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Converging aims and diverging means of teaching thinking: An epilogue

B. Csapó & J.H.M. Hamers

Introduction

Education, one of the most ancient human enterprises, aims at cultivating children's minds. However, throughout the long history of organized education, there have been different views of what this aim really means and how it can best be achieved. In the second half of this century, there has been a growing emphasis on those aspects of cultivating the mind that enable learners to manage, process, organize and apply the information they acquire. Teaching thinking is one of the umbrella-keywords under which the research into this problem seems to find its place, but there are a number and classical or recently emerging areas of research that are also aimed at the same target. When we attempt to review the main research trends in this field and the related areas, all efforts initially appear to point in the same direction. If they deal with knowledge, procedural components are emphasized, and the quality of students' knowledge is characterized by how well is it organized, and how easily it can be mobilized in new situations. If students' school learning is studied, meaningfulness and understanding are central issues; students' potential to learn is to be improved or their learning strategies are to be developed. This apparent convergence of the broad aims of research and development diminishes if the

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particular research projects are considered. Although their theoretical frameworks are becoming more consistent, the particular solutions they propose for the general problems studied are quite different.

This book mirrors these two faces of current research and programme development. The research projects that are the bases of the chapters seem to be aimed at the same target, and, as we have already discussed in the first chapter of this volume, they tend to turn to the same pool of philosophical and theoretical sources. There are several links between the projects presented in this book, but at present they rather seem to be mosaics or fragments of a larger picture than parts of a consistent research paradigm. Diversity and consistency are not the only issues that the editors of this book faced when selecting and organizing the chapters, but the dilemma they pose is characteristic of the whole field of research as well. Thus, it is hard to synthesize the results of the book without outlining the broader problems of the area. Therefore, as we draw a final conclusion from the work presented in this book, we outline a strategy of managing this diversity as well. We address general issues related to the present and future of research regarding teaching thinking research which is illustrated in the chapters of this book. Diversity of ideas, approaches and practical solutions is of great value, especially if the actual field of research is in a phase of rapid development. However, the particular projects may become easily isolated if they do not support each other and if they lack the links that organize the concepts used within certain projects into consistent conceptual networks. One of the challenges that will influence the next few years of research regarding teaching thinking may be how a healthy and fruitful balance can be found between the benefits and drawbacks of diversity and consistency.

Diversity: Advantages and drawbacks

There are many advantages of diversity, many rooted in the premise that: different approaches to the same problem can be cross-fertilizing when they are contrasted and discussed in the same framework. Interpreting particular contradictions often requires broadening the field of vision and shaping a conceptual framework. Researchers in the field have already encountered the diversity of research regarding teaching thinking, and (beyond the scheme we propose in the first chapter) have attempted to classify the approaches several times. For example, Nickerson, Perkins and Smith (1985), who reviewed around thirty projects carried out in the United States until the mid 1990s, classified them into five main categories. Jones and Idol (1990) used six dimensions of thinking, and Nickerson (1988) listed seven aspects of teaching thinking. However, these attempts not only indicate that the number of approaches - as well as their diversity - is growing, but even attempts to synthesize the results show impressive variety.

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Most of these attempts aim at classifying, categorizing and synthesizing United States projects, and one of the best known collections of teaching thinking programmes (Costa, 1991) also presented programmes that have already been implemented in the United States. When Hamers and Overtoom (1997) published a comparable inventory of European programmes for teaching thinking, this added another dimension of variety to the already enormous complexity of the field: they presented an inventory of 42 projects in a consistent format; in doing this, they introduced programmes that were devised and implemented in different countries, in different cultures and educational settings, and in different languages. McGuinness and Nisbet (1991) also published about the European research on teaching thinking. Their volume was the first one that presented enough information about some programmes to prompt the intention of implementing them somewhere else or at least using the experiences of other programme developers. There have already been some well-known attempts to transfer teaching thinking projects from one culture to another (for example, the Venezuelan projects are the best known ones, see Dominguez, 1985; Sánchez, 1987), but in Europe it is different. Because of linguistic isolation (and also because of the former ideological and political divisions of the continent) a number of original ideas, theoretical concepts and practical methods have appeared and were nurtured in several countries that may fertilize works in other research communities. However, such an enterprise also prompts the questions: how and how far can programmes devised and implemented in one culture be used in other countries? Under what conditions can a programme that is successful in one educational setting be used in another country with approximately the same efficiency? How can experiences from one culture be transferred into another, or putting it in a different way, how far can research results be replicated under different circumstances?

Our present book continues to pose such dilemmas, although there are some historical parallels that we should learn from. Language and cultural issues are not new at all. Some terms introduced by German psychologists, like 'Gestalt' have become known not only to psychologists around the world, but are also now part of standard English (as well as many other languages), while Piaget's 'structure d'ensemble' is known only by the specialists in the field, although it is also known that this French term is the one that best expresses Piaget's original concept. It is also known that 'activity' has a rather different connotation than its Russian original, and the problems caused by inappropriate translations of Piaget's early works into other languages have also been broadly discussed in the literature (for some current instances see Adey & Shayer, 1994). Despite all these controversies, it is undeniable that the works of German psychologists, Vygotsky and his followers, and the Geneva school have become the common knowledge base of the present English-speaking research community. Or to cite a more recent example, Dutch psychologists benefited greatly by drawing from the works of another generation of Russian

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psychologists (see references in the first chapter and other chapters by Dutch authors). Benefiting from this type of linguistic and cultural diversity is definitely slowing down since English is becoming the dominant language of scientific communication. Maybe there are ideas and terms presented in this book that probably lose their original Finnish, Dutch or Hungarian flavour when translated into English, but today's researchers, even if English is not their first language, keep in mind 'how would it sound in English' when choosing terms for developing conceptual frameworks.

As for the linguistic aspects of the difficulties of the synthesis, it is not the ideas originally expressed in different languages that cause the main complication. A major part of the problem lies within the English terminology itself. The proliferation of terms used in the field of teaching thinking seems to be accelerating, and quite often they are applied inconsistently and so increase the complexity of problems unnecessarily. In some cases, some words are used as synonyms and are varied to make the presentation of ideas more attractive; in other cases, the selection of terms indicates sharp differences of theoretical orientations.

At least four groups of terms can be distinguished. (a) The first group refers to the mental process itself. The most frequently used words are: thinking, reasoning, cognition, and information processing. Although some authors strictly distinguish them and prefer or avoid one or several of them, these words are quite frequently used as synonyms to name the mental processes studied in general. (b) In the second group, there are terms that refer to the dispositions or attributes that lie behind the mental processes. The words typically used are: skills (specific, general, higher order thinking, reasoning), abilities (mental, cognitive, specific, general), mind, intelligence (general, fluid, crystallized, practical), procedural knowledge, cognitive strategies, operations, structures, operational structures, competence or even aptitude. The choice of term in this case is fairly characteristic for the author's approach and theoretical position. The programmes (including those presented in this book) aim at improving these dispositions or attributes. (c) The terms in the third group are used to name the change itself, or the process that results in the desired change of the disposition or attributes. A large number of terms can be identified, for example, teaching, developing, improving, training, instructing, educating, modifying, fostering, enhancing, increasing, stimulating, accelerating, remedying. The choice of this type of term is usually determined by the theoretical paradigm the authors identify with, by the type of expression selected from the second group or by the target population of a specific programme, (e.g., teaching or developing is more often used in the normal population while training or remedying fits better to children in special education, and expressions like fostering or stimulating are more often used for naming the programmes devised for exceptional children). (d) Finally, the terms that describe or name the specific programmes are usually the combination of words listed in the previous

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groups. Their structure is frequently 'doing something with something'. In the vast body of research literature almost every combination can be found. Besides the most common combinations, e.g., teaching thinking or improving cognitive abilities, a large number of original or unusual terms also appear, for example 'teaching intelligence' (Blagg, 1991), 'cognitive instruction' (Jones & Idol, 1990), or the really unusual 'training of intellectual aptitude' (Snow, 1982). Some combinations refer to specific areas of intervention, e.g., improving operational abilities, fostering inductive reasoning, while others name whole research paradigms or orientations. For example, an international association was organized around 'cognitive education', and a journal has been published (see also Scheinin and Mehtäläinen, this volume).

The chapters of this volume are no exceptions to this trend: they also use a variety of expressions to name the object of their study. Although there are trademark-like associations of terms in this book that are also associated with certain types of research or research communities (e.g., Experiential Structuralism introduced by Efklides and Demetriou; Cognitive Acceleration through Science Education, CASE, trademark of the research by Adey and Shayer; Scheinin's and Mehtäläinen's Formal Aims of Cognitive Education, FACE; or Csapó's Operational Enrichment, OE) in elaborating the theoretical frameworks, a wider consistency can be observed. The usage of terms and expressions usually does not go beyond the Piagetian, Vygotskyan, constructivist, information processing and psychometric terminology. This consistency of terms helps to bridge the differences between the specific theoretical foundation and practical implementation of the research programmes. The chapters still do not use a well-defined terminology but there are a number that overlap making the conceptual frameworks 'translatable'.

Cognitive research and/or programme development

There is one more dimension to the variety of teaching thinking projects that, quite often, is characterized by the theoretical or practical orientation of the researchers or programme developers, but in fact the sources of the differences are deeper than that. Actually, the orientation of researchers and thus the outcome of their work is determined by a number of different factors, and among these, professional considerations that are derived from different philosophical ideas also play an important role.

Those who are closer to the positivist view of the development of sciences and who tend to share the values best expressed by natural scientists doing basic research, believe in the step-by-step accumulation of scientific knowledge in the field of human cognition and in studying cognitive development as well. In this view, devising and testing programmes for improving thinking skills is part of an empirical research process and the results contribute to the growing body of

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knowledge about the development of thinking. They follow the classical principle that says: "If you want to understand it, try to change it." Research being done in this vein requires sophisticated theories, consistent effort, careful design and good coordination of work done by different researchers at different places. Controlling other's findings, replicating experiments, synthesizing the results via the quantitative processes of meta-analysis or conceptual analyses are all broadly accepted processes of this paradigm. Then the ever-changing and permanently tested body of knowledge can be utilized to solve the actual problems, which in our case are the design of curricula, courses or other programmes for teaching thinking.

On the other hand, the applicability or at least the universal validity of this strategy in the research into human cognition, or more precisely in the study of teaching thinking, is often challenged. The enormous complexity of the problem can be the first objection. Too many variables need to be taken into account so the models or theories that describe the whole phenomena would be hopelessly complicated. Therefore, for a longer period of time, developing training programmes for the practical situation has come to dominate teaching thinking. Programme developers, in general, have not paid too much attention to the theoretical foundations, or used particular or ad-hoc theories. This works resembled to medical or pharmaceutical research, or engineering. There has been a need to solve problems arising in practice: processes or treatments have to be applied even if their scientific bases are not fully understood. Particular technologies were tested in practice, and if the treatment worked, no one bothered about the theories. As Hager (this volume) also points out, technologies or technological rules may work well in practice even if their theoretical foundations are weak. Many such programmes have been developed and tested (see Costa, 1991), including Feuerstein's Instrumental Enrichment (IE), de Bono's CoRT programmes, and Lipman's Philosophy for Children. They have become known worldwide and have been adapted in several countries (for a review of these programmes, see for example Blagg, 1991). These training programmes consist of certain instruments, tasks, teaching materials, specifically organized sessions of teaching or longer courses. If these 'pre-packaged' programmes are properly applied, as described in their manuals, they will probably have the desired effects.

However, if the training involves complex processes, application to new circumstances always requires some adaptation as well. If the programme is theoretically not well established, modifications cannot be theoretically understood either. During such modifications one can question, how far these programmes preserve their own identity? How does their adaptation to new circumstances influence their efficiency? And if the working of a programme is not understood well, how can it be systematically improved? And if it is not adapted, or the technological rules are too rigid, how can an efficient implementation be expected? These dilemmas can be illustrated by the status of

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one of the most well known programme, Feuerstein's IE. As Adey and Shayer (1994) describe, IE has become 'fossilized' in its original form, and although it was promising at the beginning, it is hardly efficient when applied in an environment that differs from the designers' original settings. Some broadly known unsuccessful adaptations of IE indicate the problem (see for example Blagg's (1991) work in Britain). Thus, developing training programmes without a strong research background can only provide a solution to particular problems.

The need for consistent research has already been expressed in the literature and several of the authors of this book are among those who are working on bridging the gap between research and practice. The programmes they have devised for improving a particular or a wider area of thinking are embedded in a broader and long-term research agenda. In this way, the underlying and supporting research makes generalization and integration of the research results possible. For example, the work of Adey (this volume) in the CASE project relates science education and teaching thinking. The neo-Piagetian background connects his research to that of Efklides' group (this volume; also see Demetriou, Shayer, & Efklides, 1992). Klauer (this volume) has devised programmes for improving inductive reasoning; furthermore, these programmes have already been applied in other countries and adapted to other languages (Hamers, De Koning, & Sijtsma, 1998; Klauer & Phye, 1995; Klauer, Resing, & Slenders, 1996). On the one hand, the theoretical foundations (e.g., the precise definition of the concept of inductive reasoning) and the broader research background to his work (see Klauer, 1993) are strong enough that the original concept can be applied to a number of new situations. New directions, like the classroom applications, have grown out of this work, and the results can be synthesized via meta-analysis (Klauer, this volume). Some concepts, borrowed from the psychometric or individual differences tradition form a link between Efklides' and Klauer's work, as well as that of Adey, Csapó, and Scheinin and Mehtäläinin. Efklides's ability approach provides a common basis to Scheinin's work and Klauer's topic, while inductive reasoning also belongs to the main theme of classical intelligence research. However, each keeps a certain distance from the often discredited concept of intelligence and they share the views of Carroll (1993) who also prefers to speak about cognitive abilities.

Other chapters in this volume are embedded in the research conducted within the information processing paradigm, like Van Oostendorp's and Elshout-Mohr's work on text comprehension, and Chanquoy's work on text production. Describing change of knowledge as a constructive process, even if the sources of these changes are texts and not the reality itself, relates the analysis of Van Oostendorp and Elshout-Mohr to the chapters where constructivist views are more directly expressed (e.g., De Koning & Hamers; Nelissen).

Direct or indirect school application of the research forms a common basis for all chapters, regardless of whether the researchers approach the classroom application from the direction of other research areas or whether the problems

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they are dealing with have arisen immediately from the school practice. Reading (De Koning & Hamers; Van Oostendorp & Elshout-Mohr), writing (Chanquoy) and mathematics (Nelissen, Van Luit, Verschaffel) has formed the core of education since medieval times. If science (Adey, Csapó, Klauer) and grammar (Csapó, Klauer) are added, almost the whole range of school subjects is covered. However, despite all these links and overlapping, further efforts are needed to improve the consistency of research and to ensure the results can be more easily replicated, and the findings more comparable and controllable.

At the present state of cognitive research, it would be unwise to deny the necessity, relevance or importance of designing programmes for teaching thinking. It is obvious that one of the ultimate benefits of cognitive research is embodied in the form of practically applicable programmes. On the other hand, again taking into account the present state of research into teaching thinking, we would strongly argue for emphasizing the importance of coordinated research efforts that serve to accumulate widely applicable knowledge for educational practice. After reviewing the chapters of this book, we may conclude that the more efficient accumulation of knowledge in the field of teaching thinking requires a new research agenda.

Outline of an agenda for future research

Teaching thinking and related areas have belonged to the main line of educational research for the past decades. Especially in the late 1970s and early 1980s interest was focused around these topics: a large number of international conferences were organized, and books were published about this theme. Then in the late 1980s, for several reasons, the intensity of interest decreased somewhat, and other issues became dominant. Since then, a number of changes have taken place, of which the trends in globalization and the revolutionary developments in information technology have had the most visible impacts on society. These changes influence schools and school education (main sites of educational research) as well as the conditions and possibilities for educational research. For example, improved communication and accessibility have had an impact on the organization of research. In the last section of this epilogue, we list some areas where we expect developments may help the synthesis of results (some of these issues have already been discussed in more detail in Csapó, 1997b).

Theoretical frames

Today's educational research draws from a number of different sources. Brain research and neuroscience offer new insight into the biological foundations of cognition and their results have already been suggested for educational application (see for example Jensen, 1988). More or less abstract models of

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cognitive science (e.g., models of parallel distributed processes) are also often considered as possible sources of educational innovation. However, we may question how broad a field educational researchers have to observe for resources, or how many new ideas educational theories can accommodate without becoming helplessly eclectic, complex and inapplicable.

Thus, first a proper level for educational theories should be found, including theories that can accommodate frameworks for teaching thinking. An appropriate level of abstraction and generalization is needed for such theories that are embedded in the general conceptual frames of cognitive sciences, that are firmly grounded in practice as well, that are neither very abstract nor too simple. A number of recent publications have already called for such a new framework or paradigm, most of them suggesting the renewal of instructional psychology through the adaptation of the results of cognitive science (e.g., Glaser, 1991). A new developmentally valid instructional psychology, a cognitive educational psychology or a 'cognitive pedagogy' (Csapó, 1992) may be close to the desired theoretical framework. Some believe that the time for a cognitive revolution in education has not arrived yet (Ohlsson, 1990), others argue that the outline of the new paradigm is already apparent (Vosniadou, 1996). We tend to agree with those who believe that such a new paradigm may appear in the near future, but it will not come without the concentrated and conscious efforts of the interested research community.

Consistent terminology

Needless to say, a firm, clear and unambiguous terminology is a precondition of any theory-building. However, psychological and educational concepts are not easy to define, and even if well known definitions exist, their interpretations may be changing continuously. Productive conceptual developments should not be stopped or limited, but there is a need to control redundancy. Physicists already have a solution for such problems: when they define a basic concept or dimension, a process of its measurement is part of the definition. In psychology, psychometricians have followed this method while behaviorists have attempted to overcome 'word magic' via carefully operationalizing their concepts. The cognitive sciences also offer firm ground for defining basic terms. The problems of fuzzy and ever changing concepts cannot be solved completely, but they require continuous attention. Developments of achieving consensus in the usage of terms can be stabilized by synthetic reviews, encyclopedic collections and dictionaries. Eysenck's (1990) work on a closely related field may be an example for such efforts.

Taxonomy: Mapping the mind

What are we going to change when we teach thinking or develop students' cognitive abilities? There are almost as many answers to this question as there are different theoretical frameworks. Based on the Piagetian, factor-analytic or

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more recent cognitive studies, there are a large number of lists, taxonomies, systems or models of thinking skills, cognitive abilities and other similar constructs. However, even if there are empirically underpinned structures available, like Carroll's factor analytic model, they require further interpretation (see, for example, Spearritt (1996) on Carroll's work) and empirical research if we are to attempt to apply them in educational contexts. Among others, the educational or practical relevance of the identified skills or abilities should also be examined. For example, inductive and deductive reasoning are often analysed in parallel in theoretical models or in cognitive studies, but their importance in real-life cognitive processes seems different. Research into teaching thinking has to involve systematic mapping of the mind in educational contexts. Demetriou's and Efklides' (1994) research into the structure of the mind is an example of how this can be done.

Development and modifiability

Describing static structures would scarcely be useful for educational applications. If researchers intend to devise programmes to stimulate development, we have to know how development takes place without the special stimulating processes: not only the structures but also their development should be described. Figures of developmental trends or exact developmental curves of the target skills or abilities would be of great help to programme developers. These developmental curves serve as base lines or points of references for intervention studies. " ... one needs evidence that a change in children's development has been achieved. For this there must also exist normative data against which the effect can be shown ..." as Shayer (1992, p. 108) put it. Systematic and comparable measurements of developmental trends in basic skills or abilities provide firm ground to estimate at what age, and how, interventions would result in the best effects (for example, for the development of inductive reasoning, see Csapó, 1997a). The ultimate goal of intervention studies is to determine if development can be modified (e.g., stimulated, accelerated). To make the picture more complicated, we have to take into account that modifiability of skills is age-dependent, so intervention studies should deal with more than one age group. Therefore, it is the modifiability of thinking skills that intervention studies examine (or should examine) and a systematic description of their modifiability would be one of the best ways to integrate research results.

Methodological standards

In the past decade the methodology of intervention studies has developed a great deal (Hager, this volume). For example, because publishing effects sizes has become standard practice, results are comparable and the synthesis of results is easier. However, if we want to compare and integrate the results into a larger

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picture, there are still a number of problems in finding standards. For example, 'doses', or units of treatment in the interventions, type and length of training sessions, and length of the whole training have to be taken into account when the results of intervention studies are compared. One of the main difficulties of doing meta-analysis studies is the lack of standards or measures of experimental treatments (Goossens, 1992).

Human thinking is one of the most complex phenomena researchers have ever studied and stimulating its development is the most ambitious goal of education. Describing the structure of thinking skills, their interdependence, their relevance, their development and their modifiability as a function of age is the major aim of research. In the near future, the success of research in this field will depend largely on how the complexity of problems is managed and whether researchers find ways of coordinating their efforts. The chapters of this book show that it is necessary, it is possible, and also that there is still much to be done.

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