Learning-to-learn strategies as a basis for effective lifelong learning

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Learning-to-learn skills are essential for effective lifelong learning to develop over the entire lifespan. These skills, which consist of cognitive and metacognitive learning strategies, largely have been neglected in analyses of issues surrounding lifelong learning and in policy development. This article draws particularly upon the work of Weinstein, Meyer, Schraw and other cognitive psychologists to outline some of the knowledge and skills required and some of the educational implications for their development from a human developmental psychology perspective. Much of the initial work in establishing these skills needs to lie with schools for reasons of access and equity. However, since mastery of cognitive and metacognitive skills is not likely to be fully achieved by the end of secondary schooling, with metacognitive skills in particular only likely to reach fuller development through work experience, there are important implications for educators at further and higher education levels.

Introduction

Lifelong learning has emerged as of considerable interest as an international movement. If anything it has become the catch-cry of the new millenium. Politicians and educators alike have seized upon this concept. As Bagnall (2000: 20) has stated: ‘It is now featured in practically every imaginable agenda for social change, educational policy preamble and mission statement’. Lifelong learning was first really seriously considered during the late sixties–early seventies (e.g. see Faure 1972, Husen 1974). It was seen then, as now, as a means of overcoming the problems being faced in an age of uncertainty where the two seeming constants are continuing change and growth in bodies of knowledge.

There are substantial reasons for the resurgence of interest in lifelong learning. Over the past two decades industrially advanced societies have been subjected to three pervasive revolutions, technological, economic and social in nature. The advent of computerization and a range of information technologies have resulted in enormous technological change. So great are the changes that it has been claimed, with reasonable justification, that the natures of work, skill and knowledge have changed as a result of these information technologies to be more cognitively demanding (Zuboff 1988). In turn, the technological revolution has been accompanied by an economic revolution as the new technologies have

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superseded existing equipment, manufacturing processes and methods of industrial organization. The globalization of world trade has further increased economic competition with the adoption of advanced production processes by many of what were once patronizingly referred to as third world countries. As a result of the technological and economic changes, there have been concomitant major social changes as well, as some occupations have been rendered obsolete and a whole raft of new enterprises and sources of wealth, power and status have emerged (Drucker 1994).

Knowledge has been closely linked to effective economic production and the maintenance of a society’s prosperity (Cullen 1997), with there being substantial evidence that those with higher levels of skill and knowledge are less likely to be unemployed and more likely to gain a higher income. It is being increasingly accepted that we have entered an information era or a knowledge society (e.g. see Drucker 1994). Only by continued learning through the lifespan will it be possible to maintain knowledge and skill currency (Candy et al. 1994).

This is made more difficult because of continuing changes in technology and the volumes of new information generated through the Internet and other information technologies. What is now required in the knowledge society, more than in previous eras, is the ability to learn more quickly to cope with the increased volume of information and to process information more effectively.

Governments have a clear and vested interest in developing lifelong learning policies to ensure that there is maintenance of an economic, competitive edge in a global economy. However, there are substantial social benefits to be gained by individuals in the maintaining knowledge through the lifespan (Cornford 1999a, 2000). Apart from the ability to maintain continuous employment there is a need to keep abreast of the considerable changes to taxation laws, superannuation regulations, and welfare entitlements. The need to maintain current knowledge about these things illustrates only too well the importance of individuals of all ages maintaining knowledge currency for personal benefit throughout their lives.

\textbf{Learning-to-learn skills as foundational elements}

Lifelong learning is first and foremost about learning, with this learning occurring over the lifespan. In effect ‘learning’ is the noun and ‘lifelong’ is the adjective describing the type of learning taking place. Thus the position taken in this article is that effective learning through the lifespan is dependent upon effective information processing and the possession and quality of basic learning-to-learn skills and knowledge centred upon cognitive and metacognitive skills (Cornford 1999a, 2000). Without the establishment of such skills learning may not occur, or more realistically will occur with more effort and less effectively than if individuals have a good repertoire of the most effective skills and make use of them.

These essential, skill-based aspects of lifelong learning have been largely neglected in the enthusiastic discussion of lifelong learning or given less than due consideration of their foundational importance for policy development. For example, analysis of the contents of the \textit{International Journal of Lifelong Education}, which has provided an extensive coverage of issues connected with lifelong learning over the past decade, has revealed no article analysing the importance of learning-to-learn skills as a foundation for effective lifelong learning. Even in
Knapper and Cropley’s (2000) excellent book on lifelong learning in higher education, now in its third edition, only a few pages are devoted to learning-to-learn skills. This despite their recognition of the need to give more attention to learning processes and the challenges that lie in more appropriately implementing the ideal of lifelong learning.

Cognitive and metacognitive learning strategies are not to be confused with the older study skills approach, or more general techniques and approaches likely to facilitate lifelong learning. Research has demonstrated that the older study skills approach is not always particularly effective (Biggs 1988, Hattie et al. 1996) although it is better than no specific approach at all to improve learning (Hattie et al. 1996). The more general methods of teaching and presentation which can facilitate lifelong learning generally (e.g. see Knapper and Cropley 2000, Chapter 5) are also different to the teaching and use of cognitive and metacognitive strategies. At certain points there will be overlap between the more general approaches advocated by Knapper and Cropley and study skills, but in essence cognitive and metacognitive skills focus upon the actual, basic learning processes used and controlled by the individual learner. This explains in part why cognitive and metacognitive learning strategies are often referred to more generally as learning-to-learn skills.

**Distinction between cognitive and metacognitive learning strategies**

Cognitive and metacognitive strategies and skills are closely related in terms of them both involving cognition and skill but they are conceptually quite distinct in at least one other major way. Weinstein and Meyer (1991: 17) state that ‘A cognitive learning strategy is a plan for orchestrating cognitive resources, such as attention and long-term memory to help reach a learning goal’. They indicate that there are several characteristics of cognitive learning strategies including that they are goal-directed, intentionally invoked, effortful and are not universally applicable, but situation specific. Metacognitive strategies appear to share most of these characteristics with the exception of the last one since they involve more universal application through focus upon planning for implementation, monitoring and evaluation (Schraw 1998). That is to say, metacognitive strategies are not so situation specific but involve generic skills essential for adult, more sophisticated forms of thinking and problem solving.

Both cognitive learning strategies and metacognitive strategies involve skill, will and self-regulation (Weinstein and Meyer 1994). There is skill learning involved, which implies relatively complex learning developed over long periods of time (Cornford 1996). Although Weinstein and Meyer (1991, 1994) do not draw upon it explicitly, Fitts’ (1968) skill learning theory helps explain what occurs during the skill learning process, and also offers additional insights into the self-regulation aspects. Fitts’ theory indicates that there are cognitive, practice-fixation and autonomous phases. In the cognitive phase a conception of the overall skill is gained, there is recognition of different steps or parts to the skill, the order in which these occur and the time relationships of the different elements. At this phase, elementary standards of performance are also gained, albeit in fairly crude terms such as good and bad, right and wrong (Cornford 1999b).
During the practice–fixation period the skill becomes firmly established in long-term memory through practice and feedback. Also at this phase there is increasing efficient performance in terms of speed and accuracy and further refinement of understanding of skill elements and standards of excellence (Cornford 1996). The autonomous phase is characterized by individuals monitoring their own performance against an established model stored in long-term memory with the skill appearing to be performed automatically. At this phase the conscious short term or working memory is freed-up so that other issues can be concentrated upon, possible problems anticipated and plans for problem solving developed if necessary (Cornford 1999b).

Particularly important at the autonomous phase are elements of self-regulation as individuals monitor and correct their own performance. This contrasts with the practice–fixation phase where there is much greater reliance upon others to assist in doing these things. Substantial elements of will are involved in terms of motivation to perform skills, maintain standards of performance (Cornford 1996), and engage in the relatively demanding metacognitive processes of planning, monitoring and evaluating these. Self-regulation and self-direction via motivation are especially important with all cognitive skills and mental processes since these are largely invisible to others in day-to-day functioning unless the individual chooses to make them explicit. This means that the opportunities for feedback and correction of skills from significant others is less likely with these than with ordinary physical skills where the end product and the processes involved in production of the performance are more easily perceived.

Types of knowledge and skills involved

Weinstein and Meyer (1991) indicate that there are a number of different types of knowledge and skills that must be developed for more effective cognitive and metacognitive strategy employment by individual learners. These include students’ knowledge about themselves as learners; students’ knowledge about course context and learning tasks; and students’ knowledge about what learning strategies to select and use. These are complex sets of knowledge and appear to be related to cognitive development over certain periods of the life-span, particularly adolescence, and the ability to use more complex and abstract concepts (Schraw 1998). Effective use is also dependent upon considerable self-discipline (Zimmerman 1989). For example, self-knowledge is dependent upon the individual possessing the ability to be objective and experiment with self-regulation. Hence the degrees of self-knowledge that can be expected of younger children, who tend to be egocentric, will be restricted. Adults lacking abilities in self-discrimination and objective self-judgment will also not develop these skills to an optimal level.

In effect there are limits to the extent and types of self-knowledge that can be acquired through direct instruction. Knowledge about sources of motivation and to some extent awareness of personal characteristics may be learned through these being directly identified. However, many aspects of self-knowledge would in fact be impossible to teach directly as they can only originate through self-experiences and a willingness to be relatively brutal in self-judgment. For example, knowledge of preferred approaches to learning and best times for study
when the individual is most receptive and alert can only come from self-learning involving personal judgements. Be that as it may be, good teachers can do as they have always done, organize learning situations so that individuals are forced to consider their own personal strengths and weaknesses, reflect on these, and learn from these experiences.

Reflection is certainly necessary in these processes as part of the learning-about-self process, but in itself is not sufficient because particularly early in the learning processes self-judgments are often not very accurate and more objective external sources of feedback are required. Situated cognition theory, for example, emphasizes the importance of learning from others in groups (Brown et al. 1989). Furthermore, mentoring and similar socially-based strategies are increasingly being recognized as important in facilitating truly effective learning and changes in behaviour through objective feedback and increased self-knowledge.

Students’ knowledge about course context and learning tasks and students’ knowledge about what learning strategies to select and use appear to lend themselves more to direct teaching, although this does not always appear to be done in traditional teaching practice (see below). As with student knowledge about themselves as learners, these elements still involve substantial skill development over periods of time. These are the kinds of skills that should be taught explicitly in the process of formal schooling for preference (see below) or post-compulsory instruction. Weinstein and Meyer (1994: 3337) argue that ‘Delivering content without instruction in how to learn the material is like giving somebody a state-of-the art personal computing system without any instructions on how to assemble and use it. Effective instruction includes assuming responsibility for helping students learn how to learn the course material…’

Earlier research (e.g., Chi et al. 1989) revealed that students varied in their knowledge of skills and their ability to use cognitive and metacognitive skills successfully. More recent research has indicated that even university students in computing, an area currently attracting some of the best and most capable students, do not necessarily know the best ways to think, process information and engage in problem solving involving learning processes (Bielaczyc et al. 1995). Further, it has been demonstrated that the deliberate teaching of certain cognitive and metacognitive strategies can result in superior learning when students actually do consciously apply these (Bielaczyc et al. 1995, Weinstein and Meyer 1994). The revolution in cognitive psychology over the past 20 years has demonstrated that it is an unwarranted assumption that learners automatically know how best to learn. The most sensible approach is not to assume the automatic development of learning skills but to teach them quite explicitly.

**Some examples of basic cognitive learning strategies**

There are numbers of different cognitive learning strategies, relating to mnemonics and self-instruction to assist in more effective processing and use of information, that can be taught quite easily to learners of just about any age beyond the very early years. The more sophisticated strategies generally require mastery of the more basic ones for effective processing and storage of information in memory and degrees of facility in the use of language through self-talk. The most fundamental strategies, and most easily taught, relating to knowledge acquisition,
storage and recall will be outlined briefly here. Although these don't necessarily involve very sophisticated operations upon content stored in memory, they are essential foundations, since no information can be utilized in permanent, long-term memory unless it has been effectively stored there in the first place. The three strategies essential for initial learning are repetition, elaboration and organization strategies (Weinstein and Mayer 1986, 1991).

Storage of information into permanent long-term memory in most common forms of learning requires repetition. This is the most basic and fundamental of learning processes and can be observed frequently in young children as they repeat names of letters in the alphabet, numbers or even actions to remember them. More complex approaches in this repetition category can involve using highlighting pens to highlight class notes, or sections of journal articles, and copying down key ideas when preparing to write an assignment or formal piece of writing. Elaboration strategies serve the important purpose of building bridges between what we already know and have stored away in long term memory and new information that we decide is important to remember. Successful learning appears always to involve new information being related to previously stored information. New information needs to be built upon, and related to previous learning. By relating new ideas to existing ones in memory we seem to actively seek to understand more comprehensively and to anchor the new ideas. Examples of elaboration strategies commonly used would include thinking of other, everyday examples of a rule or principle, paraphrasing and summarizing something read into your own words. More sophisticated elaboration approaches would involve the creation of analogies, similes or even metaphors.

Organization strategies require the transformation of information into a different form and the development of some schematic system that establishes the relationships between parts or elements. This would appear to lead to deeper levels of understanding, particularly with relationships where the establishment of ideas of sameness or difference can often be important, particularly in how we store information away into long term memory. The process of drawing mind maps to ensure all elements are being recognized and related in appropriate, logical ways is a good example of how elaboration can facilitate learning. What this process of mind mapping also frequently does is to overcome the built-in limitations of short term or working memory, which is our conscious memory, with this particular form of memory generally only able to hold approximately seven units of information for about 20 seconds.

Teachers and current teaching of cognitive and metacognitive skills

The importance of cognitive and metacognitive skills in effective learning and performance has been recognized for some time (see Weinstein and Mayer 1986, Sternberg 1998). Indeed the metacognitive skills of planning, monitoring and evaluation constitute the essence of skilled professional performance in the adult world of work. But there is still little evidence that cognitive and metacognitive skills per se are being taught widely or effectively at all levels of schooling or beyond. One of the problems generally facing educators is that these types of skills are relatively invisible, that is to say they are internal and private and only
visible when someone who is using them deliberately explains the processes engaged in. Schraw (1998) and others argue that few teachers make their thinking opaque and real and demonstrate these skills to students in their classes.

Although many teachers would claim that they do teach cognitive and metacognitive skills, and do so effectively, recent research has tended to confirm the findings of earlier research that in reality little explicit teaching and fostering of these specific skills occur. Hamman et al. (2000) recently examined teachers’ coaching of learning and the relationship to students’ strategic learning in middle school, American grades 6, 7, and 8, using a sample of 11 teachers and 235 students. Middle school is a particularly important period when adolescent thinking is changing substantially to permit more sophisticated abstract reasoning and analysis of thinking processes. Hamman et al. found that most of the time (60%) was spent by teachers in communicating task-related information (i.e. directing) while the least amount of time, only 9%, was directed to coaching. Additional analyses by these researchers revealed that there were no interactions or changes with for grade level or subject taught. These finding closely parallel the earlier finding for elementary school teaching by Moely et al. (1992) also in the American context.

While these findings from a mere handful of American research studies should be treated with some caution, they probably reflect the generally low levels of teaching of cognitive and metacognitive strategies more generally. For example, research in Australia in the post-compulsory and vocational sectors to determine the levels of awareness appears to indicate that there are very few teachers in further education who employ teaching strategies which are congruent with the development of lifelong learning skills (Kearns et al. 1999). There is good reason to believe that those who have entered further, non-university-based education, are more in need of explicit teaching of effective cognitive and metacognitive strategies than those who generally have benefited most from school education and hence gone on to university (Cornford 1999a, 2000). The further education sector is also the one in which probably the most technical change is experienced and the one in which there is the most need for continual updating of skills and knowledge because of this type of change. Candy et al.’s report (1994) on the need to develop lifelong learning skills in university undergraduates in Australia also did not find that there was much evidence of teaching to facilitate lifelong learning in the university sector, a point reinforced by a more recent article by Candy (2000).

Despite the rather dismal picture painted of current use of methods to facilitate lifelong learning through specific teaching of cognitive and metacognitive strategies, there is reason to be more optimistic. Greater knowledge derived from research on the efficacy of learning-to-learn strategies (e.g. Biggs 1988, Hattie et al. 1996), more materials on the use of different strategies (Schraw 1998, Weinstein and Meyer 1991, 1994) and the re-conceptualization of approaches to teaching cognitive and metacognitive skills (see Sternberg 1998, 1999, Cornford 1999a, 2000) are contributing to a set of related approaches which have the potential to ensure that these skills can be taught more effectively. In practical terms, the basis for effective teaching of cognitive and metacognitive skills has been established by the work of Weinstein and Meyer (1991, 1994) and Schraw (1998). Apart from the need for major curriculum revision to support their teaching (see below), the chief obstacle may remain the lack of understanding of
the importance of learning-to-learn skills by teachers at various educational levels. In very few instances have teachers or lecturers themselves been formally instructed in cognitive and metacognitive strategy use in initial teacher education courses. As a result of lack of formal instruction, not only do teachers not understand their importance, but it is probable that the teaching of cognitive and metacognitive skills may pose a threat to many classroom teachers who feel uncertain of their abilities to teach them.

Levels of achievement and access and equity issues

The terminology ‘lifelong learning’ suggests that learning occurs over the entire human lifespan and from a human developmental psychology perspective this is undoubtedly true. From this developmental perspective it is also probable that there are some key periods of learning when certain skills like reading and writing need to be mastered earlier in the lifecycle so that they can be put to good effect later on, as for example in learning skills for work and occupations. It is highly desirable, but probably unrealistic, to expect that all students leave the secondary school system in possession of high levels of cognitive and metacognitive skills (Cornford and Peak 1997). Possession of these skills operating to levels of autonamisticity in Fitts’ (1968) terms would appear to provide certain advantages for those learning the skills and knowledge for performance in chosen occupations.

Occupational training after compulsory initial schooling is very individual and occurs in many different settings both formal and informal which reflect different standards. Further, there is considerable evidence that the learning experiences of apprentices within the same trade area can be very diverse and indeed workplace learning can be unsatisfactory, for example in an area like commercial cookery in the hospitality industry (Cornford and Gunn 1998). For reasons of access and equity there are good reasons to consider that cognitive and metacognitive skills teaching and learning should be concentrated upon in the compulsory schooling period (Cornford 1999a, 2000). This is because such education is compulsory and through prescribed curricula it would be possible to ensure that all students were exposed to the teaching of these skills. There is still the issue that, because of the nature of individual differences and abilities, individual students would still leave school with different levels of proficiency or mastery of the skills they may have been exposed to through teaching. Whatever level of cognitive and metacognitive skill learning is achieved during the compulsory schooling years, this will need to be built upon further in later, more occupationally focused learning. In fact Sternberg (1998) has argued that fuller development of metacognitive skills, which involve planning, monitoring and evaluation, is only likely under the stimulus of work experience. The alternative approach, of focus on development of cognitive and metacognitive skill development during post-compulsory education experiences, is to build in inequality. Inequality will result because of the differences of the learning-teaching experiences and lack of access of all to the same occupational training.

While compulsory schooling of necessity may be the best period of education in which to acquire learning-to-learn skills, there still will remain a major role for those involved in post-compulsory education, whether it be further or higher education. From a human developmental psychology perspective, which acknowledges the
nature of individual differences and different rates of learning, it is to be expected that, as with more general learning, students will leave high school with individually different repertoires of cognitive and metacognitive skills. Teachers at further and higher education levels need to sustain and further develop cognitive and metacognitive skills previously acquired, compensate for earlier inadequate acquisition of elements of these skills, and teach specialist, occupationally-oriented content knowledge in the most effective ways. The way in which specialist occupational knowledge is taught can have a significant impact on not just the effectiveness of learning but the likelihood of application or transfer to real world settings.

Curriculum approaches

Weinstein and Meyer (1994) indicate that there are two distinct approaches to teaching cognitive and metacognitive skills—the adjunct and the metacurricular approaches. The adjunct approach involves the teaching of such skills as an add-on or separate subject. There is good reason to believe that this is not the most effective approach as transfer of learning is less likely to be achieved via this curricular approach. Much of the situated cognition research indicates the need for the contextualization of knowledge for effective learning to occur (Brown et al. 1989). The metacurricular approach, which involves the teaching of appropriate cognitive and metacognitive strategies along with normal subject content, is likely to both facilitate the learning of the content and the application of these skills so gained more broadly. This broader transfer is likely to occur when skills have been effectively learned and applied in one specific context, and can be seen by the individual learner to result in more effective learning in terms of the amount learned, recalled, and applied (see Carrell 1998).

Cornford (1999a) has suggested that especially with more experienced learners there may be a third approach that draws upon both adjunct and metacurricular approaches at quite specific points in the learning process. This would involve generally metacurricular teaching but also the use of adjunct teaching to make explicit and overt the cognitive and metacognitive strategies which had been taught but embedded in subject content. This could occur at certain selected points in the formal schooling/learning process, and has the advantage of embodying good teaching practice through revision to further assist comprehension. What this explicit, additional adjunct teaching might do is serve the purpose of ensuring that learners are very consciously aware of cognitive and metacognitive strategies and their effective usage. This would thus encourage high road transfer, which Salomon and Perkins (1989) considered so important in ensuring effective further application and transfer of learning.

The role of teachers at compulsory and post-compulsory levels

There remain significant challenges for teachers at both compulsory and post-compulsory education levels in the teaching of cognitive and metacognitive learning strategies. There is need for teachers to understand and possess the
knowledge and skills themselves and be able to teach these to others along with specialist content knowledge. Available evidence suggest that at least in the Australian context that there is little teaching of this kind done at university or further education levels (Candy et al. 1994, Kearns et al. 1999). Since these skills have rarely been taught explicitly in the past there is a need to ensure that beginning teachers are thoroughly prepared to teach cognitive and metacognitive strategies and there will also be a need for considerable in-service and professional development of teachers at further and higher education levels. As Knapper and Cropley (2000: 192) indicate, there is already a considerable problem in ensuring that lecturers at university acquire and value appropriate teaching skills since the focus remains upon research. In countries like Australia, where workplace learning has become a part of the occupational training agenda, there will also be a need to ensure that trainers and teachers in industry can assist the people whom they teach to learn and remember what they have been taught more effectively.

The major challenge will lie in changing curricula and teachers’ attitudes to incorporate the teaching of learning-to-learn strategies along with content knowledge and shift from the almost exclusive focus upon content knowledge. Such a change of attitude and practice will have major implications for the amount of content that can be taught in the earlier years of any course prior to the effective mastery of the cognitive and metacognitive strategies. Reduction in the amount of subject matter content will be necessary to ensure that the learning-to-learn skills are well practised and through practise, mastered. There is good reason to believe that too much information provided can result in only superficial learning (Ramsden and Entwistle 1981). However, once more effective learning strategies have been mastered, then it would be anticipated that more content can be covered and learned effectively with this compensating for the lesser amount of content taught in the earlier stages.

More generally, there will be a need for all teachers to become more aware of the overall development of cognitive and metacognitive skills and how what they are teaching fits into an overall continuum of these skills over a longer perspective. In effect this will probably mean that individual teachers and trainers must become more aware of individual differences in their learners’ knowledge and skill repertoires. It will also mean that they need to become much more conversant with the identification of knowledge and skill abilities and being able to diagnose deficiencies in basic skills. Over the last several years a wider range of specialist tests has been developed in relation to learning to-learn strategies. Many of these tests have the potential to assist teachers in making diagnoses about the learning of individuals and also to provide feedback to individuals on their readiness for different types of learning activities. De La Harpe and Radloff (2000) have recently considered issues surrounding the measurement of lifelong learning and considered how assessment can contribute to learning, teaching and assessment practices for lifelong learning.

**Conclusion**

Recognition of the importance of cognitive and metacognitive strategies holds the seeds for an educational revolution which would involve the explicit teaching of
specific learning skills along with subject content. While it is easy to summarize concisely what is involved in this way, the actual impact upon actual practices would be far reaching if not revolutionary. First, there is the need to ensure teachers and trainers at all levels of education possess the knowledge and skills to teach these strategies. Second, there is the need to change curricula to reflect the teaching both of content and these skills and their underpinning knowledge rather than the still prevailing approach focused almost exclusively upon content knowledge. Both of these challenges are substantial and should not be underestimated given that it is not generally accepted in higher education that student learning is as important as research by lecturers (Knapper and Cropley 2000). However, if we are serious about achieving the ideal of lifelong learning, we must address the challenges involving process issues of learning as identified by Knapper and Cropley (2000). After all, possession of effective learning-to-learn skills is an important prerequisite for effective lifelong learning to occur.

References


