

Learning skills and the development of learning capabilities

Review conducted by the Thinking Skills Review Group

Technical report written by Professor Steve Higgins, Dr Viv Baumfield, Elaine Hall

EPPI-Centre
Social Science Research Unit
Institute of Education
University of London

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REPORT

Describes the background and the findings of the review(s) but without full technical details of the methods used

TECHNICAL REPORT

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Abstract

The review question

The initial review question used to identify and map the research literature in this area was as follows:

Which teaching approaches that explicitly aim to develop pupils' learning capabilities are effective?

Then a specific question for in-depth review was identified as follows:

Which teaching approaches that explicitly aim to develop pupils' learning capabilities and which have been used in at least three schools show evidence of improved learning of pupils?

A further sub-question was added to identify issues in scaling up interventions or teaching approaches across schools:

What issues are identified in these studies about implementation or scaling up of the teaching approach?

Who wants to know and why?

The key aim of this review is to support current policy initiatives to develop learning and teaching in schools. One specific objective is to support one of the five core components of the development of personalised learning through 'teaching and learning strategies that actively engage and challenge learners and

develop their ability to focus on their learning skills and their capability to take ownership of their own progress' (NCSL, 2005). This provides a clear focus on approaches which support metacognition and self-reflection as is made explicit in Key Stage 3 and Primary Strategy materials (e.g. DfES, 2005a, p 5; DfES, 2003, p 29).

A second aim was to identify evidence from research which could inform practice. This is challenging as findings from research needed to be translated (Toth *et al.*, 2000) rather than applied to different teaching and learning contexts. Our objective is therefore to develop an understanding not just of what works in terms of specific teaching approaches in specific contexts, but an understanding of why different approaches are successful in order to support teachers in making informed choices about what is likely to be effective in their own context.

In terms of research the aim is to build on earlier reviews in this area (e.g. Hattie *et al.*, 1996) and to identify recent research evidence about the how pupils' learning capabilities can be developed in the light of recent conceptual development in the area of metacognition and self-regulation (Pintrich, 2003).

Methods of the review

A systematic search of the literature was

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undertaken to identify relevant studies. This aimed to identify research which had been undertaken in primary and secondary schools in order to develop pupils' learning capabilities (rather than just their attainment in specific aspects of the curriculum) by the explicit teaching of learning skills or strategies. 'High' weight of evidence (WoE) was applied to studies which looked at issues of implementation, and sustaining change and improvement, as this was identified as a key challenge from the members of the advisory groups. Once this literature had been identified, it was classified or keyworded and analysed to produce a map of the kinds of research that have been undertaken and where there was evidence about developing pupils' learning capabilities (such as subjects of the curriculum and ages of learners). From this map, a sub-sample of studies was identified of research conducted on a larger scale; this was then reviewed in greater depth.

Results

There are effective approaches which teachers can use to develop pupils' learning capabilities. The characteristics identified by the review include the following:

- structured tasks that focus on specific metacognitive strategies in the context of the lesson/subject
- capacity in lessons for more explicit transactions between the learner and the teacher concerning the purpose of the activity
- small group interactions promoting the articulation of the use of strategies during teaching
- mechanisms built into the task to promote the checking of mutual understanding of the goals by peers and with the teacher
- enhanced opportunities for the learner to receive diagnostic feedback linked directly

to the task

For example, in science, explicit processes necessary for designing experiments should be identified - such as planning, justifying and evaluating - and tasks developed within the specific context of the lessons to scaffold learners' performance and to establish effective feedback loops to monitor progress (Olina and Sullivan, 2004; Toth *et al.*, 2000). In another example (Vauras *et al.*, 1999), inquiry skills are developed by envisioning snapshots of what it would mean to be successful at each stage of the task combined with consolidation through the completion of concrete tasks. The key components of the interventions are planning based on a good understanding of the processes of learning, key concepts of the content to be studied, and an awareness of the learning context. There is also support for the view that the orientation towards learning should be one in which success results from appropriately guided effort and not on a construct of ability (Dweck, 1999). In short, effective approaches are those which explicitly develop awareness of learning strategies and techniques, particularly when these are targeted at the metacognitive level.

The key components identified from the studies included in the in-depth review are as follows:

- the necessity for a clear understanding of the features of the relevant learning processes to achieve success in a particular context
- the design of concrete tasks to scaffold the development of the awareness of the processes and their importance for success
- opportunities to feedback during the task to enable teacher intervention with provision for this to become gradually internalised as self-regulation
- explicit emphasis on developing capability through effort and the possibility of improving performance by responding to feedback and adaptation

We can also identify some necessary conditions:

- The teacher needs to have an alignment of a good understanding of learning, in terms of the subject and the context - what European educationalists would call 'didactics'.
- There is also the need for the teacher to have access to concrete tools and strategies to guide the learner and enhance opportunities for feedback.
- Both teachers and learners should have an orientation towards learning characterised by a willingness to engage in dialogue and negotiation regarding the intent and purpose of a particular teaching and learning episode.
- The focus should be on how to succeed in terms of the selection of appropriate strategies and making the right effort, rather than on ability.

However, the messages in the research are neither simple, nor conclusive. The lack of conceptual clarity regarding the provenance and use of terms such as learning capability means that the studies included in the review are located within different, if overlapping, frameworks offering different interpretations of why an intervention might be effective. There is also a tension between approaches to learning skills which emphasise content (in terms of mastery of specific skills) and process (in terms of locating skills within an overall understanding of learning approaches). Therefore, in the short term, the most effective means to improve performance where the assessment focuses on content knowledge is likely to be direct instruction. In the longer term, or where assessment focuses on conceptual understanding, metacognitive or strategic approaches are more likely to be effective.

Implications

While there are approaches which can be used effectively by teachers in classrooms in schools to develop pupils' learning skills and capabilities, research findings need to be 'translated' (Toth *et al.*, 2000), rather than simply applied to school settings. There is a reported tension between teachers adhering closely to the *format* of a programme, and their having the deeper understanding and critical distance necessary to adapt the *ideas* to context (Dusenbury *et al.*, 2003). It is therefore important that teachers understand the principles underpinning approaches which seek to develop pupils' learning skills and capabilities (Hattie *et al.*, 1996) This is so that, as different approaches are used and adapted, in various learning contexts, they achieve the aims or intentions underpinning the approach. The planning of professional development to support teachers in using these approaches is therefore both essential and challenging, if development in schools is to be sustained beyond an initial innovative phase.

At policy level, specific consideration of the development of learning skills and capabilities as part of the curriculum needs to include explicit advice that such development should not only be embedded in the curriculum, but also taught in such a way that this is explicit to pupils. Opportunities to achieve this should be identified in the early stages of schooling as well as for older pupils. It should also be recognised that it can be difficult to assess the impact of such approaches in both the short term and in terms of the development of a learner's identity over time. Further research is needed to identify what would be the most appropriate learning outcomes to judge the effectiveness of such interventions (James and Brown, 2005). Any such research needs to identify both short-term and longer-term indicators, which can be related both to attainment in the curriculum and to learners' meaningful participation in learning.

CHAPTER ONE

Background

The aim of this document is to set out detailed information about a systematic review of the educational research evidence on the teaching of learning skills. The intention of the review is to inform and support current government policy and its implementation, while at the same time supporting the work of practitioners and managers in schools in making strategic decisions to develop an integrated approach to improving teaching and learning in their schools. One of the key issues is to identify how the application of such knowledge by teachers can support development of learning and teaching in their schools, and ensure progression in pupils' learning. In particular, strategies to support systematic whole school implementation need to be identified from a research and evidence base. This report details the processes of the review and the methods used to locate, describe and synthesise research studies relevant to the themes.

Outcomes of the review:

- A research report describing the background and processes of the review, a map of the evidence base and an in-depth review of a key area (to be determined by a policy steering group)
- A research summary for policymakers, identifying the key issues
- A research summary for practitioners with

recommendations to support systematic whole-school implementation

- Guidelines for practitioners and school managers on developing learning skills to be disseminated via the National Strategy networks

1.1 Aims and rationale for current review

Although there is extensive research evidence about the effectiveness of a wide range of learning and teaching interventions, it is difficult to interpret and use this knowledge at both policy and practice levels. While systematic reviews can go some way towards clarifying matters, they are only part of the answer (Higgins and Hall, 2004). A degree of consensus has been achieved in a few key areas, such as thinking skills, following the review by Carol McGuinness (1999), and assessment for learning, resulting from the work of the Assessment Reform Group (Black and Wiliam, 2004). It is still challenging for schools to use this information and to manage development effectively and ensure that this development is sustained. This is partly because there is a lack of information about what the indicators are in terms of a progression in pupils' thinking and learning, and what can be achieved with a whole-school approach. As a result, there is a danger that schools may not be in a position to make

informed choices about effective approaches to develop learning and teaching more systematically.

The key thinking and learning skills are identified in the DfES White Paper *14-19 Education and Skills* (DfES, 2005b) as follows:

- Enquiry includes asking relevant questions, planning and testing conclusions.
- Creative thinking includes suggesting hypotheses and imaginatively challenging ideas.
- Information processing includes locating and classifying information.
- Reasoning includes explaining opinions, actions and decisions, and using deduction.
- Evaluation includes assessing evidence, judging against criteria and values.

One of the intentions behind the review was to bring together evidence from a range of sources and to relate it to current policy initiatives, particularly SNS and PNS initiatives currently being implemented in schools. This is to map what is known from the research and evidence base on to subject specialisms and effective pedagogies. The aim is therefore to develop an understanding not just of what works in terms of specific teaching approaches in specific contexts, but also in terms of an understanding of why different approaches are successful in order to support teachers in making informed choices about what is likely to be effective in their own context.

1.2 Definitional and conceptual issues

Learning skills is a very broad term used to describe the various skills needed to acquire new skills and knowledge, particularly in a formal learning setting, such as school or university. The broad general category is often broken down into sub-categories which commonly include the following:

- *Information and communication skills*: often including aspects of literacy or literacies
- *Thinking and problem-solving skills*: particular the development of critical thinking
- *Interpersonal and self-management skills*

The aim of developing learning skills or capabilities is therefore to improve subsequent learning, either by developing more effective study skills and habits, or by improving specific skills - such as aspects of literacy, for example, comprehension or inference - which will be the basis or the prerequisite for further learning. The concept is therefore closely associated with *learning to learn* and the development of *independent learning skills* as well as the concept of *transfer of learning* across or between contexts. In terms of current policy initiatives, it has clear links with *personalised learning* and *assessment for learning* in the way that it focuses on the role of individual learners in improving their own performance.

Skills, competencies, capacities and capabilities

Vocabulary and terminology in this area are disputed (Hargreaves, 2005) and there is no consensus about language to talk about how training or education develops and changes an individual's ability to benefit from what they have learned in their subsequent experience. There is a general dissatisfaction with the concept of skills and its limited view of learning and performance, particularly from a philosophical perspective. This is evident both in the literature about thinking skills (e.g. Higgins and Baumfield, 1998) and transferable skills (e.g. Bridges, 1993). The underlying concern is that a learner should not only be able to make choices intellectually or academically, but should also be able to pursue them practically. Bridges (1993) explores some of the different concerns underlying the notions of cross-curricular, generic, core and transferable skills, and relates these to what is in some sense more

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fundamental or generally applicable in learning. In particular, he identifies that cross-curricular skills tend to be discussed in terms of their relationship to cognitive domains, and transferable skills in relationship to social domains. In either case, the notion of transfer has to be based upon some theory of discrete domains as Higgins and Baumfield (1998) also argue. Bridges suggests that the solution may be in what kinds of capacity might be involved in being able to perceive the *applicability* of knowledge and skills derived from one social or cognitive context in another, to adapt, modify or develop it so as to enable a person to use it in different circumstances. The shortcomings of the concept of skills are particularly evident therefore when the notion of transfer of learning skills from one context to another is considered; for a more detailed discussion, see Moseley *et al.* (2005, Chapter 1). Different possible solutions to this issue have emerged, with developments in critical thinking and learning to learn adopting the notion of dispositions for learning (Claxton and Carr, 2004; Perkins *et al.*, 1993; Perkins *et al.*, 2000) or habits of mind (Tishman, 2000). In higher education and educational leadership, the idea of learning capabilities rather than skills has also gained some acceptance (Stephenson and Weil, 1992; Duignan, 2004).

Looking originally at mathematical learning, Sfard (1996; 1998) observed that education research was caught between the ‘acquisition metaphor and participation metaphor’ (1996, p 399). According to Sfard, the *learning as acquisition* metaphor is deeply embedded in thinking about learning. Language such as ‘acquisition of mathematical concepts and processes, building up mathematics...’ (1996, p 400) implies that knowledge is something that is acquired. All these expressions suggest that skills and knowledge are viewed as a commodity which can be accumulated and learning it amounts to the acquisition of this commodity. However, there has recently been a shift in the language of learning mathematics where the metaphor of *learning-as-participation* has become more apparent. Learning as participation highlights the importance of learner as actively engaged.

It represents a ‘linguistic turn’ (Sfard, 1998) which ‘suggests that the learner should be viewed as a person interested in participation in certain kinds of activities rather than in accumulating private possessions’ (p 6). Learning activities are therefore seen as experiences which take place in contexts which have significant social, cultural and situational specificity. From this perspective, learning is also the ‘process of becoming a member of a certain community’ (p 6) about learning the language of that community and participating according to the expected social and cultural norms; see James and Brown (2005) for a further discussion of this issue and the challenge of understanding the nature of learning outcomes in the light of this issue. Sfard (1996, p 409) stresses that both perspectives have value and concludes that ‘the acquisition and participation metaphor, when combined together, run a good chance of gratifying all our needs without perpetuating the drawbacks of each one of them’.

Mindful of these issues, we have framed the key research question for this review in terms of pupils’ learning *capabilities*. Stephenson (1992, p 1) points out that the concept of ‘capability depends much more on our confidence that we can effectively use and develop our skills in complex and changing circumstances than on our mere possession of those skills’ (1992, p 1). This therefore includes an effective as well as a cognitive dimension. He further suggests that capable people have confidence in their ability to ‘take effective and appropriate action within unfamiliar and changing circumstances’. He defines the concept of capability as follows:

...an all round human quality, an *integration* of knowledge, skills, personal qualities and understanding *used appropriately and effectively* - not just in familiar and highly focused specialist contexts but in response to new and changing circumstances. (Stephenson, 2000, p 2; author’s italics).

Frameworks for classifying thinking and learning skills interventions

In a recent review of classifications and frameworks for describing thinking (Moseley *et al.*, 2004), conducted for the Learning Skills Development Agency (LSDA) and the further extension of this work (Moseley *et al.*, 2005) across the ages of schooling, we have proposed an integrated framework of classifications and taxonomies of thinking as it applies to teaching and learning. This is based on a systematic review of over 50 distinct approaches to describing and classifying thinking. The model maps on to the National Curriculum thinking skills framework, but is more comprehensive in the thinking and learning skills covered. This is particularly in terms of memory and recall, and in terms of metacognition and self-regulation of learning. The model has been adapted to include categories for the physical domain (for example, it encompasses learning in Physical Education) and emotional domain (following the original taxonomy of Bloom (1956) and its revision (Anderson and Krathwohl, 2001).

One of the intentions of using this model was to classify studies located in the mapping stage of the review in terms of the broad categories of physical, cognitive (and the sub-categories of information-gathering, building

understanding and productive thinking) in order to show where there is research evidence applicable to learning skills in each of these areas. In addition, the classification can be used to identify potentially relevant studies for in-depth review, such as in the areas of problem solving or creative thinking. The areas therefore form part of the keywording to create the map of research and help to structure the in-depth review.

1.3 Policy and practice background

One of the aims of this review in terms of its policy background is to support one of the five core components of the development of personalised learning through ‘teaching and learning strategies that actively engage and challenge learners and develop their ability to focus on their learning skills and their capability to take ownership of their own progress’ (NCSL, 2005). This provides a clear focus on approaches which support metacognition and self-reflection as is made explicit in Key Stage 3 Strategy materials: ‘personalised learning is an approach to teaching and learning that stresses deep learning as an active, social process and which is explicit about learning skills, processes and strategies’ (DfES, 2005a, p 5).

Figure 1.1 Strategic and reflective thinking

Engagement with and management of thinking/learning, supported by value-grounded thinking (including critically reflective thinking)

PHYSICAL	COGNITIVE		EMOTIONAL
<i>Information-gathering</i>	<i>Building understanding</i>	<i>Productive thinking</i>	
Experiencing recognising and recalling	Development of meaning (e.g. by elaboration, representing or sharing ideas)	Reasoning	Understanding casual relationships
Comprehending messages and recorded information	Working with patterns and rules	Problem-solving	Systematic enquiry
	Conception formation	Creative thinking	
	Organising		

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A similar vision is set out for primary schools:

The Primary Strategy will develop a framework for learning and teaching across the curriculum. The framework will propose the range of learning skills, knowledge and understanding that children should develop as they progress through primary school. It will help teachers to map the development of different learning skills against the opportunities offered by the different curriculum areas. Bringing together the development of learning skills and progression across the subjects in the National Curriculum will help schools to shape and define their individual whole school curriculum, and make sure that children are acquiring a really wide range of skills as they learn. (DfES 2003, p 29)

The Primary National Strategy has also focused in its 'Learning and Teaching' materials (2003) on affective as well as cognitive aspects of learning. The review has therefore included within the definition of self-regulation features such as self-awareness, managing feelings, motivation, empathy and social skills (see Figure 1.1).

1.4 Research background

The most relevant review in the area of learning skills is the meta-analysis of the effects of learning skills interventions on student learning by Hattie *et al.* (1996). Their review aimed to identify the features of study skills interventions which led to successful learning. The kinds of studies which they identified typically focused on task-related skills, self-management of learning, or affective components, such as motivation and self-concept. Interventions were also classified in terms of their impact in terms of near and far transfer of learning (Perkins and Salomon, 1989). Their findings support the notion of situated cognition in that teaching other than for basic recall should 'be in context, use tasks in the same domain as the target context and promote a high degree of learner activity and metacognitive awareness' (p 1). There is

a general consensus that the direct teaching of all-purpose learning or study skills is not effective (e.g. Pintrich and De Groot, 1990; Tabberer, 1984) and that 'if strategy training is carried out in a metacognitive, self-regulative context, in connection with specific context rather than generalised skills, and if such training is supported by the teaching context itself, positive results are much more likely' (Hattie *et al.*, 1996, p 129).

Other reviews broadly support this position. Sipe and Curlette (1997) used meta-analytic techniques to identify factors which support student achievement and used Walberg's (1984) educational productivity model as a theoretical framework. This model identifies aptitude (ability, development and motivation), instruction (amount and quality) and environment (home, classroom, peers, television) as significant factors affecting student achievement. They refer to their study as a 'meta-synthesis' as they undertook a quantitative synthesis of other meta-analyses.

One of the key findings from this review and an earlier meta-synthesis by Hattie (1992) is that the effect of typical educational interventions is to raise pupils' achievement by about 0.4 of a standard deviation (the effect size). This is equivalent to raising the average attainment of class by about 16 percentage points. This provides a good benchmark against which to judge the impact of different approaches to raising attainment; see Higgins *et al.* (2005) for a fuller discussion of interpreting effect sizes in the context of research into thinking skills approaches.

The meta-synthesis by Hattie (1992) included 134 meta-analyses published between 1976 and 1985; the meta-synthesis by Sipe and Curlette (1997) included 103 meta-analyses of over 4,000 primary research studies published between 1984 and 1993. One further significant meta-analysis is that of Marzano (1998) which summarised research on teaching and learning of over 4,000 effect sizes involving 1.2 million students. His approach was also theory driven and examined the impact on learning across several aspects

of thinking and learning: the self system, metacognitive, cognitive and knowledge domains.

The majority of techniques (2,893) identified in Marzano's meta-analysis were designed to be used by teachers. However, those designed to be used by students (1,164) had a higher average effect size (0.73 versus 0.61). Techniques designed to be employed by students (explicit techniques and strategies) produced an average percentile gain of 27 points; techniques designed to be employed by teachers (implicit techniques and strategies or teaching approaches) produced an average percentile gain of 23 points. Marzano speculates that the difference might be due to the fact that any techniques employed by students automatically demand the use of the metacognitive system, thus increasing the extent to which students generate strategies, monitor the effectiveness of those strategies, and employ various dispositions, such as seeking accuracy or restraining impulsiveness.

Other reviews have focused on specific aspects of thinking and learning skills. Examples of these include Kobayashi's (2006) meta-analysis of the value of the teaching of note-taking, the effects of problem-based learning on knowledge and skills (Dochy *et al.*, 2003) and the impact of cognitive training (Hager and Hasslehorn, 1998). Another example of a study which fits a broader definition of learning skills is the review of reciprocal teaching by Rosenshine and Meister (1994). This is a teaching approach which features 'guided practice in applying simple concrete strategies to the task of text comprehension' (Brown and Palincsar, 1989). It includes cognitive techniques, such as summarisation, question generation, clarification and prediction supported through dialogue between teacher and students (or students and students) as they attempt to gain meaning from a text. Rosenshine and Meister's review includes 16 studies with quantitative data of reciprocal teaching and found an average effect size of 0.32 when the impact of the intervention was measured, using standardised tests and an average effect size of 0.88 when more specific

tests developed by the researcher were used.

The current review specifically focuses on the explicit development of pupils' learning capabilities in schools by their teachers. It aims to build on earlier existing systematic reviews. Learning skills was the focus of considerable research in the 1980s but, by the end of the decade, the consensus that developed from this work was that the direct teaching of general or all-purpose study skills is not effective (e.g. McCombs, 1984; Pintrich and De Groot, 1990; Tabberer, 1984;). Subsequently, the research focus moved to other factors, such as learner strategy training, motivation, self-efficacy and self-regulation, with a keen interest in the specific and social nature of the learning situation (e.g. Brown *et al.*, 1983; Derry and Murphy, 1986; Garner, 1990).

In the area of learning skills, the analysis by Hattie *et al.* (1996) has some important findings which remain relevant to policy and practice. This review aimed to identify features of learning skills interventions that are likely to lead to success. Using meta-analysis, the authors reviewed 51 studies where the reported interventions aimed to enhance student learning using either one or a combination of learning or study skills. They found the following:

- The effects of learning skills interventions are greatest on performance but are also effective at improving learners' attitudes and feelings towards learning (affective measures).
- Approaches which target learners' attributions, memory or structural aids (such as advance organisers, graphic organisers, or writing strategies) tend to be more successful than those which aim to improve motivation or study skills directly.
- It is easiest to improve performance on closely related content, tasks and activities; the further the 'transfer', the harder improvement is to achieve.

- Low attaining pupils tend to benefit from all types of approaches, mid-range attainers tend to benefit most from approaches which offer specific strategies or techniques, and high attainers benefit most from approaches which target memory or approaches which support self-management.
- The younger the students, the more they tend to benefit. Learning habits develop young and are hard to change.
- In terms of strategy training, they suggest a number of successful conditions:
 1. High and appropriate motivation, including self-efficacy and appropriate attributions (such as attributing failure to lack of effort, and setting realistic and attainable goals)
 2. The strategic and contextual knowledge for doing the task
 3. A teaching and learning context that supports and reinforces the strategies being taught

The Thinking Skills Review Group have undertaken three EPPI reviews in the area of thinking skills (Baumfield *et al.*, 2005; Higgins *et al.*, 2003; Higgins *et al.*, 2005), looking at the impact on thinking skills approaches on pupils using narrative and quantitative synthesis as well as reviewing the impact on teachers. The inclusion criteria for this review were therefore specifically designed to avoid replication of this work, and to avoid replicating the work of other reviews in related areas: for example, as peer- and self-assessment, and the use of learner strategies in Modern Foreign Language teaching (Hassan *et al.*, 2005).

A further review was considered necessary to support current policy initiatives in England and to ensure that research evidence in the area of learning skills was sufficient to cover current needs (taking into account existing and commissioned EPPI reviews), as well as to update earlier published reviews in this area.

1.5 Authors, funders and other users of the review

The review was conducted to support the development of current national policy in developing the role of learning skills in schools in England and is complementary to other national initiatives, such as the development of personalised learning. As an EPPI-Centre review, it is part of the development of the evidence-based policy and practice initiative funded by the Department for Education and Skills. This aspect of the review is reflected in the expertise of the Policy Steering Group.

The Review Group were all members of the Research Centre for Learning and Teaching at Newcastle University, which has significant expertise in systematic and critical literature reviews. Members of the Group have been involved in a number of major reviews and have developed skills in the identification, review and management of large review libraries. The outcomes have been both qualitative and quantitatively focused reviews exploring many areas, such as frameworks and taxonomies of thinking (Moseley *et al.*, 2005), the impact of thinking skills approaches on teaching (Baumfield *et al.*, 2005) and learning (Higgins *et al.*, 2003; 2005a), learning styles (Coffield *et al.*, 2004), school building programmes (Woolner *et al.*, 2005), the effects of the physical learning environment (Higgins *et al.*, 2005b) and information and communication technologies (ICT) (Higgins, 2003).

The practitioner perspective was developed through the involvement of the local Advisory Group who all had experience of involvement in either EPPI reviewing or similar initiatives.

1.6 Review questions

Following the agreement of the outline of the review by the Policy Steering Group, the Review Group completed a review protocol in accordance with procedures for conducting an EPPI review. After feedback from the EPPI team, some revisions to the review question

and the inclusion/exclusion criteria were made to ensure that the focus of the review did not overlap significantly with earlier reviews undertaken by the group (such as excluding published thinking skills programmes) or other reviews currently underway (such as studies which focus on self- or peer-assessment as this is the subject of an Assessment Review Group systematic review). The review question was refined accordingly as follows:

Which teaching approaches that explicitly aim to develop pupils' learning capabilities are effective?

The search strategy therefore sought to identify empirical classroom-based research in which the aim of the approach or intervention was explicitly to improve aspects of pupils' learning by focusing on particular teachable skills and capabilities. Particular weight was given to studies which looked at issues of implementation and sustaining change and

improvement, as this was identified as a key challenge from the members of the advisory groups.

The review was undertaken in two main stages. The first stage involved searching and mapping to produce a map of existing research and evidence. The key terms for this mapping stage were agreed with the policy steering group as this classification determined the questions which could then be answered at the second stage of the review. The second stage was a more detailed, in-depth review of a subset of those studies relevant to the development of learning capabilities through metacognition and self-regulation, where the approach had been implemented in three or more schools in order to identify issues about implementing such approaches across schools and about the sustainability of any such initiatives.

CHAPTER TWO

Methods of the review

This section describes the methods used in the review in terms of the involvement of potential users of the review, how relevant research was identified and used in the review, and the systematic reviewing techniques used in its analysis.

2.1 User involvement

There were two main advisory groups: one with a policy focus and one with current practitioner experience in schools. These groups were consulted and met to provide feedback on the focus and process of the review as well as its potential outcomes. Feedback to identify the in-depth question was crucial in determining the final focus of the review. User perspectives on the review process and the provisional report have been incorporated into the final report. Meetings were held locally and nationally with the two key user group to solicit feedback about the focus of the review and the provisional findings. Methods for this participation included the critical reading of drafts of the protocol and review, and specific involvement of users to assist in including outcomes relevant to different users.

2.2 Review methods

The focus of the review, the inclusion criteria, the review-specific keywords and the topic for

the in-depth review were decided through a series of meetings between the members of the Review Group, the national Policy Steering Group and EPPI-Centre staff, with discussions from the Local Advisory Panel providing further advice and guidance. The review methods followed EPPI-Centre procedures. Reports of relevant research were identified from electronic databases, citations from reference lists, web searches and personal contacts. For a study to be included in the systematic map, it had to contain empirical evidence about effective approaches to developing thinking and learning skills through pupils' active involvement in awareness and management of their own learning, where the study was set in schools with mainstream pupils aged 4-19.

The studies found in this way were then described, using both generic EPPI-Centre keywords and review-specific keywords which aimed to take account of links with a number of policy areas to create a 'map' of the research literature. After looking at the results of the map, the Review Group met the National Policy Steering Group to decide on the focus and question for the in-depth review. With guidance also from the Local Advisory Panel, the decision was made to look at teaching approaches which explicitly aimed to develop pupils' learning capabilities and which showed evidence of improved learning of pupils. In order to address issues of scaling up, studies had to have been undertaken on a reasonable scale.

Studies in the map were excluded from the in-depth review if they were undertaken in fewer than three schools. The studies in the in-depth review were then read and described in more detail using EPPI-centre data-extraction questions, including assessments of the weight of evidence (WoE) that each study lent to the review. Quality-assurance was carried out at

the screening, keywording and data-extraction stages, for example by a study being data-extracted independently by two people, and the results then compared and agreed. Finally, the results of the selected studies were brought together in a synthesis. More details of the methods are given in the Technical Report.

CHAPTER THREE

What research was found?

From the electronic databases and full-text collections searched, 1,379 citations or references to documents were identified. Following screening of titles and abstracts and duplication of citations, 1,198 citations were excluded, which left 181 reports of studies for further consideration. A further 14 citations were identified through handsearching or personal contacts, making a total of 195 reports of research identified at this stage. After 11 duplicates had been eliminated, the remaining 184 reports were targeted for retrieval. These reports were books or chapters in books, published articles, conference papers, project reports and theses. For these, full copies (either electronic or paper) were then sought through the internet, local university libraries and inter-library loans. Of these, a total of 146 reports were obtained within the timescale identified for this phase of the review. These reports were screened again, using the inclusion and exclusion criteria and to check that the reports referred to different studies. Seven reports described aspects of studies already included and were coded accordingly as linked documents. Fifty-nine (59) further reports were excluded, once the full paper was available. This left a total of 80 studies included in the systematic map.

The studies remaining after application of the criteria were keyworded according to EPPI-Centre procedures. Additional keywords specific to the context of the review were also

coded. All the keyworded studies were added to the larger EPPI-Centre database (REEL) for others to access through the website.

Twenty countries were represented in the research studies included in the review. The largest group came from the United States, with clusters in the UK, Australia and Israel. The majority of the studies were from 'first world' countries.

More studies related to secondary schools (45) than primary schools (33), and the curricular focus of studies is dominated by first-language literacy, numeracy and science, reflecting the common association of learning skills with core-curriculum subjects and more generally the focus on these subjects of the curriculum in educational research (Higgins *et al.*, 2003).

Due to the nature of the inclusion criteria, all studies included metacognitive thinking or the self-regulation of learning. There were more studies focusing on the development of understanding and reasoning or problem solving (65), than on other areas of thinking such as gathering information (17) or emotional and affective thinking (12).

Educational research into the explicit teaching of learning skills and learning capabilities is therefore being conducted internationally. The majority of this literature in this review reports studies in the United States, Australia and the UK, which reflects the search

strategy only including studies in English. As with earlier reviews (Higgins *et al.*, 2003), the majority of studies focus on science, mathematics, English (or the first language of where studies were undertaken). Research has been undertaken across the age range in primary and secondary schools, with slightly

more research investigating the learning of older pupils. In addition to the metacognitive elements they all share, the balance of aspects of learning in the studies is weighted towards building understanding and productive thinking, rather than information gathering, emotional or physical aspects.

CHAPTER FOUR

What were the findings of the studies?

4.1 Selecting studies for the in-depth review

In order to meet the aims for the review, specific issues were identified by the Policy Steering Group as potentially valuable. These were issues of scale, applicability of the research to other school contexts and the explicit development of learning capabilities by teachers. To meet these criteria the specific question for in-depth review was identified as:

Which teaching approaches that explicitly aim to develop pupils' learning capabilities and which have been used in at least three schools show evidence of improved learning of pupils?

A further sub-question was added to identify issues in scaling up interventions or teaching approaches across schools:

What issues are identified in these studies about implementation or scaling up of the teaching approach?

Applying these additional criteria to the studies in the systematic map produced a subset of 10 studies which met the additional criteria; see Appendix 4.1 of the Technical Report for further details about these studies.

4.2 Further details of studies included in the in-depth review

The in-depth review focuses on ten studies identified from the systematic map in which

there is evidence from research undertaken in schools about interventions which explicitly aimed to develop pupils' learning capabilities. These studies are international in their spread and were undertaken on a scale where at least three schools were involved. The approaches used in the research vary and are based on different theoretical perspectives about learning. However, all share common features where a key feature of the research is that the approach included the development of metacognitive thinking or self-regulation by the learners involved.

Summary

There are effective approaches which teachers can use to develop pupils' learning capabilities (Adey *et al.*, 2002; Desoete *et al.*, 2003; Toth *et al.*, 2000; White and Fredriksen, 1999; Williams *et al.*, 2002) and the characteristics identified in the review include the following:

- structured tasks that focus on specific metacognitive strategies in the context of the lesson/subject
- capacity built into activities in lessons for more explicit transactions between the learner and the teacher concerning the purpose of the activity
- small group interactions promoting the articulation of the use of strategies during teaching
- mechanisms built into the task to promote the checking of mutual understanding of the goals by peers and with the teacher
- enhanced opportunities for the learner to

receive diagnostic feedback linked directly to the task

For example, in science, explicit processes necessary for designing experiments should be identified, such as planning, justifying and evaluating and tasks developed within the specific context of the lessons to scaffold learner's performance and to establish effective feedback loops to monitor progress (Olina and Sullivan, 2004; Toth *et al.*, 2000). In another example (Vauras *et al.*, 1999), inquiry skills are developed by envisioning snapshots of what it would mean to be successful at each stage of the task combined with consolidation through the completion of concrete tasks. The key components of the interventions are planning based on a good understanding of the processes of learning, key concepts of the content to be studied and an awareness of the learning context. There is also support for the view that the orientation towards learning should be one in which success results from appropriately guided effort and not on a construct of ability (Dweck, 1999). In short, approaches which explicitly develop learners' awareness of strategies and learning techniques by which they can succeed are effective, particularly when they are targeted at the metacognitive level (Desoete *et al.*, 2003; Guterman and Boxall, 2002; White and Fredriksen, 1999) or use self-regulatory approaches (Kolic-Vehovec, 2002).

The key components identified from the studies included in the in-depth review are as follows:

- A clear understanding of the features of the relevant learning processes to achieve success in a particular context
- The design of concrete tasks to scaffold the development of the awareness of the processes and their importance for success
- Opportunities to feedback during the task thus enabling teacher intervention, but also providing for this to become gradually internalised as self-regulation
- Explicit emphasis on developing capability

through effort and the possibility of improving performance by responding to feedback and adaptation.

We can also identify some necessary conditions:

- The teacher needs to have an alignment of a good understanding of learning, in terms of the subject and the context (what European educationalists would call 'didactics').
- There is also the need for the teacher to have access to concrete tools and strategies to guide the learner and enhance opportunities for feedback.
- Both teachers and learners should have an orientation towards learning, characterised by a willingness to engage in dialogue and negotiation regarding the intent and purpose of a particular teaching and learning episode.
- The focus should be on how to succeed in terms of the selection of appropriate strategies and making the right effort, rather than on ability.

However the messages in the research are neither simple, nor conclusive (De Corte *et al.*, 2001; Olina and Sullivan, 2004; Vauras *et al.*, 1999). The lack of conceptual clarity regarding the provenance and use of terms such as 'learning capability' means that the studies included in the review are located within different, if overlapping, frameworks, offering different interpretations of why an intervention might be effective. There is also a tension between approaches to learning skills which emphasise content (in terms of mastery of specific skills) and process (in terms of locating skills within an overall understanding of learning approaches). Therefore, in the short term, the most effective means to improve performance where the assessment focuses on content knowledge is likely to be direct instruction. In the longer term, or where assessment focuses on conceptual understanding, metacognitive or strategic approaches are more likely to be effective.

CHAPTER FIVE

Implications

5.1 Strengths and limitations of this systematic review

A clear strength of the review is its use of systematic reviewing techniques based on EPPI-Centre procedures and techniques which aim to make the processes of systematic reviewing more transparent (for further details, see Appendix 1). A further strength of the review is its relevance to current policy and practice, and the involvement of potential users of the review.

The findings of the review broadly confirm the findings of earlier reviews in this area. Some inconsistencies have emerged, particularly in relation to how such learning capabilities should be developed. Thus the findings of this review suggest that the teaching of learning skills may need to be made explicit as well as embedded in the curriculum; previous reviews have suggested that an embedded approach was preferable. Another issue raised by this review is the age groups for whom such teaching is appropriate. Previous reviews have not reached a consensus, with some suggesting that such teaching is most effective with older learners; the implications of this review is that its goal is to develop more effective attributions, and working with younger learners may be more beneficial.

The limitations of the review derive from the breadth and complexity of the concepts of learning skills and the development of learning capabilities. In order to cope with the scale of the task and the range of possible literature, a

number of choices had to be made about how to focus the review. One aspect of this focus was the need to avoid repeating areas covered in other EPPI-Centre reviews: these include the Modern Foreign Languages review on ‘the role of prior knowledge in unidirectional listening comprehension’ and the Assessment review group’s (unpublished) work on peer and self-assessment. The findings and implications of other reviews should therefore be borne in mind when reading this review, including the previous Thinking Skills review, which looked at approaches to effective teaching and learning and the evidence for impact on learners (Higgins, 2004). The review by Higgins found the following:

- There is evidence of a positive impact on pupils' attainment in both curriculum and non-curriculum measures, and some evidence that pupils' can translate this learning to other contexts.
- The impact may not be even across all groups of pupils; there may be greater impact on low-attaining pupils, particularly when using metacognitive strategies.
- There is some evidence that pupils benefit from explicit training in the use of thinking skills strategies and approaches.
- The role of the teacher is important in establishing collaborative group work and effective patterns of talk, and in eliciting pupils' responses.

- When introducing interventions that focus on improving specific cognitive strategies, it could be more efficient to target particular groups of pupils and identify the most appropriate times for development. However, interventions aimed at developing a classroom ethos conducive to making learning more explicit and fostering dialogue about teaching and learning can be promoted at any time.
- There may be a significant delay before the impact on attainment becomes apparent in tests and exams.

A further limitation arises from the specific focus of the in-depth review on interventions which aimed explicitly to develop pupils' learning capabilities through the use of metacognitive or self-regulatory approaches in at least three schools. Although this produced a manageable number of studies for synthesis, it necessarily reduced the scope of the review. This may have omitted other studies' findings relevant to the broader aims of the review.

5.2 Implications

5.2.1 Policy

At policy level, specific consideration of the development of learning skills and capabilities as part of the curriculum needs to include explicit advice that such development should not only be embedded in the curriculum, but also taught in such a way that is explicit to pupils. Opportunities to achieve this should be identified in the early stages of schooling as well as for older pupils. It should also be recognised that it can be difficult to assess the impact of such approaches in both the short term and in terms of the development of a learner's identity over time. Further research is needed to identify what would be the most appropriate learning outcomes to judge the effectiveness of such interventions (James and Brown, 2005). Any such research needs to identify both short-term and longer-term indicators which can be related both to attainment in the curriculum and to learners'

meaningful participation in learning.

5.2.2 Practice

While there are approaches which can be used effectively by teachers in classrooms in schools to develop pupils learning skills and capabilities, research findings need to be 'translated' (Toth *et al.*, 2000), rather than simply applied to school settings. There is a reported tension between teachers adhering closely to the *format* of a programme, and having the deeper understanding and critical distance necessary to adapt the *ideas* to context (Dusenbury *et al.*, 2003). It is therefore important that teachers understand the principles underpinning approaches which seek to develop pupils' learning skills and capabilities (see Hattie *et al.*, 1996) This is so that, as different approaches are used and adapted, in various learning contexts, they achieve the aims or intentions underpinning the approach. The planning of professional development to support teachers in using these approaches is therefore both essential and challenging if development in schools is to be sustained beyond an initial innovative phase.

5.2.3 Research

This review has been conducted as part of a series of reviews of education research supported by the EPPI-Centre. Other completed reviews have much to say about the development of pupils learning skills and capabilities. Further work is needed to relate the findings of this review to the findings and implications of other related reviews.

The findings of this review illustrate the complex nature of the learning outcomes needed to judge the effectiveness of interventions to improve learning skills and capabilities (see James and Brown, 2005). Further research is needed to identify both short-term and longer-term outcome indicators which can be related both to attainment in the curriculum and to participation in learning.

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Appendix: EPPI-Centre framework and methods for systematic review

What is a systematic review ?

A systematic review is a piece of research following standard methods and stages (see Figure 1). A review seeks to bring together and ‘pool’ the findings of primary research to answer a particular review question, taking steps to reduce hidden bias and ‘error’ at all stages of the review. The review process is designed to ensure that the product is accountable, replicable, updateable and sustainable. The systematic review approach can be used to answer any kind of review question. Clarity is needed about the question, why it is being asked and by whom, and how it will be answered. The review is carried out by a review team/group. EPPI-Centre staff provide training, support and quality assurance to each review team.

Stages and procedures in a standard EPPI-Centre review

- Formulate review question and develop protocol.
- Define studies to be included with inclusion criteria.
- Search for studies: A systematic search strategy including multiple sources is used.
- Screen studies for inclusion:
 - Inclusion criteria should be specified in the

review protocol.

- All identified studies should be screened against the inclusion criteria.
- The results of screening (number of studies excluded under each criterion) should be reported.
- Describe studies (keywording and/or in-depth data extraction)
 - Bibliographic and review management data on individual studies
 - Descriptive information on each study
 - The results or findings of each study
 - Information necessary to assess the quality of the individual studies

At this stage, the review question may be further focused and additional inclusion criteria applied to select studies for an ‘in-depth’ review.

- Assess study quality (and relevance)
 - A judgement is made by the review team about the quality and relevance of studies included in the review.
 - The criteria used to make such judgements should be transparent and systematically

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applied.

- Synthesise findings

- The results of individual studies are brought together to answer the review question(s).
- A variety of approaches can be used to synthesize the results. The approach used should be appropriate to the review question and studies in the review.
- The review team interpret the findings and draw conclusions/implications from them.

Quality assurance can check the execution of the methods of the review, just as in primary research, such as:

- Internal QA: individual reviewer competence; moderation; double coding
- External QA: audit/editorial process; moderation; double coding
- Peer referee of: protocol; draft report; published report feedback
- Editorial function for report: by review specialist; peer review; non-peer review

The results of this systematic review are available in four formats:

SUMMARY

Explains the purpose of the review and the main messages from the research evidence

REPORT

Describes the background and the findings of the review(s) but without full technical details of the methods used

**TECHNICAL
REPORT**

Includes the background, main findings, and full technical details of the review

DATABASES

Access to codings describing each research study included in the review

These can be downloaded or accessed at <http://eppi.ioe.ac.uk/reel/>

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Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre)
Social Science Research Unit
Institute of Education, University of London
18 Woburn Square
London WC1H 0NR

Tel: +44 (0)20 7612 6367

<http://eppi.ioe.ac.uk/>

<http://www.ioe.ac.uk/ssru/>

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The EPPI-Centre was established in 1993 to address the need for a systematic approach to the organisation and review of evidence-based work on social interventions. The work and publications of the Centre engage health and education policy makers, practitioners and service users in discussions about how researchers can make their work more relevant and how to use research findings.

Founded in 1990, the Social Science Research Unit (SSRU) is based at the Institute of Education, University of London. Our mission is to engage in and otherwise promote rigorous, ethical and participative social research as well as to support evidence-informed public policy and practice across a range of domains including education, health and welfare, guided by a concern for human rights, social justice and the development of human potential.

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telephone: +44 (0)20 7947 9556 email: info@ioe.ac.uk