Paper Presented at the AARE Annual Conference, Melbourne, 2004
Australian Association for Research in Education

COR04942

Cognitive and Metacognitive Strategies as a Basis for Effective Lifelong Learning: How Far Have We Progressed?

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Abstract: Cognitive and metacognitive strategies appear truly generic skills through their ability to foster effective learning in an era where the two constants are continuing change and growth in bodies of knowledge. Yet the literature on lifelong learning has rarely acknowledged the importance of these skills as a vital foundation in a less than surface way, while policy at Australian federal government level seems generally to be rooted in superficial rhetoric. Interestingly, however, more serious attention has been given to effective learning strategies in earlier Vocational Education and Training (VET) documents, probably because VET attracts many less academically able students. After briefly outlining the importance of cognitive and metacognitive strategies as a basis for effective lifelong learning, this paper examines the changes that have occurred concerning adoption of cognitive and metacognitive skills as a basis for effective lifelong learning at school and post-compulsory education levels over approximately the last seven years. It is concluded that, while there is evidence of the effectiveness of the teaching of learning-to-learn approaches, policy makers in Australia appear to have little real understanding of the needs for effective policy and do not recognise curriculum and teaching revolutions that need to occur for the ideal of effective lifelong learning to be realised.

Introduction

Perhaps unsurprisingly in an era of great change, lifelong learning has emerged as of considerable interest, as an international movement and the educational catch-cry of the new millennium. As Bagnall (2000, p.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 (eg see Faure 1972, Husen 1974), and was seen then as a means of overcoming the problems being faced in an age of uncertainty where the two seeming constants were continuing change and growth in bodies of knowledge. Over the past two decades industrially advanced societies have been subjected to three pervasive revolutions, technological, economic and social in nature, hence the need for lifelong learning has intensified rather than diminished. Coinciding with the resurgence of interest in lifelong learning has been the development of interest in generic skills (eg see Kearns, 2001). These have influenced policy thinking in the areas of education and employment in Australia since the early 1990s, for example in the form of the Mayer Key Competencies, because it has been assumed that teaching generic skills will enable individuals to adapt to changed work and learning circumstances (Kearns, 2001).

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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 (Watson, 2003). While the arguments that we have entered an information era and/or become a knowledge society (eg Drucker 1994) have been challenged, on the grounds that empirical evidence does not support much of the optimistic rhetoric (Lloyd & Payne, 2003), there is substantial evidence that the nature of work and knowledge has changes into a more cognitively demanding kind since the wide application of computer technology (Cornford, 1998). There is also considerable, demonstrable evidence that the pace of technological change has not slowed and changes to legislation relating to social benefits, etc are ongoing. Only by continued learning through the lifespan will it be possible to maintain knowledge and skill currency (Candy, Crebert and O'Leary 1994). What is now required are skills to cope with the increased volume of information and to process information more effectively. Truly effective lifelong learning has now become a necessity on both individual and societal levels.

This paper's central concern is charting the progress made in Australia and a broader context in gaining acceptance of the idea of teaching of cognitive and metacognitive strategies as generic skills for effective lifelong learning. In essence effective policy development and consequent curriculum change and changes in teacher education are linked to this wider acceptance. Before charting the issues related to acceptance, it is necessary to very briefly overview what is involved in cognitive and metacognitive strategies and, specifically, their relationship to lifelong learning.

Learning-to-learn Skills as Foundational Elements in Lifelong Learning

The lifelong learning literature is multidimensional in nature and characterised by confusion and many conflicting ideals in terms of both desired ends for lifelong learning and the analyses of what is involved in achieving these. Bagnall (2000) and Aspin and Chapman (2000) have provided the best analyses of the competing ideals to date. From their analyses it becomes apparent that the underlying factor is essentially that of learning, with this learning then being directed towards the varying desired ends. In essence then lifelong learning is first and foremost about learning, with this learning occurring over the lifespan. Here 'learning' is the noun and 'lifelong' is the adjective that describes the type of learning taking place. From a cognitive psychology perspective 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 1999, 2000). Recently Edwards, Ranson and Strain (2002) have specifically identified metacognition as an important element in the development of a theory of lifelong learning. Without the explicit teaching of cognitive and metacognitive skills, learning may not occur, or 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 (Bielaczyc, Pirolli & Brown 1995).

Learning-to-learn skills involve cognitive and metacognitive skills. 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

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way. Weinstein and Meyer (1991, p.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 truly generic skills essential for adult, more sophisticated forms of thinking and problem solving.

Not withstanding the fact that cognitive skills are more context specific, that is one strategy is not often universally applicable, proper teaching of them involves developing knowledge in students about themselves as learners, knowledge about course context and learning tasks, and knowledge about what strategies to select and use. The last category would also include information about repetition for retention, elaboration to more strongly secure knowledge in long term memory and make information personally meaningful, as well as organization strategies to establish relationships, etc. (Weinstein & Meyer, 1991) These elements are generally applicable or generic in effective learning, although different sub-strategies may not have universal application (see Weinstein & Meyer, 1991). Specific teaching for transfer of these strategies within the one subject area and to other subjects will further alert students to a range of generic skills provided the nature of transfer is made explicit (see Cornford, 2000). Apart from this, the teaching of the principles of the development of personally meaningful mnemonics to aid learning and retention (Cornford, 2002), will further create generic skills of wide application.

Both cognitive learning strategies and metacognitive strategies involve skill, will and self-regulation (Weinstein and Meyer 1994). Where skill learning is involved there is relatively complex learning developed over long periods of time. The explicit teaching of the Fitts' stages in skill learning (Cornford, 1996) and how these operate, will provide further grounding in generic skills. So too would the explicit teaching of the information processing model which establishes the limitations of short-term/working memory and what must be done via coding and rehearsal, and chunking to ensure effective long term memory storage. Additionally with cognitive and metacognitive skills, there is good reason to conceive of the learning of both sets of skills occurring at the same time but that later instruction may elucidate the much wider and truly generic nature of the planning, monitoring and evaluation elements.

Earlier research by Chi, Bassok, Lewis, Reimann and Glaser (1989) revealed that students varied in their knowledge of and their ability to use cognitive and metacognitive skills successfully. More recent research has indicated that even university students in computing, an area that at the time the research was conducted was 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). There exists a very considerable body of research from the 1980s onwards that demonstrates that possession and usage of these skills

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result in superior learning generally (eg, see Weinstein & Mayer, 1986) with meta-analyses of research findings like that of Haller, Child and Walberg (1988) strongly supporting the effectiveness of metacognitive instruction. Review of these studies is beyond the scope of this paper but research into cognitive and metacognitive learning strategies continues to feature strongly in educational journals devoted to publication of empirical education research such as the *Journal of Educational Psychology*. For a recent article see Thielde, Anderson and Therrialt (2003).

Desirable and Achievable Outcomes from a Cognitive Psychology Perspective

Teaching cognitive and metacognitive skills is aimed at making learners expert students (Sternberg, 1998) and there is good reason to believe that possession of a sophisticated set of cognitive and metacognitive skills eventually will place control of learning with the learner. However, in all of this, the essential elements in learning cognitive and metacognitive skills involve skill, will and self-regulation (Weinstein & Meyer, 1994). Skill may be taught directly but certainly the issues of will, that is definite self-motivation, and self-regulation can only really be acquired through the individuals learning about themselves and their abilities and assuming responsibility for what they engage in and achieve (Cornford, 2002). Of necessity, with normal learners, teaching for self-regulation starts with the child/adolescent/adult's abilities and their stage of development and can be progressively developed through social influences, direct teaching and modelling as well as experimentation by the learners (Schunk & Zimmerman, 1997). What will also be involved will be general progression from more limited, specific cognitive skills, to the far more abstract and generic metacognitive skills of planning, monitoring and evaluating (Schraw, 1998) that require greater ability in abstract reasoning.

The teaching of a variety of skills will provide learners with a choice of learning for occupations and adult life, with these necessitating the ability to think critically, to solve problems and to understand what they are doing and why, rather than having them adopt the one approach that they initially at least feel most comfortable with. If they cannot understand what they are engaged in and select appropriate strategies, there is little likelihood of truly critical thinking or effective problem solving with the best that could be expected intuitive or concrete thinking in terms of Piaget's stages of development. These forms of thinking are not sufficient for survival in competitive workplaces in adult life for individuals in the normal range of abilities. While, of necessity, the starting point for teaching and development will be the individual's preferred learning style, the continual fostering of a preferred learning style will lead to learners' dependence upon that style, thus mental set, one of the most frustrating of issues facing learners and teachers, which restricts development beyond their current understandings of the world (Hyman, 2002). Furthermore, the fostering of effective, additional and specifically taught cognitive and metacognitive skills will in no way have detrimental effects upon individual differences or special abilities. In fact they have the potential to enhance these in terms of Gardner's (1999) theory of multiple intelligences, since special abilities must be developed through more sophisticated thinking and learning. Indeed Weinstein and Meyer (1991) specifically recognise the need to develop recognition of personal strengths and weaknesses as part of the fostering of a repertoire of effective skills.

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By providing the individual with the skills for effective learning beyond specific subject content, and by making students explicitly aware of the skills and of their own learning abilities, the teacher will have prepared the individual for effective lifelong learning. More detailed accounts of how to foster cognitive and metacognitive skills through classroom teaching are to be found in the seminal works by Weinstein and Meyer (1991, 1994) and Schraw (1998) as well as numerous studies into specialist applications in reading, writing and mathematics (eg Thielde et al, 2003).

Distinction Between Cognitive and Metacognitive Skills, and Study Skills and Related Approaches

Cognitive and metacognitive learning strategies should 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, Biggs & Purdie 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 that have come to be seen as capable of facilitating lifelong learning generally (eg, see Knapper and Cropley 2000, Chapter 5) are also different to the specific teaching of and use of cognitive and metacognitive strategies along with subject content (Weinstein & Meyer, 1994). There will be overlap with the more general approaches advocated by Knapper and Cropley and study skills proponents, but in essence cognitive and metacognitive skills focus upon the actual, basic skill learning processes used and controlled by the individual learner. This is why cognitive and metacognitive learning strategies are often referred to more generally as learning-to-learn skills. When made explicit, they move beyond process potentially to a learned skill capacity that can be retained for life.

Earlier Neglect of Cognitive and Metacognitive Skills in the Lifelong Learning Literature

Cognitive and metacognitive skills 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 *International Journal of Lifelong Education*, which has provided an extensive coverage of issues connected with lifelong learning over the past decade, revealed no article analysing the importance of learning-to-learn skills as a foundation for effective lifelong learning before the publication of Cornford's article on these issues (Cornford, 2002, p.358). Slightly more recently Edwards et al (2002), in another article published in that same journal, have acknowledged that metacognition will need to be an important element in a theory of lifelong learning. However, 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. In other otherwise commendable books on the need for lifelong learning that give serious consideration to wider schooling and curriculum reform issues (eg Chapman & Aspin, 1997), the role of cognitive and metacognitive strategies in effective lifelong learning is ignored. This is despite general 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.

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In the Australian context, despite the enthusiasm for and acknowledgement of the need for effective learning in Candy et al.'s (1994) highly influential (at least in university education circles) *Developing Lifelong Learners Through Undergraduate Education*, there is little attention given in this report specifically to cognitive or metacognitive learning strategies.

Vocational Education and Related Policy Literature

Vocational education is the area that has probably experienced the greatest changes over the past fifteen years because advances in technology necessitate changes to knowledge, skills and attitudes, as well as work organization practices. The workforce became the focus of major efforts at multiskilling and upskilling, that is increasing the standards, variety and levels of skills in the workforce and through this productivity, from the late 1980s. This occurred as the full impact of the technological revolution was felt along with concomitant effects of increased unemployment and balance of payment problems. In essence it was considered that only through increased learning in the workplace would it be possible to increase Australia's international competitiveness. This is not to say that the schooling systems in Australia did not also experience great changes also, as with VET in schools, but that the same forces were operating there too (Cornford, 1998).

For reasons of increased productivity and national competitiveness the policy and position papers released through the 1990s by government and quasi governments bodies have reference to lifelong learning with a decided practical orientation. What is especially important as a background factor here is that many people finish up in vocational education and specific types of work because they are not academically inclined and did not learn well at school (Cornford, 1999, 2000). Thus these people are probably even more in need of specific teaching of effective learning strategies. Some of the more notable reports of the mid 1990s did acknowledge at least some of the issues, if not the importance specifically of the teaching of cognitive and metacognitive strategies. For example in *Lifelong Learning – Key Issues* (National Board of Employment, Education and Training, 1996) key practical issues in the development of lifelong learning were identified including assessment, curriculum, delivery by teachers, the social dimensions of lifelong learning, access and equity, recognition of prior learning and the impact of the new technologies. Also there was recognition of the importance of reading and writing in further learning.

Another report dealing with the issues, *Learning to Learn in the Vocational Education and Training Sector* (Employment and Skills Council, 1996), revealed a more sophisticated understanding of the issues in acknowledging the range of issues that affect lifelong learning skills. Vocational education was recognised as an important avenue to motivate lifelong learning, assessment was seen as an important factor that can promote or hinder lifelong learning and schools were seen as an important avenue for providing the intellectual foundations for development. It also recognised the importance of transfer of learning and the need for a policy in which explicit teaching approaches are identified to try to ensure positive transfer of skills. A number of less commendable factors are evident including an overt political agenda and failure to acknowledge that there was a fundamental 'conflict of value between competency-based training and lifelong learning' (Employment and Skills Council, 1996, p.10).

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These two reports that have been summarised, and also others, created positive attitudes towards lifelong learning. Evidence of this is to be found on the website and in issues promoted by the Australian National Training Authority (ANTA) which represents both the states and the federal government. However, it was made abundantly clear by Michael Gallagher, officially representing the Minister for DETYA, David Kemp, at an ANTA lifelong learning promotional seminar in conjunction with the 7th Annual International Conference on Post-compulsory Education and Training at Surfers Paradise, on the Sunday evening of 5th December, 1999, that the Minister and his department did not support lifelong learning. The claim was made that the evidence from European studies indicated that it did not work. (Notes made during this seminar indicate that a promise was made to disseminate information concerning these studies supposedly 'proving' this, but this never occurred.) Implicit in comments were that any serious adoption of lifelong learning would cost money and the federal government was not going to provide that. This effectively killed initiatives to establish networks throughout Australia to promote lifelong learning that were being established prior to this seminar. It was also abundantly clear that at ministerial level there was no understanding of the connection between lifelong learning and learning-to-learn skills.

More recently, the publication of *Generic Skills for the New Economy* (Kearns, 2001) clearly indicated that more forward looking employers were concerned that Australia was decidedly out of step with the UK, Europe, and the USA in factoring lifelong learning into policy making. In Kearns' report contrasts were made between Australian, UK and American approaches, and the DeSeCo European project on lifelong learning given considerable attention. While the complexity and diversity of the approaches used in the UK and the USA were not acknowledged, and thus misrepresented, the report appeared to signify that the federal government was reluctantly being forced to acknowledge that lifelong learning was an important issue for the future of Australia and more effective learning through the lifespan. Some of the subsequent reports, relevant to the issues focused upon in this paper, from the Department of Education, Science and Training (DEST, formerly DEET and DETYA) do not advance the issues in a constructive way through serious consideration of the teaching of cognitive and metacognitive skills as a basis for effective lifelong learning. A commissioned report from Watson (2003), commendably has highlighted the need for more consideration of means to assist lower level workers. Yet it never draws upon the psychology of learning literature or engages in discussion of cognitive and metacognitive strategies in promoting more effective learning, although this was supposed to be a project reviewing omissions in research for policy purposes. In effect the scope of the review indicates that there is limited understanding of learning-to-learn skills, as a necessary foundation for involvement in effective learning through the lifespan, in Australian government research and policy making circles.

Another recent DEST report by Chapman et al. (2003) has certainly highlighted the need for a more liberal interpretation of lifelong learning beyond instrumental approaches directed solely at improvement in workplace productivity for the national interest. A series of 'snapshots' of best practice are included that tend to indicate that there are genuine efforts being made to increase awareness about lifelong learning and to implement strategies to bring about involvement in this for at least some individuals. While recognising the work that needs to be done in terms of educating

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teachers, it neglects the issues of the teaching of cognitive and metacognitive skills as a basis for effective later learning, and thus fails to grapple with the means to make lifelong learning more than policy rhetoric. The judgement made by the author in relation to both the Watson (2003) and Chapman et al. (2003) reports is that DEST did not commission reports that could have indicated the need for large-scale expenditure on teacher education, with the 2003 federal government budget ignoring to a large degree the needs of schools and universities (see Maslen, 2004). The commissioning of reports of limited scope and the exercise of editorial control are tactics seemingly frequently used by bureaucrats involved in Australian policy making.

School, University and Vocational Education: Rhetoric and Actual Teaching of Learning-to-learn Skills

Aside from the overarching policy issues, there are also important practical issues about the extent to which teachers currently are ensuring effective learning by explicitly teaching cognitive and metacognitive skills in a metacurricular way, that is teaching how to learn effectively along with the subject content (see Cornford, 1999, 2002). The importance of cognitive and metacognitive skills in effective learning and performance has been recognized for some time (Weinstein & 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 in tertiary education, at either university or college levels. Recent publication of research into the maturation of the human brain indicates that the self-regulation areas, that would appear closely related to monitoring and evaluation of the self, occur in the late teens and probably early twenties (Wallis, 2004). The implication of this research is that it is in post-compulsory education that the teaching of metacognitive skills is likely to be the most fruitful, with these research findings supporting earlier arguments advanced by Sternberg (1998) concerning the development of these skills through the adult world of work and related education.

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, Berthelot, Saia and Crowley (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 (ie 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 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

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of cognitive and metacognitive strategies more generally with some rare exceptions (see below). For example, research in Australia in the post-compulsory and vocational sectors to determine the levels of awareness and usage 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 1999, 2000). Even in regard to the university sector, Candy (2000) recently found the need to re-emphasise the need for effective learning skills and indicated that there was not much evidence of teaching to facilitate lifelong learning here. Despite the more optimistic 'snap shots' of 'best practice' provided by Chapman et al. (2003), personal experience of the university sector leads the author to concur with Candy (2000), particularly in regard to the explicit teaching of cognitive and metacognitive skills.

Not withstanding this overall unpromising scenario, there are glimmers of hope and indeed even success stories regarding the effective teaching of learning-to-learn skills. The earlier Project for Enhancing Effective Learning (PEEL) (Baird & Mitchell, 1986) in the Australian public school context proved of limited duration once initial funding ceased. However the project clearly established that teachers not used to using metacognitive and related strategies need to be taught how to do so, and that the approach was quite revolutionary in terms of conception and practices associated with conventional teaching/learning (see Baird & Mitchell, 1986). Where the extent of the need for change is recognised and there are principals/administrators provided to persevere, develop teachers' skills and knowledge, and, probably equally as important, change the prevailing culture, success can seemingly be achieved. Ipswich Grammar School in Queensland has implemented a Learning Made Easy (LME) program since 1991. The program, based upon the development of students' metacognitive practices, has proven to be successful in increasing the percentage of students going on to either university or TAFE. Also students' perception of what they experienced over the full period of their schooling in this institution indicate reasonable degrees of success (Bartlett, 2002). Prior to full scale adoption of the program, between 65-77% of students went on to university or TAFE study. Since then some 86-94% do this, with 94% being achieved in three of the seven years between 1994-2000 and 90% and 92% in two of the other years. The Learning Made Easy program was reported to have been sold to two separate groups of schools in mainland USA and Hawaii (Bartlett, 2002).

In terms of curriculum reform, which is seen as an important issue (eg Chapman & Aspin, 1997; Chapman et al., 2003: Cornford, 1999, 2002; Weinstein & Meyer, 1994) there were until very recently some signs of change in the Australian context. NSW was about to introduce a Cognitive Science subject for years 11 and 12 for the Higher School Certificate. In its draft form the proposed syllabus covered areas as diverse as philosophy, psychology, anthropology and artificial intelligence. There was good use of terms like metacognition, and statement of ideals such as recognising the importance 'that students have the knowledge and skills to critically evaluate and use new knowledge in this field as it emerges' (Board of Studies NSW, 2002, p. 8). However, there was little understanding demonstrated of the difference between adjunct and metacurricular approaches. Furthermore, there was little evidence in the

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draft of opportunities for students to learn specifically what is involved in metacognition and to practise skills relevant to its acquisition or for meaningful transfer of learning to other subjects or within the same subject. Overall, while there were serious limitations in the proposed syllabus, it was better than nothing and indicated some movement beyond mere rhetoric. The weaknesses in the syllabus were correctable but according to information recently obtained from the NSW Board of Studies while writing this paper the subject has been dropped on account of costs and the time needed to bring it on-line.

In relation to teacher education, it is not certain how extensively information and specific teaching practices relating to cognitive and metacognitive skills are disseminated in Australia, with there being a clear need for research in this area. The author and a colleague, Peter Russell, have attempted to introduce substantial degrees of awareness through undergraduate VET and school-teacher preparation courses at UTS, as well as in adult education at masters level. The University of Sydney also has at least one Masters degree level subject examining effective learning strategies. However it is not known how widely in Australia such attempts are made at tertiary level since educational psychology fell out of fashion in teacher preparation courses approximately a decade ago to be replaced by more reflective practices. What is known is that some science teachers continue to be inspired by the PEEL Project (Baird & Mitchell, 1986), and that the influences of the PEEL project are disseminated through some teacher education courses at the Universities of Melbourne and Monash (Loughran, personal correspondence).

Major Challenges Ahead

The overarching problem in Australia probably remains the lack of direction of policy established by minsters for education in various state governments since this will influence both curriculum and the professional preparation of teachers (see below). However, with the Australian federal government increasingly involved in educational issues, particularly as they relate to vocational education and training and workplace productivity, and also responsible for taxation disbursements, federal policy is also likely to influence states directions. At present the importance of generic skills in teaching for the longer term is a major issue (eg see Kearns, 2001), and it is still possible that the importance of learning-to-learn skills will be recognised as an important and achievable aspect of lifelong learning policy. Yet Chapman et al.'s (2003, pp.126-8) report clearly indicates the confusion surrounding what lifelong learning is all about, in large part on account of the failure of most policy makers involved to move away from general rhetoric and define the learning issues. What is also reflected in Watson's (2003) report is the lack of real understanding in policy making circles of education and learning issues.

Learning-to learn issues are exceptionally important for many TAFE students who have left school often lacking academic skills when they enter vocational areas which are subject to the most direct technological change. These students are thus the ones most obviously needing to maintain knowledge and skill currency through effective learning. However, it is most unlikely that all the remedial work in teaching learning-to-learn skills can realistically be accomplished at TAFE. Logical analysis leads back to the secondary school in particular as the best place to acquire the basis foundations of these skills, with there being potentially substantial benefits for all students were

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this to occur (Cornford, 1999, 2002). The most recent research on the maturation of adolescent brain functioning (see Wallis, 2004) suggests, however, that there is certainly a major role for post-compulsory education institutions with work-based learning and adult role expectations serving to stimulate metacognitive skill development.

For the secondary school to become a major source of teaching for learning-to-learn skills a curriculum revolution would be required. At present subject content and specialisation dominates the curriculum in at this level. Any movement to increase the teaching role to encompass both the specific teaching of learning-to-learn skills and content would require a major re-conceptualisation of the roles of secondary teachers in particular. Should the curriculum changes occur, then, in initial stages of subjects, less content will be covered since time must be devoted to the development and teaching of learning-to-learn processes. It is highly likely that once superior learning techniques are mastered then the amount of content covered can be more than such as to compensate for lighter coverage in the earlier stages of subjects (Cornford, 2002). With regard to post-compulsory education, much the same comments apply regarding a need for a curriculum revolution. Even though Chapman et al. (2003) may have detected positive attitudes towards lifelong learning, there is little evidence in that report that indicates that specific teaching of cognitive and metacognitive skills to foster more effective learning is occurring broadly or intensively.

For the changes in curriculum incorporating learning-to-learn strategies to be successful there are substantial requirements for changes in teacher education, both in-service and pre-service. It is widely acknowledged that no substantial educational reform has ever been successful without the cooperation of the teachers implementing the reform. At present, while teachers would undoubtedly claim that they are teaching effective learning along with content, there is little empirical evidence to support any such claim (see above). It would be highly desirable to conduct research in classrooms across a wide range of subjects and levels, as well as across states which have different curricula, to determine how much teaching effort is in fact devoted to the development of learning-to-learn skills in schools in Australia. Such research would then serve a number of functions, not least of which would be to present teachers with the true extent of the direct teaching of learning skills.

To ensure that teachers have the knowledge and practical skills to teach learning-to-learn strategies, in-service education of existing teachers would need to be a priority, as would ensuring that the pre-service education of teachers effectively provided them with these skills (Cornford 1999, 2002). Such a project may well provide the impetus to rectify the generally low levels of in-service education provided to experienced teachers in Australia. What is provided as in-service education is generally only provided when a new syllabus is introduced. This curriculum revolution would serve that function too, but presumably it would serve as an incentive for teachers to closely examine approaches to teaching specialist subject content as well. With a generally older teaching service, professional re-invigoration may be desirable, additional result, both in schools and in teacher education faculties. Younger pre-service teachers need to be adequately taught, not just about learning-to-learn strategies, but also how to teach these in combination with their subject content (see Weinstein & Meyer, 1994). Obtaining lecturing staff with the expertise in cognitive psychology, and specifically knowledge of learning strategies, required to teach these courses may

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constitute a problem since educational psychology has fallen from what was once a pre-eminent place in teacher education courses. Judging by the types of papers presented at teacher education conferences in Australia, and that includes this conference, there are not too many teacher educators who have expertise in educational psychology or a demonstrated interest in learning-to-learn strategies.

Conclusion

Despite the rather dismal picture painted of current teaching of cognitive and metacognitive strategies to foster truly generic skills and thus lifelong learning, there is reason for some optimism. Greater knowledge derived from research on the efficacy of learning-to-learn strategies (eg Biggs 1988, Hattie et al. 1996), more materials on the use of different strategies (Schraw 1998, Weinstein & Meyer 1991, 1994) and the re-conceptualisation of approaches to teaching cognitive and metacognitive skills (see Sternberg 1998, 1999, Cornford 1999, 2000) are contributing to a set of related approaches which have the potential to ensure that these skills can be taught more effectively.

There generally appears to be greater awareness developing in serious academic publications of the need for learning-to-learn skills to provide the foundations for effective lifelong learning. Also there are now more articles and papers which emphasise the importance of these skills (eg Thiede et al, 2003), and the fact that successful, practical outcomes can be achieved (Bartlett, 2002). Although policy makers previously have tended to engage in much rhetoric, without any real support for change, through either funding for projects involving experimentation and implementation or serious development of framework policies for lifelong learning, this may change as European countries seriously continue to develop and implement lifelong learning policy. That is to say Australian governments may move from largely empty rhetoric and the commissioning of reports to create substantial policy. There is already considerable awareness in some government policy circles that effective vocational education and training underpins the effective functioning of the society through the direct link between training and workplace productivity. In addition, the employment of youth and the needs of these learners who are attracted to VET seemly are being recognised as serious, legitimate needs because of the economic implications. Unfortunately, with an election looming, representatives from both major parties on the House of Representatives Standing Committee on Education and Training (2004) inquiry into Vocational Education in Schools seem to have opted for the status quo and failed to make serious recommendations for change to enhance learning, despite the fact evidence of this need was presented to them (House of Representatives Standing Committee on Education and Training Inquiry into Vocational Education in Schools, *Proof Hansard*, Sydney, 26th February 2003, ET 109-119).

Ultimately, as in the late 1980s-early 1990s, it may be forces exerted through competition in the international trading area that bring about changes in Australian educational policy. The economic and efficiency challenges that are gradually being presented by neighbouring Asian countries like Malaysia and Singapore may spur major changes. These two countries have been implementing school curricula centred upon HOTS (Higher Order Thinking Skills – see Ryan, 1997) for several years. Information from visiting professors of Education also have indicated that recently

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Hong Kong also introduced a highly innovative, if not revolutionary, new school curriculum which focuses upon the teaching and learning of cognitive and metacognitive skills. From being a country that was at the forefront of social change in the early twentieth century, policy-wise, Australia is relatively a very conservative country at the beginning of the twenty first century.

To achieve the ideal of effective lifelong learning through the teaching of cognitive and metacognitive skills a revolution in approaches to teaching and learning is needed (Cornford, 1999, 2002). There is a need for major curriculum revision to support this and make it possible (Chapman & Aspin, 1997; Cornford, 2002). What also must occur is effective education of teachers. The vast majority of teachers at all levels of education have good intentions to promote effective learning by their students, but they have never been taught how to incorporate the teaching of cognitive and metacognitive skills into their sessions. In short, along with changes in curriculum, a revolution in approaches to teacher education may well be necessary. Despite the apparent strength of logic and research evidence, unfortunately these revolutions will only occur when Australian educational policy makers forsake timidity, formulate relevant policies and implement them effectively.

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