness status of schools to changes in the functioning of school factors.

Although the studies mentioned above have provided support for the main characteristics and assumptions of the dynamic model, we need further research to test the generalisability of the findings of these studies. Moreover, comparative studies should be conducted in order to find out whether the factors of the model are associated with student achievement in a range of different countries. In this context, a longitudinal study had been conducted in six European countries and revealed that the teacher and school factors of the dynamic model are associated with student achievement gains in mathematics and science (Panayiotou et al., 2013). Given the fact that this study has been conducted in only six countries within Europe, comparative studies should also be undertaken to see if the teacher and school factors can explain variation in student achievement in countries in diverse educational contexts. Such comparative studies may also be used to develop the dynamic model at system level further and formulate research questions on the impact of specific national policies on outcomes in different sociocultural contexts. Such studies may eventually contribute to the establishment of the international dimension of educational effectiveness research (EER) (Reynolds, 2006).

The dynamic model was developed in order to establish stronger links between EER and improvement of practice. There was also an attempt to find ways of using the model for improvement purposes, but it was found that schools and teachers need more than a

model to identify the factors and explain why they are associated with student learning outcomes (Creemers & Kyriakides, 2010b). As a consequence, a dynamic approach to school improvement (DASI) that makes use of the knowledge base of EER has been proposed. This approach stresses the importance of collecting data about the functioning of factors at the classroom and school level to identify teacher and school improvement needs, respectively. In this way, an evidence-based and theory-driven approach to improvement can be gradually developed.

Since a series of studies has provided support for the validity of the dynamic model, it can be argued that the model can contribute towards the establishment of stronger links between EER and practice. To help schools make use of the knowledge base of EER in designing their school improvement strategies, DASI has been developed, making use of the dynamic model and the results of studies testing the validity of this model (Creemers & Kyriakides, 2012). In this paper, we therefore present the rationale for DASI and describe its main elements. We also refer to studies investigating the impact of using DASI on promoting student learning outcomes and explain why and under which conditions DASI can be more effective than other approaches to school improvement. Finally, we make suggestions for further research in developing and using theoretical models for promoting quality in education.

### **The dynamic approach to school improvement: assumptions and main steps**

This paper argues that the dynamic model of educational effectiveness could contribute to establishing a theory-driven and evidence-based approach to school improvement. The need for an evidence-based approach is accepted generally, and it is used in several policy documents. The term refers to the fact that improvement programmes should be introduced when they have been systematically evaluated using designs that demonstrate their impact on quality of education (Slavin, 2002). The dynamic model can be treated as a framework for developing an evidence-based approach, especially since a series of studies has provided support for its validity (see Table 1). A distinctive feature of the dynamic model is that it not only refers to factors that are important for explaining variation in educational effectiveness but also attempts to explain why these factors are important by integrating different theoretical orientations to effectiveness (Scheerens, 2013). In this way, teachers and other school stakeholders involved in improvement efforts can develop awareness of both the empirical support for the factors involved in their project and the way these factors operate within a conceptual framework. By means of this approach, the teachers and the other school stakeholders are offered the opportunity to use this knowledge base in a flexible way, adapt it to their specific needs, and develop their own strategies for school improvement. Thus, DASI is proposed, and its main assumptions and features are presented. The main steps of DASI are also outlined in this section.

### **Main features and assumptions of DASI**

The main assumption of DASI is that school improvement projects can have an impact on student learning outcomes only when these projects are based on valid theories (Bryk, Sebring, Allensworth, Luppescu, & Easton, 2010). Therefore, DASI promotes the design of school improvement projects that are based on a theory which has been systematically tested (Mosteller & Boruch, 2002; Slavin, 2002). This assumption implies that relying only on school stakeholders' experiences can be limiting in terms of their school's development and improvement as various evaluations of school improvement projects

seem to have revealed (Bonman, Hewes, Overman, & Brown, 2003; Britzman, 1991; Gray & Wilcox, 1995). There appears to be little, if any, evidence from the published literature that assisting the school stakeholders to engage in any developmental or improvement programme without providing them with a validated framework to meet their personal needs and help them identify priorities for improvement necessarily improves their effectiveness (Scheerens, 2013; Smith & Hatton, 1992). Likewise, many studies stress the need for the provision of a well-researched and theory-based framework to form the basis of the improvement effort (e.g., Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Buczynski & Hansen, 2010; Domitrovich et al., 2009; Yoon, Garet, Birman, & Jacobson, 2007). Thus, DASI has its own theoretical framework, which refers to factors of educational effectiveness that need to be considered when introducing a change at school level. Specifically, DASI makes use of the dynamic model, which refers to factors found to be associated with student achievement gains not only in empirical studies but also in quantitative syntheses of school and teacher effectiveness studies that have taken place in various countries (see Table 1).

Second, DASI assumes that each school should develop its own strategies and action plans for improvement by taking into account the knowledge base provided by the dynamic model, which attempts to describe the complexity of educational effectiveness. At the same time, it is considered crucial that in its attempt to refer to factors and dimensions of effectiveness, the dynamic model provides opportunities for school stakeholders to address improvement of education in a flexible way (Creemers & Kyriakides, 2010a; Heck & Moriyama, 2010; Hofman, Hofman, & Gray, 2010; Sammons, 2009). This argument is also empirically supported since studies testing the validity of the model reveal variation in the functioning of factors in different school settings. This finding points to the fact that addressing these factors should be done in a way that takes into account the abilities of the school stakeholders (i.e., teachers, students, parents, and school management team) and their professional needs.

Third, effective schooling is seen as a dynamic, ongoing process. Therefore, to be considered effective, schools are expected to adapt to the changing contexts. Similarly, ineffective schools may be encouraged by the community and local school boards to improve. This notion is consistent with the contingency theory (Donaldson, 2001; Mintzberg, 1979) and can be viewed as one of the main assumptions upon which the dynamic model is based (Scheerens, 2013). Therefore, DASI presents the process of improving school effectiveness as one that should take place in all schools, irrespective of how effective they are. Moreover, DASI assumes that even schools which are among the most effective should take actions to improve further their policy for teaching and their school learning environment in order to remain effective (Creemers & Kyriakides, 2010a). This characteristic of the dynamic model is taken into account in establishing DASI. Specifically, at the beginning of the school year, all schools (including those which were among the most effective in the previous year) are expected to generate data to find out how to improve the functioning of the school factors and through that to promote student learning.

Fourth, DASI is based on the assumption that unless systematic support from an advisory and research team (A&R Team) is provided for schools, improvement is not likely to occur. Research on school improvement shows how crucial for establishing sustainable change is the provision of continuous support for school stakeholders in order for them to develop further and implement their school improvement strategies and action plans. Follow-up evaluation of schools that made use of DASI has revealed that improvement is only observed during the period that teachers and other stakeholders had the



support of the A&R Team (e.g., Antoniou & Kyriakides, 2013). The A&R Team may therefore be expected to provide school stakeholders with their technical expertise and the available knowledge base on the improvement of factors addressed by the school. Although DASI treats schools as professional communities responsible for designing and implementing their own improvement strategies and action plans, it also supports the view that school stakeholders should not be left alone to design and implement their strategies and actions. School stakeholders should be encouraged to make use not only of the A&R Team but also of other available resources within and outside the school in order to design their improvement strategies and action plans. Therefore, DASI is based on the assumption that a systematic research-based approach to design, implement action, and evaluation of improvement efforts should be adopted in order to promote quality in education (Borman et al., 2003; Bryk et al., 2010).

Fifth, DASI promotes a special approach to improvement whereby stakeholders and the A&R Team have to collaborate in order to develop effective improvement strategies and action plans. Each party has a specific role and expertise that they bring to the improvement project, and for this reason collaboration between the A&R Team and school stakeholders is seen as an essential condition for promoting quality in education. Each party is obviously not expected to play the same role in the school improvement process, but the school improvement strategies and action plans can only be developed if both the knowledge base of EER and the special characteristics of the school are taken into account. To achieve this purpose, school stakeholders and the A&R Team should put together their own expertise and knowledge in establishing the school improvement strategies and action plans. In the past, we have had improvement projects which were dominated by either the research team who followed a strict experimental approach (e.g., studies using the research and development approach) or by professionals (e.g., studies based on the assumption that practitioners should develop their improvement strategies by making use of their own knowledge and expertise without taking into account the knowledge base generated from research on effectiveness), but none of these projects had a significant impact on promoting learning outcomes (Cheng, 1996; Coe, 2009).

Sixth, DASI assumes that school improvement projects should result in the promotion of student learning and its outcomes. Therefore, DASI is also concerned with investigating the impact of the improvement project on student outcomes. For this reason, a summative evaluation is undertaken by using approaches similar to those that are used in conducting experimental studies (see Demetriou & Kyriakides, 2012). The results of these interventions are expected to contribute to the further development of the theoretical framework of DASI and not only to the understanding of the improvement process in a single school.

Finally, DASI is based on the assumption that even when the two parties (i.e., school stakeholders and the A&R Team) collaborate in designing their strategies and action plans for improvement, the implementation of the action plans will reveal difficulties in putting them into practice, which cannot be easily predicted. Therefore, formative evaluation mechanisms should be established to identify ways of improving the strategies and action plans during the implementation. The importance of formative evaluation is also supported by the dynamic model, which argues that school evaluation (especially its formative function) is associated with student achievement gains. It is also argued that schools should establish mechanisms to evaluate school policy for teaching and SLE, especially since these two aspects of school evaluation are treated as overarching school factors (see Creemers & Kyriakides, 2008). This implies that effective schools generate data about the quality of the school policy for teaching and the school learning

environment rather than simply about student performances. This is an essential difference between DASI and those approaches promoting the use of data for improvement purposes (Hallinger & Heck, 2011; McNaughton, Lai, & Hsiao, 2012; Visscher & Coe, 2002). Schools are expected to generate data about the quantitative and qualitative characteristics of their school policy for teaching and their school learning environment in order to identify priorities for improving the process variables that operate at the school level. Research on the impact of school-level factors shows that by improving the school-level factors that do not perform well, schools will ultimately improve their effectiveness status and promote student learning outcomes (see Creemers & Kyriakides, 2010a).

### ***Major steps for effective school improvement***

Figure 1 illustrates the steps of DASI. It is shown that school stakeholders and the A&R Team are expected to be actively involved in each step of DASI. Their ability to work together and exchange skills, expertise, and experience is assumed to be critical to the success of the school improvement project. These steps are presented below in more detail.

#### *Establishing clarity and consensus about the general aims of school improvement by considering student learning as the main function of the school*

The first step of any school improvement effort is based on the assumption that it is important to start with a clear understanding of its aim and how improvement in quality of education will be achieved. This could be considered as “a purposeful task analysis” (Wiggins & McTighe, 1998), which suggests a planning sequence. Commitment to collaborative work needs to be established, however, as Chapman and Fullan (2007) emphasise, because people have different perceptions of change. Hence, it is difficult to reach consensus among the participants in school reform efforts, although this may well be crucial to its success. Therefore, it is important to establish procedures to ensure clear understanding among stakeholders about the aims of school improvement. At this very first stage of DASI, it is emphasised that student learning should be considered as the ultimate goal of any school improvement effort. However, in presenting DASI to the school stakeholders, it is likely that not every school stakeholder will agree with, or commit himself/herself to, the school improvement project. Although DASI places emphasis on the involvement of the whole school community, it is not realistic to expect that all individual members of the school community will participate in the improvement project. However, it is critical at this point that a sufficient number of school stakeholders agree with the main aims and the intermediate objectives of the improvement project. At this very first stage, commitment to the implementation of the improvement project by both the school community and the research advisory team should be established.

#### *Establishing clarity and consensus about the aims of school improvement by addressing school factors which influence teaching and learning*

Adopting DASI implies that school stakeholders should attempt to design whole-school reform efforts aiming to improve the functioning of the school-level factors included in the dynamic model (Creemers & Kyriakides, 2012). From this perspective, helping school stakeholders to understand the importance of the dynamic model, particularly of the school-level factors included in the model, can assist school stakeholders’ understanding of the necessity of developing school evaluation mechanisms. School evaluation



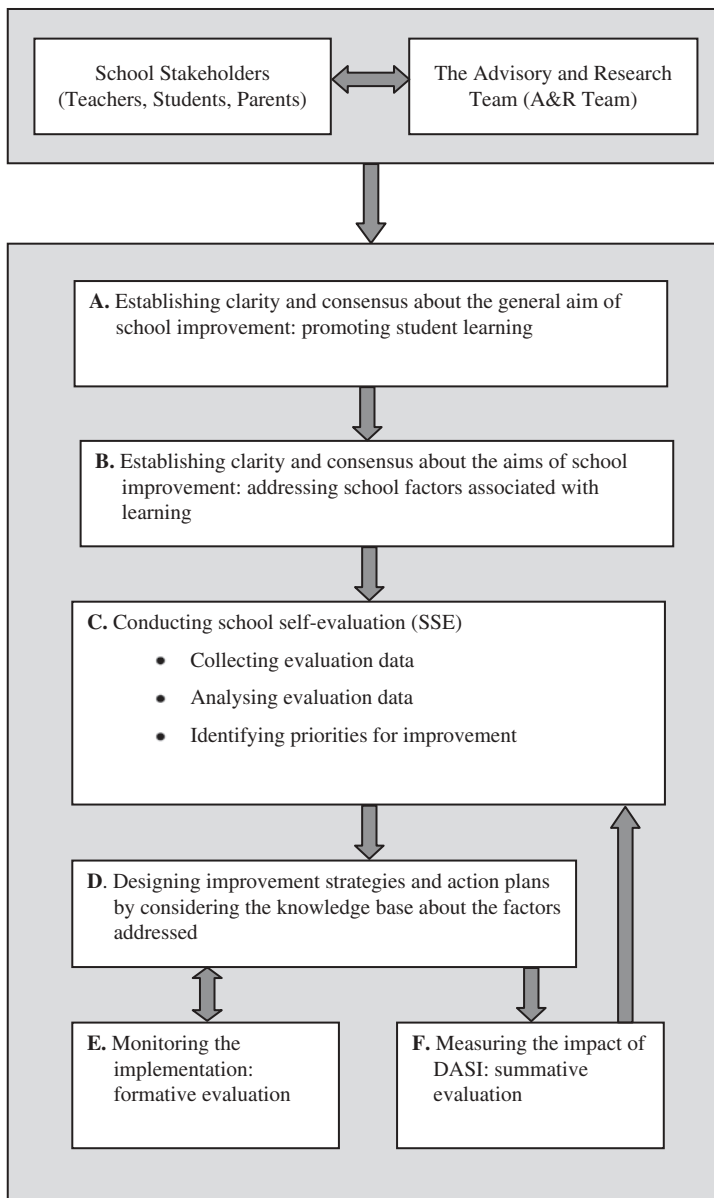


Figure 1. The major steps of the dynamic approach to school improvement (DASI).

mechanisms are expected to generate data not simply on student learning outcomes but about the functioning of each school factor and its dimension. Thus, at the next step data should be collected with a view to identifying priorities for improvement, which will be concerned with specific factor(s) that is(are) not functioning at a satisfactory level. In this way, evaluation data will help school stakeholders take decisions on how to improve the school policy for teaching and the school learning environment.

For example, factors concerned with school policy on teaching carry the expectation that all stakeholders (teachers, parents, and students) will ensure that the use of teaching

time is maximised, that extracurricular learning opportunities are offered to students, and that teaching quality is improved. Although specific aspects of these factors may be more applicable to some stakeholders than others, it is necessary to involve each of them in an improvement strategy, and for this reason partnership policy has a central role in the dynamic model (see Creemers & Kyriakides, 2008). Thus, the teachers and other school stakeholders involved in the project should be persuaded that the factors included in the model are associated with learning and learning outcomes, and that these need to be addressed in order to improve the effectiveness of the school, which was stated as the main aim of school improvement (see Step A). It is also important to stress that not all factors can be addressed at once and that specific improvement priorities should be identified instead in order to aid the development of a more systematic and focused intervention. Thus, at this point data should be collected with a view to identifying priorities for improvement. These will be concerned with factor(s) that are not functioning at a satisfactory level. The next step, therefore, is concerned with the collection of evaluation data and the identification of improvement priorities.

#### *Collecting evaluation data and identifying priorities for improvement*

The task of designing and developing instruments to collect data about each school factor should be undertaken jointly by the A&R Team and the school stakeholders. Drawing on the expertise of the A&R Team, analysis of the data can be conducted, and its results may help school stakeholders identify priorities for improving the functioning of specific factors. Although the A&R Team has an important role to play in analysing the data, the school stakeholders should also be involved in this process and should be encouraged to identify the questions that need to be answered by the data analysis. In this way, the scope of analysis is broadened and the special characteristics of the school are taken into account (see Creemers & Kyriakides, 2012). The improvement area, the selection of which is based on the data analysis results, should be announced to the whole school community, and comments/reactions need to be considered in order to define the area in such a way that all school stakeholders can understand the factors that are to be addressed (Conway, 1984; Kyriakides & Campbell, 2004).

#### *Designing school improvement strategies and action plans by considering the available knowledge base concerning the factor(s) to be addressed*

The dynamic model refers to school factors which have been found to be associated with student achievement. For each of these factors, a number of studies have been conducted which not only explore the impact of the factor but also consider the conditions in which these factors have stronger effects (Creemers & Kyriakides, 2012). Consequently, the dynamic model refers to the qualitative characteristics of the functioning of factors, which increase the impact of these factors on student learning outcomes. At this point, members of the A&R Team should share their expertise and knowledge with school stakeholders, providing additional input to existing ideas, experiences, and knowledge in order to help schools develop their own strategies and action plans. Whilst the A&R Team is expected to provide suggestions for school stakeholders, which are based on research evidence, it is the schools themselves that must decide on the content of their action plans, having considered the available research evidence and the evaluation data. The final decision is taken by the school as development of action plans requires not only putting into practice what is available in the literature but also adopting the guidelines relating to the needs and

abilities of the stakeholders of each school (Hofman et al., 2010). In developing action plans, it is important to specify which tasks need to be undertaken, who is going to be responsible for implementing each task, when each task is expected to be implemented, and which resources should be provided for the stakeholders to implement these tasks. In several cases, some parts of the action plans will not be able to be implemented, and unless evaluation data is collected, the school stakeholders will not be able to take decisions on how to improve their action plans, and, as a result, the aims of the school improvement project will not be achieved. Therefore, school stakeholders should not only develop strategies and action plans which they are ready to implement but should also attempt to establish evaluation mechanisms which will enable them to improve their action plans.

#### *Monitoring the implementation of the improvement project by establishing formative evaluation mechanisms*

Unless formative evaluation data on the implementation of the action plans is collected, the school stakeholders may not be able to take decisions on how to improve their action plans, and, as a result, the aims of school improvement may not be achieved. Therefore, school stakeholders should not only develop strategies and action plans but should also establish formative evaluation mechanisms. The role of the A&R Team is important, as their expertise in conducting the evaluation is shared with school stakeholders. However, school stakeholders should be directly involved in conducting formative evaluation. As a consequence, an internal school evaluation mechanism should be developed, and school stakeholders should reflect on their abilities not just to implement the action plans but also to improve the functioning of school factors. Thus, the results emerging from this evaluation mechanism can be used to improve action plans and simultaneously to create an environment which supports the gathering of evidence for improvement purposes. Such a setting is necessary for building effective internal evaluation mechanisms at the school level (Kyriakides & Campbell, 2004). Thus, DASI supports the notion that a developmental evaluation strategy may contribute to the improvement of the effectiveness status of schools, which has been supported by substantial research evidence (e.g., Gray et al., 1999; Shaw & Replogle, 1996). As a result of establishing formative evaluation mechanisms and collecting data, school stakeholders can identify weaknesses in their action plans and take decisions on how to improve them.

#### *Measuring the impact of DASI*

At this stage, school stakeholders (with the support of the A&R Team) should measure the impact of their improvement efforts upon the functioning of school factors and upon student learning outcomes (i.e., the intermediate and ultimate aims of improvement). The results of a summative evaluation may assist school stakeholders in determining whether it is worthwhile implementing the improvement project, in terms of expenditure of effort. Positive findings of summative evaluation may increase the commitment of a school to this approach. Summative evaluation may also help school stakeholders decide whether the factor(s) addressed have been substantially improved and, consequently, if a new priority for improvement needs to be identified and new action plans developed. In particular, if evaluation reveals that a school has managed substantially to improve the functioning of the factor(s) addressed, school stakeholders and the A&R Team may decide to collect new evaluation data and identify a new area of improvement. By conducting

school evaluation concerned with the functioning of school factors (moving back to Step C), the new priority area will be identified and a new improvement project may be developed and implemented. It can therefore be claimed that [Figure 1](#) shows that improving school effectiveness is an ongoing and never-ending process, irrespective of how effective a school might be, something that demonstrates that the dynamic nature of educational effectiveness is taken into account. Improvement efforts are seen as continuous, cyclical in nature, and embedded in a wider process of overall school development (Nevo, 1995; Scheerens, Glas, & Thomas, 2003).

### Investigating the impact of DASI upon student achievement

This section provides a brief overview of studies investigating the impact of DASI on promoting quality at the classroom and school levels. We also refer to the conditions under which DASI can have an impact on promoting learning outcomes. [Table 2](#) refers to four experimental studies which have been conducted and have revealed that DASI has a stronger impact on improving learning outcomes than the participatory approach to teacher and school improvement, which places emphasis on professional experience. The first two studies presented in this table were concerned with interventions addressing the quality of teaching. Empirical studies investigating the impact of teacher factors on

Table 2. Experimental studies investigating the impact of using DASI rather than participatory approaches that are based on practitioner's expertise and effects on student learning outcomes.

Area of investigation	Impact on factors	Ultimate aims	Cohen's d
1. Using DASI rather than HA to offer in-service training (INSET) to primary teachers ( $n = 130$ )	Only teachers employing DASI managed to improve their teaching skills	DASI had an impact on student achievement	0.37
2. Using DASI rather than CBA to offer INSET course on assessment ( $n = 240$ )	DASI had a stronger impact than CBA on improving assessment skills of teachers at Stages 2, 3, and 4	DASI had an impact on student achievement	0.23
3. Using DASI to establish school self-evaluation mechanisms in primary schools ( $n = 60$ )	Not examined since schools had to deal with different improvement areas	DASI had an impact on student achievement	0.25
4. Integrating DASI with research on bullying to help schools ( $n = 79$ ) in five European countries to establish strategies to face and reduce bullying	DASI had an impact on school factors	DASI had an impact on reducing bullying	0.36 (reduction of victims) 0.31 (reduction of bullies)

#### Studies:

- (1) The impact of a dynamic approach to professional development on teacher instruction and student learning: results from an experimental study (Antoniou & Kyriakides, 2011).
- (2) Searching for stages of teacher skills in assessment (Christoforidou, 2013).
- (3) The impact of school self-evaluation upon student achievement: a group randomisation study (Demetriou & Kyriakides, 2012).
- (4) Using the dynamic model of educational effectiveness to design strategies and actions to face bullying (Kyriakides, Christoforou, et al., 2013).

student achievement have been able to identify specific stages of effective teaching (Antoniou & Kyriakides, 2011) and assessment (Christoforidou, 2013). These results provide support for the assumption of the dynamic model that factors operating at each level (in this case, those operating at classroom level) are related to each other. By identifying the stages of effective teaching (where factors and their dimensions are grouped together), a specific approach for improving teacher effectiveness that is comprehensive in nature may emerge. This approach lies between the two dominant approaches to teacher professional development: (a) the competency-based approach (CBA), which refers to a list of highly explicit strategies developed by experts (Sprinthall, Reiman, & Sprinthall, 1996) that teachers are expected to master, and (b) the holistic approach (HA), which is focused on encouraging reflection on teaching practices, experiences, and beliefs (Golby & Viant, 2007). Thus, DASI aims to overcome the main weaknesses of these two approaches to teacher professional development. In particular, the content of the proposed dynamic approach 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 its content refers to teaching skills that have been found to be positively associated with student achievement, the participants are also engaged in systematic and guided critical reflection on their teaching practices. In this context, the aim of the first study (Antoniou & Kyriakides, 2011) was to compare the impact of using DASI on teacher professional development and the impact of the HA upon improvement of their (a) teaching skills and (b) effectiveness status (as measured by student achievement gains). The other study aimed to compare the impact of DASI with that of CBA by investigating the impact of each approach on promoting assessment skills of teachers and student learning outcomes (Christoforidou, 2013). It is important to note here that the HA is in line with the main elements of the participatory approach to school improvement which is based on professional experiences. Specifically, the HA places emphasis on teacher reflection, which is expected to help teachers define their own improvement projects (without necessarily considering the knowledge base of EER). The fact that teachers can develop any action plan for improvement they like is expected to promote authentic ownership of the improvement project (Chapman & Fullan, 2007; Cousins & Earl, 1992). As a consequence, the content of this participatory approach is much broader than that of DASI, which is concerned with the needs of each group of teachers as these are reflected by the stage at which they are found to belong. On the other hand, CBA is more in line with the research and development approach since teachers are expected to master specific teaching skills that are identified by experts.

In each study, teachers volunteered to participate in teacher professional development programmes. At the first phase of Study 1, the teaching skills of the participants were evaluated, and teachers who were found to be at a certain developmental stage were randomly allocated into two teams of equal size (Antoniou & Kyriakides, 2011). The first team employed DASI and the second HA. For example, the 32 teachers who proved to be at Stage 1 were randomly allocated into the two experimental groups, each one consisting of 16 teachers. By using a similar approach, the assessment skills of participants were evaluated in the first phase of the second study (Christoforidou, 2013). Participants were also found to be classifiable into developmental stages (see Christoforidou & Xirafidou, *in press*) and were randomly allocated into equally sized teams. The first team employed DASI and the second CBA. Analysis of data from the first study revealed that the final score of teachers employing DASI ( $M = 0.36, SD = 1.05$ ) was bigger than their initial score ( $M = -0.28, SD = 1.01$ ) and that this difference was statistically significant ( $t = 4.14, df = 64, p < .05$ ). On the other hand, the

final score of teachers employing the HA ( $M = -0.25$ ,  $SD = 1.04$ ) was no higher than their initial score ( $M = -0.26$ ,  $SD = 1.05$ ), and the  $t$  test for paired samples did not reveal any statistically significant progress ( $t = 0.87$ ,  $df = 64$ ,  $p = 0.38$ ). Moreover, multilevel analysis was conducted in order to measure the impact of each of the two approaches to teacher professional development on student achievement gains in mathematics. It was found that the use of DASI had a statistically significant impact on student achievement (see Antoniou & Kyriakides, 2011). The results of this study were in line with those from the second study, which revealed that teachers employing DASI managed to improve their assessment skills more than teachers employing CBA. Moreover, the use of DASI had a stronger impact on student achievement than the use of CBA (see Christoforidou, 2013).

The other two studies presented in Table 2 were concerned with interventions addressing school factors. Study 3 (Demetriou & Kyriakides, 2012) was concerned with the attempt of schools to establish school self-evaluation (SSE) mechanisms for school improvement purposes. Schools participating in this project were volunteers, and a group randomisation study was conducted. One group made use of DASI to establish SSE mechanisms and developing improvement strategies and action plans, whereas the other group followed the participatory approach in defining SSE mechanisms. More specifically, schools which made use of the participatory approach generated their own criteria by conducting group interviews with each group of school stakeholders (i.e., teachers, parents, and students). Then, each school developed its own SSE mechanisms addressing factors that stakeholders of each school considered important. Based on the results of SSE, stakeholders of each school developed their own strategies and action plans for improving the effectiveness of their school. On the other hand, schools that made use of DASI established evaluation mechanisms which were in line with the knowledge base of EER as this is reflected in the dynamic model. Since the DASI approach was followed, beyond presenting the dynamic model and its assumptions to the various stakeholders of these schools, the instruments used to test the validity of the dynamic model were administered, and data about the improvement priorities of each of these schools were collected (see Creemers & Kyriakides, 2012). The results of this initial evaluation phase were presented to the school stakeholders, and they were encouraged to design their own school improvement initiatives in such a way that one of the first three priorities of their schools could be addressed. Guidelines on actions and strategies that could be considered in designing their improvement strategies were also offered to the school stakeholders. Finally, both groups of schools were asked to develop mechanisms in order to monitor the implementation of their school improvement plans, and the research team was available to provide support when needed. By conducting multilevel analysis, it was shown that DASI had an impact on student achievement gains in mathematics (see Table 2).

Finally, Study 4 took place in five European countries and was concerned with the use of DASI to reduce bullying (Kyriakides, Christoforou, et al., 2013). A network of approximately 15 schools in each participating country (i.e., Belgium, Cyprus, England, Greece, and The Netherlands) received support in using DASI in order to improve the functioning of school factors included in the dynamic model of educational effectiveness which are associated with reduction of bullying. The Revised Olweus Bully/Victim Questionnaire (Olweus, 1996) was administered to students in the experimental and control groups, both at the beginning and at the end of the intervention. Using multilevel modelling techniques, it was found out that schools which made use of DASI were able to reduce bullying to a significantly greater degree than the schools in the control group.

Table 2 also refers to the effect sizes reported in each study that made use of DASI to promote student learning outcomes (see Column 4). One could claim that the reported



effect sizes are relatively small. However, these results are in line with the results of evaluation studies measuring the impact of interventions in education which show that during the early phases of effective interventions their impact on achievement is relatively small (Slavin, Lake, & Groff, 2009). It is, therefore, important to conduct longitudinal studies, involving both quantitative and qualitative research methods, which could provide answers to questions dealing with not only the short- but also the long-term effects of DASI upon different outcomes of schooling. Finally, three of these studies (Antoniou & Kyriakides, 2011; Christoforidou, 2013; Kyriakides, Christoforou, et al., 2013) revealed that DASI had an impact on improvement of learning outcomes through improving the functioning of school factors (see Creemers & Kyriakides, 2012). For example, multilevel structural equation modelling analysis revealed that DASI had not only direct, but also an indirect, effects on reducing bullying through improving the functioning of school factors (Kyriakides, Creemers, Papastylianou, & Papadatou-Pastou, 2013). This finding seems to provide support to the assumption of DASI that school improvement can be achieved by taking action to improve the functioning of school factors.

The four studies mentioned in Table 2 not only revealed that DASI had an impact on improving school factors and promoting quality of education but also helped us identify the conditions that are necessary for a successful and effective implementation of school improvement projects. It should first of all be acknowledged that participants in all studies were volunteers who expressed their interest in participating in these projects in order to improve their effectiveness status. This implies that DASI can be used when school stakeholders agreed to participate and cannot therefore be seen as an approach to promote quality in education in all schools, irrespective of whether the teaching staff is willing to take action in order to improve their effective status. It should, however, be acknowledged that volunteers participated not only in schools using DASI but also in schools following other improvement approaches, but only DASI had an impact on promoting student learning outcomes (see Table 2). Nevertheless, DASI is very unlikely to have an effect on promoting such outcomes when the requirement to implement this approach is imposed on stakeholders by central authorities.

Second, DASI is based on the assumption that each school improvement initiative should aim to promote student learning. It is, however, not always possible to persuade school stakeholders that improvement efforts should address factors associated with student learning. Moreover, DASI assumes that school stakeholders will take into account research evidence showing that student learning can be promoted by addressing the school factors included in the dynamic model. In the studies mentioned in Table 2, school stakeholders were not only keen to participate in school improvement projects but also took seriously into account the research findings demonstrating the importance of the factors included in the dynamic model. However, when the majority of school stakeholders are not convinced about the importance of effectiveness factors, DASI cannot be implemented, and this should be made explicit in describing the assumptions and the steps of DASI.

Third, the success of DASI is likely to be dependent on the extent to which school stakeholders and the A&R Team can work together. DASI is based on the assumption that both parties have their own responsibilities and contributions to make to the implementation of the various steps of the school improvement efforts. To achieve such collaboration, each party should appreciate the expertise and knowledge that the other has and not to underestimate the importance of either the knowledge base developed through empirical research or the professional knowledge of school stakeholders about the situation of the school in which DASI is implemented.

Finally, it should be acknowledged that the studies investigating the impact of DASI were designed and carried out by members of the research team that developed and tested the validity of the dynamic model. Therefore, there was commitment and expertise among the members of the A&R Team in designing and implementing these improvement efforts. In the previous section, the crucial role and the abilities and commitment of the A&R Team to the success of school improvement was stressed especially since we see their contribution as an important condition for undertaking in an effective way improvement strategies based on DASI.

### **Conclusions and suggestions for further research**

This paper argues for establishing stronger links between EER and school improvement. In the first section, it is claimed that the dynamic model can help us develop such links by promoting an evidence-based and theory-driven approach to school improvement. This is partly attributed to the fact that the model takes into account the dynamic nature of educational effectiveness. Moreover, the paper refers to evidence supporting the validity of the dynamic model generated by empirical studies and meta-analyses. At this point, it is important to acknowledge that the empirical studies which have been conducted in order to test the validity of the model took place in primary and pre-primary schools. One could argue that the model is not necessarily able to describe the nature of educational effectiveness in secondary schools. Nevertheless, the two meta-analyses which looked at the impact of teacher and school factors on student achievement by drawing on data from studies conducted in different countries at the primary and secondary school levels revealed that the factors included in the dynamic model are relevant to both phases of education (see Kyriakides, Christoforou, et al., 2013; Kyriakides, Creemers, Antoniou, & Demetriou, 2010). Obviously, further research on testing the impact of the teacher and school factors included in the dynamic model on learning outcomes of secondary school students may help us to develop further this model and investigate the impact of using the model for school improvement purposes in secondary education.

Since one of the main aims of establishing the dynamic model was to contribute to the improvement of practice, an approach that makes use of this model has been developed. The proposed approach (DASI) is based on the assumption that the knowledge base of EER can be used in establishing strategies and action plans for improving the quality of education. Thus, the main features and steps of this evidence-based and theory-driven approach to school improvement are outlined in the second part of this paper. In addition, four studies investigating the impact of DASI have been conducted, and their main results reveal that DASI can promote student learning through improving the functioning of teacher and school factors. In this paper, we move from establishing theoretical models that can describe the nature of educational effectiveness to searching for ways of using models to improve effectiveness in education. Although further research on modelling effectiveness is needed, we also argue that researchers should examine in a more systematic way the school improvement process. This implies that the research agenda of EER should be expanded and should cover issues associated not only with modelling and evaluating effectiveness but also with the development of a theory-driven and evidence-based approach to school improvement. These two research areas should not be seen as two different fields since studies investigating the process of school improvement can have an impact on developing the theoretical framework of EER.

Further research is also needed to investigate not only the short-term effects of DASI but also its long-lasting effects. These projects may not only reveal the impact of DASI on

promoting quality in education but may also provide further insights into the conditions necessary for effective use of DASI over a long period of time. Thus, issues associated with the sustainability of this approach could be raised. For example, we need to find out how the roles of school stakeholders and A&R Teams may change over time. Given that DASI depends on the collaboration between the school stakeholders and the A&R Team, it is important to find out whether the stakeholders in schools which have used this approach for a long period are now able to run their projects with minimal support or even without the need of substantial assistance from the A&R Team. By identifying changes in the role of the A&R Team and school stakeholders over time, the dynamic character of DASI may be demonstrated and the quality of education in schools may be promoted.

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