Educational Psychology

Advances in learning, cognition and motivation

RICHARD A WALKER, UNIVERSITY OF SYDNEY
RAYMOND L. DEBUS, UNIVERSITY OF SYDNEY

Educational psychology continues to produce a growing body of theory and research in human learning, cognition and motivation. Insights concerning the active, constructive and situated nature of learning, the role of prior knowledge and of metacognitive skills in learning have been incorporated into research investigations that have enhanced understanding of learning in classroom environments. Increased research on learner motivation and the components of stimulating learning environments have emphasised learner goals, interests and self-perceptions as mediators of learning outcomes. A growing emphasis on developing self-regulated learning emerges from an integration of research insights from these areas. The complementary contributions of quantitative and qualitative research processes have been important in undergirding these emphases. Educational psychology research is increasingly conducted in classroom contexts with significant ‘design experiments’ simultaneously developing innovative learning environments and advancing theory development about learning from instruction. The field is contributing integrative explanatory concepts and design principles for incorporation in classroom programs. Educational psychology, arguably, has to more to contribute to teacher education today, at both preservice and inservice levels than at any earlier period in the history of the field.

Since its emergence as a field of study, educational psychology has produced a large and growing body of theory and research into its tripartite concern with human learning, cognition and motivation. Initially, much of this research was published in the Journal of Educational Psychology, established in 1910, and in the British Journal of Educational Psychology which was founded in 1930. Since that time there has been a steady growth in the number of journals publishing educational psychological research; in the 1980s and 1990s important journals like Educational Psychologist, Cognition and Instruction, Journal of The Learning Sciences, Learning and Instruction, and Educational Psychology Review have come into productive existence and plans are currently underway for the creation of a new journal concerned with best practice
in educational psychology. The definitive publication in educational psychology, however, is the Handbook of Educational Psychology published in 1996. This 1071 page publication contains 33 chapters which summarise recent educational psychological research into cognition and motivation, development and individual differences, the school curriculum, teaching and instruction, and the foundations of the field.

In their introductory chapter in the Handbook, the editors (Calfee & Berliner, 1996) assert that the field of educational psychology is "dynamic and relevant" (p.1). The present paper, through examination and analysis of contemporary conceptual and methodological developments in the field, demonstrates the force of this statement as it explores the elements producing a dynamic educational psychology. The paper also considers the relevance of a contemporary psychological perspective for teacher education. In a special issue of Educational Psychologist (1996, Volume 31, Number 1) dealing with the relevance of educational psychology for prospective teachers, Blumenfeld & Anderson (1996, p.1) define this contemporary psychological perspective as follows:

Currently, the heart of a contemporary psychological perspective is an image of learners as active and social constructors of meaning, and an image of learning as an act of construction through social interaction in many contexts. Furthermore, there is an interaction between the construction of meaning by individual learners and the situations in which learning occurs.

This contemporary psychological perspective is evident in research into learning, cognition and motivation, discussed in the next section, and in the formulation of a set of learner-centred psychological principles (Lambert & McCombs, 1998).

A CONTEMPORARY EDUCATIONAL PSYCHOLOGY PERSPECTIVE

1. Learning and cognition

As indicated in the introduction, the last decade of theory and research into learning and cognition has produced a number of commonly accepted understandings held by educational psychologists. Amongst these understandings is the acceptance of the active, constructive nature of learning, the important role of knowledge in the development of competence and expertise, the acknowledgment of the importance of metacognitive processes and strategies in effective learning, the importance of deep approaches to learning, the situated nature of learning, and the combined importance of all of these factors in the transfer of learning. Additionally, research into cognitive load in the last decade has enhanced an understanding of the instructional and other factors which limit the learner’s cognitive processing and subsequent learning. Multimedia learning has increasingly been investigated from the perspective of cognitive load theory. At the same time that common understandings have developed, however, there has been considerable debate concerning the nature of learning and cognition and the subsequent
emergence of different understandings of learning and cognition. These alternative
views, which have their origins in the neo-Vygotskian perspective on learning, are briefly
considered towards the end of this section.

With the widespread acceptance of constructivist views of learning in the last decade,
there is general agreement amongst educational psychologists that learning involves the
active construction of knowledge (Phillips, 2000). As there are, however, a number of
different constructivist perspectives, there is considerable debate over the nature of the
learning process. While the predominant view maintains that processes of knowledge
construction occur at the level of the individual learner, referred to as personal or
cognitive constructivism, there is a growing acceptance of the social nature of learning
(Phillips, 2000; Palincsar, 1998). This latter perspective, which has its origins in the work
of Vygotsky and neo-Vygotskian theorists such as Cole (1996) and Rogoff (1998),
considers learning to be fundamentally social in nature. While both constructivist
perspectives emphasise the fact the learning is a process of making meaning, cognitive
constructivists consider that an individual’s prior knowledge structures, or schemata, are
instrumental in this process. Socio-cultural-historical and social constructivist
researchers, however, emphasise the role of language and cultural artefacts, amongst
other cultural factors, in the process of constructing meaning. Both approaches have led
to productive conceptions of learning and research on learning.

Continuing debate over the nature of learning in recent years has required that
learning researchers have a much better understanding of the epistemological
assumptions underlying various perspectives on learning. It is clear, however, that while
some researchers consider their work to fall within the bounds of the constructivist
perspective, they have not aligned their learning theory with a constructivist
epistemology. This is evident, for instance, in the work of some information processing
constructivists who continue to explain learning through reference to the acquisition of
information. A recent article (Packer & Goicoechea, 2000) which suggests that learning
theorists need to consider the ontological, in addition to epistemological, assumptions in
theories of human learning, indicates that philosophical issues are likely to be active in
research journals in the area of learning and cognition in the future.

A major feature of research on learning and cognition has been the continued
emphasis on the role of knowledge and the domain specificity of learning and thinking.
While researchers have continued important investigations into the nature and
development of expertise in various domains (Ericsson, 1996), there has been
considerable theory development and research into academic expertise and into the
development of competence in school subjects. Research into reading, writing and
mathematics conducted in the 1980s has continued into the 1990s with recent research
into history, science, mathematics and second language learning presented in Berliner &
Calfee (1996). In addition, journal issues in the last decade have been given over to
learning in the following areas: literacy (Symons, Woloshyn and Pressley, 1994), history
(Wineburg, 1994), mathematics (Van Oers & Forman, 1998), writing (Russell & Bazerman,
1997; Galbraith & Rijlaarsdam, 1999), second language acquisition and writing
(Archibald and Jeffery, 2000). The model of learning in the academic domain, advanced by Alexander (1997, 2000), has also provided an important recent contribution to understanding of the multidimensional nature of the construction of school knowledge.

This emphasis on knowledge and competence in academic learning has been paralleled by a continued emphasis on metacognitive and cognitive processes in learning (Hacker, Dunlosky & Graesser, 1998). While the teaching of metacognitive skills in the domains of reading and writing has been demonstrated to enhance achievement outcomes in experimental studies, the action research orientation of the PEEL project (Baird and Northfield, 1992) has shown that teachers are able to successfully create student-centred, metacognitively oriented classroom environments. An important advance in metacognitive research in the last decade has been the recognition that many metacognitive and other self-regulative skills and strategies have less generality than previously thought and are developed in the context of specific bodies of knowledge and specific tasks. In fact, understanding of the contextual or "situated" character of much learning and cognition differentiates current theory and research form that of an earlier era. Increasingly, the successful or expert learner has been shown to be a person who is able to reflect on the process of learning and to effectively deploy general learning skills and more specific metacognitive and self-regulatory skills as required. This learner also, as Biggs (1993) has demonstrated, has a deep approach to learning rather than a surface approach and is consequently more likely to learn with understanding.

Learning theory and research have made important advances in the last decade in the understanding of the transfer of learning. It is generally agreed (Campione, Shapiro & Brown, 1995; Brown, 1990) that learners will most effectively be able to transfer their learning when they have an understanding of domain or disciplinary principles as well as the ability to reflect metacognitively upon their own learning and to engage in deep approaches to learning. Learners need sufficient competence in a domain of knowledge to be able to identify central principles underlying the domain so that these principles can be applied to new learning topics and tasks in the domain. As well, learners need the metacognitive and reflective skills to be able to discern the relevance of disciplinary principles for new topics, tasks and contexts. Deep approaches to learning, therefore, also assist learners in the application of their knowledge.

Insights concerning the active, constructive and situated nature of learning, the role of prior knowledge and metacognitive skills in learning, and of the nature of learning transfer have been incorporated into the work of several research teams which have greatly enhanced the understanding of learning in classroom environments. Brown & Campione's (1996) Fostering Communities of Learners project (FCL), Scardamalia & Bereiter's Computer Supported Intentional Learning Environment (CSILE) project (Scardamalia, Bereiter & Lamon, 1994), and the work of the Cognition and Technology Group at Vanderbilt University (1994) have all been conducted in classrooms, and have led to the emergence of learning principles applicable to such complex learning environments.
The emergence of cognitive load theory in the last decade has provided valuable insights into the instructional and other factors which limit a learner’s ability to process new knowledge. This theory, primarily developed by Sweller (Sweller, van Merrienboer & Paas, 1998), demonstrates that when a learner’s cognitive processing ability is reduced or overloaded, as in the case of split attention for instance, subsequent learning is impaired. This has important implications for, amongst other things, text and diagrams in textual learning materials, the use of written manuals when attempting to use new computer applications, and aspects of multimedia learning. Cognitive load research has, for instance, demonstrated that more effective learning occurs when textual information is integrated into diagrams in textual materials, when computer manuals are integrated into software packages, and when there is complementarity and contiguity in auditory and visual knowledge (Moreno & Mayer, 1999) in multimedia presentations.

In comparison to the emphasis on knowledge in learning and cognition reflected in the research discussed above, the emerging socio-cultural-historical approaches (Greeno, 1998, 1997; Rogoff, 1998; Palincsar, 1998) see learning as enculturation into cultural and community practices. Learning involves a movement from peripheral involvement in cultural practices to a more central involvement, and as such, is very much tied up with change in a person’s identity. Language and discourse are considered central to the understanding of learning and cognition. Learning and cognition are seen as fundamentally social and distributed across persons, cultural artefacts and tools, contexts and tasks and furthermore are considered to be culturally, socially and historically specific; socio-cultural-historical approaches, thus, also emphasise the situated character of learning. Transfer of learning is explained through reference to the articulation of cultural practices and to the affordances and constraints operating in specific situations and learning environments. This means that learners will be successful on new learning tasks to the extent that these tasks are embedded in similar cultural or disciplinary practices to those of the context in which the original learning occurred, and to the extent that the learning context offers supportive learning cues. As they are increasingly articulated through exposition (Greeno, 1998; Rogoff, 1998) and debate (Greeno, 1997; Anderson, Reder & Simon, 1996) these emerging approaches to learning and cognition are attracting adherents and posing a number of conceptual and methodological issues for the practice of educational psychology.

2. Motivation

An important part of the contemporary psychological perspective arises from recent conceptualisations and research in the area of learner motivation. Three clusters of constructs have been salient in the work of the past decade. A major research focus has been on concepts of achievement goal orientation, seen as the pattern of purposes or reasons that guide the learner's engagement with an academic task. Over the past fifteen years, a considerable range of research has resulted in refinement of the initial constructs and a substantial body of evidence of the differential outcomes associated with particular
goal frameworks. Another major focus has been on a range of self-related constructs such as academic self-concept and self-efficacy which have been demonstrated to have substantial impacts on processes and outcomes of learning. A third focus of research has been on more specific and situated motivation in learning contexts through the evocation and instigation of learner's interest as a basis for closer engagement and involvement in learning activities.

Each of these research themes has contributed to current concepts of the active learner interacting in social and task contexts. Research in these areas has clarified many features of classroom contexts in which positive and adaptive patterns are stimulated in learners. Additionally more recent research has provided new insights into features of classroom structure which may instigate maladaptive responses which interfere with student learning. An active body of research in achievement goal theory has centred upon a distinction between mastery goal structures and performance goal structures established by teachers. An emphasis on progress, effort, self-improvement, enhanced understanding and intellectual development characterise a mastery goal environment. In a performance goal setting, there is emphasis on relative ability and competition among students. In such a goal structure teachers are likely to compare students' abilities and place emphasis on test scores and students' performance relative to others, so that students are well aware of the relative academic standing of class members. These mastery and performance concepts are also applied to the personal goals of learners and may be seen as representing a general orientation to learning comprising "a number of related beliefs about purposes, competence, success, ability, effort, errors and standards" (Pintrich, 2000a, p.94). With great consistency mastery goal orientations have been associated with more positive attitudes to learning, with use of deeper strategies in learning, greater persistence, higher perceived competence and self-efficacy (Urdan, 1997) and adaptive seeking of help when needed. The salience of mastery as a basis for satisfaction with success has been supported in a variety of cultural settings (McInerney, Hinkley, Dowson & Van Etten, 1998).

Performance goals reflect a greater concern by the learner as to how her/his performance levels compare with those of classmates. This may represent a concern to be viewed as 'relatively able' in class activities (an approach tendency), and may have positive effects on engagement and achievement for some learners (Pintrich, 2000c). Where, however, the concern is to avoid demonstrating a lack of ability (an avoidance tendency) a range of maladaptive patterns such as procrastination, avoidance of seeking help for fear of appearing dumb, and not studying in preparation for tests may be employed and these circumstances may be cited as reasons for poor performance to protect the individual from appearing to be of low ability (Midgley & Urdan, 2001).

In addition to these achievement-related goals, the broader social relationship goals and experiences of the learners influence their adaptations in learning contexts. Positive relationships with teachers provide a context in which students experience a sense of belonging and feel more academically efficacious and less self-conscious in class and
group contexts (Roeser, Midgley & Urdan, 1996). Student perceptions that teachers care about them are shown to be related to their pursuit of prosocial and social responsibility goals and their academic effort (Wentzel, 1997). Students saw evidence of teacher caring in teachers' recognition of the student's individuality, in the provision of equitable treatment and respect, in the provision of constructive feedback and in indications of the teacher's enthusiasm in teaching. Recent research is thus bringing out the importance of some of these more elusive aspects of social relationships.

Recognition of the importance of the learner's self-perceptions of competence and their relation to learning has also advanced our understanding of learners as they undertake varied activities in learning contexts. A major advance arose from research indicating the multidimensional nature of the self-concept of learners. Thus the same person may have a high self-concept in some domains, but low self-perceptions in others. Research by Marsh and colleagues (e.g. Marsh, Craven & Debus, 1991) on the measurement of self-concept indicates that children, from a very early age, differentiate their self-perceptions in a number of areas of their academic and personal development. Evidence of the relation of academic self-concept to achievement has generally revealed a reciprocal relationship with enhancement of self-concept influencing subsequent achievement and further achievements enhancing self-concept (Marsh & Yeung, 1997). Such relationships have been demonstrated in a range of academic, sporting and occupational contexts. Increasingly educational psychology research has come to assess the learner's sense of efficacy in learning activities as well as their achievement outcomes. Positive relationships have also been found between task mastery goals and self-concept and self-efficacy measures with negative links between performance-avoid goals and the learner's self-perceptions (Pajares, Britner & Valiante, 2000). Self-concept has been of continued salience in educational psychology research both because it represents an important educational outcome in itself in a range of settings, but also because it plays "a central role in mediating the effects of other desirable educational outcomes" (Marsh, 2000, p.14).

A further emphasis in recent motivation research provides a motivational parallel to the emphasis on situated cognition. Studies of situated motivation (Paris & Turner, 1994) seek to enhance our understanding of the characteristics of tasks and learning activities that result in higher levels of interest, engagement and involvement of learners. They emphasise the variability of motivation across individuals in the same situation and intra-individual variability in motivation. Motivation in a specific class session or task activity emerges from an interaction of person and the learning context. Paris & Turner (1994) suggest that tasks which give learners opportunities for choice, challenge, control and collaboration are most likely to facilitate the display of sustained and strategic task involvement. By engaging the learner's interests, provision of some choice in learning enhances commitment to the activity, deeper involvement and a sense of some autonomy for the learner. The teacher is concerned with negotiating a careful balance between challenge and skill by sensitively adjusting levels of support and assistance so that the
learning activity is sustained at a level at which students can build new understanding (Turner, Meyer, Cox, Logan, De Cintio & Thomas, 1998). Experience of collaborative learning can enhance students' cognitive interaction in group tasks and their learning gains, particularly when attention is given to structuring tasks and training and monitoring group interaction skills (Gillies & Ashman, 1998; Webb & Farivar, 1994).

Major multimedia programs also seek to enhance learner involvement through stimulating interest in contextualised lifelike or authentic situations or the use of focal themes of wide appeal. Examples of mathematical calculations of fuel use and timing in the planning of a rescue in the Jasper series (Cognition and Technology Group at Vanderbilt, 1994) or the theme of endangered species (Brown & Campione, 1996) or the Wollongong group's "Exploring the Nardoo" (Harper, Hedberg, Corderoy & Wright, 2000) illustrate these characteristics. For primary school age groups, embedding arithmetic concepts and applications within a computer-based fantasy context of a "Space Quest" or "Treasure Hunt" enhanced learner engagement, their learning outcomes and their level of perceived competence (Cordova & Lepper, 1996). In these various examples the learner's increased level of involvement is reflected in enhanced cognitive and affective learning outcomes.

The development of self-regulated learning in students represents a further significant theme, emerging over the past fifteen years, which draws together cognitive and motivational processes. In this emphasis, self-regulated learners are viewed as "metacognitively, motivationally and behaviorally active participants in their own learning process" (Zimmerman, 1986, p.308; Zimmerman, 2000). As they develop self-regulation, children and adolescents become able to function increasingly independently in "an adaptive, generative and creative manner" (Schunk & Zimmerman, 1997, p.195). Self-regulation is conceptualised through a cycle of phases in the process of learning and problem solving. In a forethought phase, a self-regulated learner assesses tasks, forms goals and plans strategies likely to be applicable to the task. At this stage motivational and self-efficacy processes are important. A performance phase is characterised by attention focussing with self-observation and monitoring of the strategies employed in relation to task demands, making necessary adjustments in the course of undertaking the task (Zimmerman, 2000). Subsequently in a reflective phase, the learner evaluates her/his performance in ways which influence future planning and courses of action.

Development of self-regulatory strategies reflects strong influence of social processes, particularly in phases of observation and evaluation, with prominent roles for teacher modelling and guidance and peer modelling (Schunk & Zimmerman, 1997; Zimmerman, 2000). Subsequent phases result in internalization and self-controlled performance and ultimately capacity to adapt strategies to new situations. While most research on self-regulation has centred on secondary and tertiary students (Purdie, Hattie & Douglas, 1996), possibilities of developing self-regulation in young children have also been demonstrated (Perry, 1998).
In some aspects of motivation, differences are being demonstrated between Western students and East Asian students who are nurtured in a cultural context more collective in nature than one emphasising independence. Thus young children exposed to Asian cultural influences place less emphasis on valuing personal choice and show greater intrinsic interest in tasks chosen by trusted adults or by their own immediate peers rather than those personally chosen (Iyengar & Lepper, 1969). Responsibility to the family and meeting family expectations are also more salient in the self processes from Asian cultural settings. Such evidence is leading to the recognition that some assumptions and findings of research in western contexts, once considered universally applicable, may not be applicable in other cultural settings (Eaton & Dembo, 1997; Iyengar & Lepper, 1999).

Thus, in quite a range of areas, research in educational psychology in the past decade has provided us with "a much more dynamic and powerful model of the learner" (Pintrich, 1994, p.140) and increased insight into the contextual factors enhancing the learner's involvement.

**METHODOLOGICAL ISSUES IN EDUCATIONAL PSYCHOLOGY**

Underlying these achievements has been a range of conceptual and methodological changes in the field of educational psychology in the past three decades. In the 1970s many experimental studies were carried out with limited or artificial learning tasks in well-controlled laboratory situations (White, 1999). Currently learning studies typically use school-relevant content rather than such molecular tasks and predominantly they are conducted in classroom contexts. Increasingly studies cover a lengthier duration: perhaps a whole year or half-year, rather than brief sessions close in time. Some longer-term studies are often part of co-ordinated longitudinal research which can reveal the differing trajectories of various outcomes for learner groups by simultaneously considering developmental processes and instructional settings. Much educational psychology research, through its focus on realistic learning topics in subject-matter domains has more direct possibilities of application in enhancing domain-based learning outcomes. Thus in the words of the retiring editor of the journal Contemporary Educational Psychology (Royer, 2000, pp. 345-346), "we now have a science that is based on real-world concerns and that is conducted in actual educational settings." All these changes reflect an increased emphasis on ecological validity and give the data much greater relevance for educational practice.

Together with these changes, educational psychology researchers have broadened the range of outcomes investigated. Multiple cognitive outcomes are distinguished and their maintenance over time and transfer are examined. Together with cognitive learning gains, researchers concurrently assess learner attitudes and valuation of the domains studied, learners' self-efficacy, and their knowledge and use of relevant cognitive and self-regulatory strategies.
Many studies focus on developing and testing models which incorporate processes that mediate the learning outcomes. By assessing such process variables and employing powerful structural equation modelling (SEM) they are able to clarify major processes that contribute to the learning outcomes. In these models, cognitive, motivational or social aspects are increasingly studied as interacting rather than separate aspects of learning. In the words of another recently retiring journal editor, "Current research highlights the need to consider these different aspects together in a multidimensional framework for understanding learning" (Pintrich, 2000b, p. 221).

One further emerging direction in data analysis also enhances the study of patterns of relationships between processes by examining profiles or patterns of the studied variables within a group of learners. Termed a "person-oriented approach," this provides an alternative or supplementary approach to the "variable-oriented approach" more characteristically applied in the field. In the variable-oriented approach, data on specific measured variables are statistically interrelated across time points to indicate changes or relationships that occur. The focus of this form of analysis is on single variables or a combination of variables, on their interrelation and how they relate to a specific criterion. This approach does not yield a focus on the way these characteristics and processes are interrelated within particular individuals.

In the person-oriented approach developed by Magnusson (1997, p. 51), "the person is conceptualized as an integrated, hierarchically-organised totality, rather than a summation of variables." In clarifying the limitations of the variable-oriented approach, Magnusson (1997, p.60) points out that "the complex dynamic process of individual functioning and development cannot be understood by summing results from studies of single variables taken out and investigated in isolation from the context of other, simultaneously operating variables." By processes of cluster analysis, subgroups of learners with similar patterns or profiles of the characteristics being studied are identified. These clusters represent interactions among the variables not reflected in the variable-oriented analysis. Usually this approach reveals a limited number of common patterns and the groups may be compared and their differences in relation to other criteria studied and their trajectories over time examined.

Mary Ainley (1993) applied cluster analysis procedures to distinguish six clusters of secondary students with differing patterns of general ability and approaches to learning variables. (Examples of the styles of engagement distinguished were termed Detached, Committed, Hopeful, Disengaged). These groups of students were shown to differ in exam preparation strategies and in achievement. In another investigation Alexander and Murphy (1998) formed clusters based on knowledge, interest and strategy measures and studied the varied trajectories of the clusters across an academic semester.

Although only a limited number of studies of this kind have been carried out, this more holistic person-oriented form of analysis complements and extends findings coming from variable-oriented research. The differentiation of patterns of characteristics may enhance the meaningfulness of the data for practitioners who may be able to relate some of the patterns discerned to some of their own students.
A feature of some of the most exciting and productive research in educational psychology has been the attempt to study learning and cognition in complex and authentic classroom environments. These research projects have involved the study of innovative learning contexts in which students and teachers are encouraged to engage in learning activities involving reflection, inquiry and collaboration. "Design experiments" (Brown, 1992) of this type involve the engineering of all aspects of the classroom learning environment (learning and teaching, curriculum, assessment, technology) and have the dual purpose of informing both theory and practice. Brown (1992) notes of her research that she "attempt(s) to engineer innovative educational environments and simultaneously conduct experimental studies of those innovations"(p. 141). Design experiments such as these supersede an earlier assumption underlying educational psychology research that formal disciplinary inquiry discovers principles that can then be applied to the practice of education; design research studies involve reciprocal relationships between theory and practice with both providing inputs to the creation of innovative classroom environments for the purpose of identifying and verifying relevant learning principles. Typical of such studies attempting to develop theoretical principles for complex classroom environments are Brown & Campione's (1996) FCL project, Scardamalia & Bereiter’s CSILE, and the work of the Cognition and Technology Group at Vanderbilt University. In all of these projects a wide variety of quantitative and qualitative data collection methods are employed and a reciprocal relationship exists between insights gained from the complex learning environment research and insights from traditional experimental research.

A concern with researching complex, authentic learning environments is also evident in Salomon's (1996, p. 397) call for an "educational psychology focusing on the study and design of complex and contextualised composites." Salomon argues that educational psychological research is analogous to architecture and aerospace science, fields which deal with composites of variables which reflect the complexity of the phenomena studied, and therefore researchers need to examine the composites of variables which exist in classrooms. Using a type of multi-dimensional scaling analysis, Guttman's small space analysis, Salomon (1996) demonstrates how the study of composites sheds light on the achievement, attitudinal, social, cognitive and teaching aspects of both traditional and innovative, interdisciplinary problem-solving science classrooms.

In their attempts to examine learning, cognition and motivation in authentic classroom environments, educational researchers are turning to qualitative research methods to a much greater extent. This greater interest in qualitative methods has also resulted from the rapidly growing interest in the various forms of socio-cultural-historical theory. These theoretical approaches emphasise that the individual cannot be studied in isolation from the social as "individual, interpersonal and cultural processes are not independent entities" (Rogoff, 1998, p.687). Socio-cultural-historical research thus investigates human learning in the context of social interactions situated in specific cultural and historical contexts. Qualitative research is being published in journals like
Cognition and Instruction, Learning and Instruction and the American Educational Research Journal to a much greater extent than in the past; some journals such as the Journal of Educational Psychology and Contemporary Educational Psychology continue, however, to publish quantitative research predominantly, though recent editorial statements explicitly welcome qualitative studies.

Although qualitative studies have been conducted in many research areas in educational psychology, there has been a noticeable preponderance of such studies concerned with peer interaction in learning and problem solving situations. Many of these studies have employed various forms of discourse analysis and have been developed to investigate issues deriving from socio-cultural-historical theory. In one such study, Kumpulainen & Mutanen (1999) present a framework for the analysis of peer interaction which focusses on the "functions of verbal interaction, and the nature of cognitive and social processing." They subsequently introduce the framework through discussion of peer interaction data involving video recordings, observations, interviews and questionnaires. A study by Brown & Renshaw (1997) provides an Australian example of this type of qualitative research.

A more recent study by Hogan, Nastasi & Pressley (2000) provides an excellent example of this type of qualitative research in educational psychology. Cognitive and sociocultural theories provided the theoretical framework for this investigation which examined interpersonal interactions between peers, and between teacher and students, as they engaged in scientific reasoning discussions. The study involved twelve targeted year eight students in two classes taught by the same female science teacher. The students were videotaped and audiotaped as they engaged in a 12-week unit of study in which they constructed and tested mental models of the nature of matter. As is customary in qualitative research, the sequence of analytic steps in the study was not predetermined but emerged inductively through interaction with the data. The data were transcribed, and coding schemes were developed and refined until all of the data could be satisfactorily described, and then were recoded using the final schemes. Discourse analysis indicated that the four peer groups differed markedly in the nature and type of their discussions. Several groups were more able to engage in productive dialogue involving the sharing of queries, presenting provocative ideas articulately, being willing and able to ask for clarification, interpreting and building on one anothers ideas.

An interesting aspect of the Hogan, Nastasi & Pressley (2000) study is the fact that both Nastasi and Pressley are very well known educational psychologists, with Pressley one of the most productive researchers in the field (Kiewra & Creswell, 2000). As such, this publication demonstrates that leading international educational psychologists are using qualitative methodologies in their research.

Educational psychology researchers also make use of qualitative and qualitative methods in concert in their research investigations. A study of the way small children and their caregivers collaborate in shared activities, conducted by Rogoff, Mistry, Goncu & Mosier (1993), provides a good example of the combined use of quantitative and
qualitative methodologies. This study involved ethnographic investigations of communities in four countries and the subsequent description of collaborative interactions amongst family members from each of these communities. Similarities and differences occurring across interactions in families and communities were identified and the interactions in each family were coded according to the coding system so developed. Finally, the coded data were graphically and statistically analysed. The reporting of this research also provided considerable detail concerning the cultural and historical contexts of each of the four communities investigated. There are very few examples of educational psychological research like this involving qualitative and quantitative research in combination, undoubtedly because of journal constraints on the publication of lengthy research reports. An increasing number of doctoral theses in educational psychology, however, report the results of both quantitative and qualitative investigations.

It is also clear that educational psychologists use quantitative and qualitative research methodologies flexibly to investigate research issues deriving from very different theoretical orientations. This expansion of the use of mixed methodology is assisted by the recent development of an explicit rationale for a range of combinations of quantitative and qualitative methods in researching educational issues (Tashakkori & Teddlie, 1998). So for example while qualitative methodologies are commonly employed in socio-cultural-historical research, quantitative methods are also used to investigate research issues derived from this perspective. This point is well illustrated by two studies concerned with mathematical practices and learning, one of which (Bowers, Cobb & McClain, 1999) adopted a case study of individual learners, while the other (Saxe, Gearhart & Seltzer, 1999) used hierarchical linear modelling to analyse data from nineteen elementary classrooms. Examples such as these reinforce Pintrich’s (2000c, p223) assertion that the field is "well past the quantitative-qualitative debate and more concerned with issues of providing good, valid, and reliable evidence to support our inferences and conceptual models, regardless of the nature of the general methodology."

A significant feature of the past decade of research has been the enhanced accessibility of research in different national contexts. While Australian educational psychologists have always been familiar with North American and British research, the extent of interchange and contact between European scholars and other groups has markedly increased. In part this has been stimulated by professional organizations and their journal publications (perhaps especially the European Association for Research in Learning and Instruction (EARLI)), by attendance at international research meetings and associations through study leave arrangements. This has resulted in some joint projects and publications such as the recent Handbook of Self-Regulation (Boekaerts, Pintrich & Zeidner, 2000), with its collaborating editors drawn respectively from the Netherlands, U.S.A., and Israel.

Australian educational psychologists seek to publish much of their research in international journals emanating from North America or Europe and most maintain regular contact with overseas scholars with kindred interests. Thus Australian
educational psychology reflects main international trends rather than being distinctively Australian (cf. Rowe, 1999); it includes some original work that has influenced research directions overseas such as Marsh’s research on self-concept, Sweller’s work on cognitive load, the PEEL focus on metacognition in the classroom, Hill and Rowe’s multi-level analyses of school effectiveness and research on teaching and learning at tertiary levels by Biggs and Prosser & Trigwell. (Further examples are provided by Rowe, 1999, p.73). A recent analysis (Phelan, 2000), covering all fields of education indicates an increasing productivity of Australian contributors to international publications that reflects levels beyond those of Australian researchers in many other fields.

INTEGRATION AND DIVERSITY IN EDUCATIONAL PSYCHOLOGY

Educational psychology has been characterised as a multifaceted discipline (Shuell, 1996) with great diversity in research undertaken. Some writers have interpreted this as fragmentation (e.g. Shuell, 1996, p.8) and Calfee (1992, p.164) characterised the field as "collage more than portrait." In a retrospective and prospective review of the field, Pintrich (1994, p. 141) suggested that much research focussed on particular components or variables in isolation (the variable-oriented research mentioned previously) and needed to "develop theoretical models and research programs that take a more holistic and integrated perspective on motivation, cognition and conation."

In the seven years since the Pintrich analysis, the field has made distinct progress towards examining linkages between components and the development of integrative models. Recent studies have examined relationships and interactions between goals and self-perceptions (e.g. Pajares, Britner & Valiante, 2000). Broader and more inclusive constructs such as self-regulation which incorporate components from goal orientations, metacognitive strategies, self-perceptions and behaviour have gained enhanced salience in the field (Boekaerts, Pintrich & Zeidner, 2000; Purdie & Hattie, 1996).

Increasing use of person-oriented analyses to supplement variable-oriented analyses (e.g. Ainley, 1993; Alexander & Murphy, 1998; Seifert, 1997) facilitates our understanding of ways in which components may interact. They reveal which patterns or combinations are more common and, with longitudinal data, provide a basis for examining the different trajectories of these student patterns across time (Alexander & Murphy, 1998; Pintrich, 2000c). Such patterns may incorporate motivational, cognitive and metacognitive components and may imply the need for different forms of support and guidance to enhance desired learning outcomes. New theoretical models reflecting the multidimensional nature of learning in subject domains (Alexander, 1997, 2000) focus our attention on "the interplay of cognitive, motivational and strategic forces" (Alexander, 1997, p.213).

A further integrating feature comes from the development and coordination of design principles that are emerging from the design experiments that have achieved increasing prominence in the field. Design principles for particular domains incorporate psychological principles from research on motivation, cognition and metacognition,
together with those emerging from specific research in the domain. A recent example is provided by the program of Concept-Oriented Reading Instruction (CORI) developed at the University of Maryland which incorporates as integrated components competence and efficacy beliefs, achievement values and goals and social aspects of reading (Wigfield, 1997; Guthrie & Aloe, 1997; Guthrie, Cox, Anderson, Harris, Mazzini & Rach, 1998). Evidence from a quasi-experimental study indicated that the program resulted in substantial enhancement of student curiosity and involvement in reading and in self-reported use of reading strategies (Guthrie, Wigfield & VonSecker, 2000).

The Fostering Communities of Learners (FCL) developed by Brown and Campione (1996) places particular emphasis on the need for explicit specification of design principles reflecting the underlying psychological theory of learning, presented in a way that can inform practice. Their design principles include clusters relating to cycles of research-share-perform activities, provision of a metacognitive and reflective environment, discourse in the community, deep content knowledge, distributed expertise and alignment of instruction and assessment. Brown and Campione (1996) emphasise the importance of embodiment and enactment of these psychologically based principles rather than enactment of the procedures by which they are implemented. In the absence of an insightful understanding of the underlying principles, procedures are likely to be "adopted, adapted and ritualized" so that the program can "degenerate into a modified activity unrelated to the guiding principles" (Brown & Campione, 1996, p.292) or even into "lethal mutations." The teacher's understanding of these principles is crucial if changes in practice are to become both self-sustaining and generative (Franke, Carpenter, Fennema, Anself & Behrend, 1998), enabling the teacher to adapt the practice to new circumstances or institute it in a new context.

As design of these programs involves the collaborative interaction of educational psychologists with a range of professionals in other disciplinary fields and with expert practitioners, another form of integration emerges from these collaborative processes. Thus there is generally a substantial congruence between the directions advanced from an educational psychology perspective and those promoted by educational reformers in particular subject domains. In a recent study, Stipek (1998) provided evidence of the convergence between instructional practices suggested by motivational research and those promoted by mathematics education reformers, together with evidence of resultant enhanced outcomes in student motivation and in increased skills and conceptual understanding of fractions.

The increasing involvement of educational psychologists with other social scientists and practitioners in designing programs for classroom teaching or for information technology projects has advanced rather more in North American projects than in Australia, but represents a likely direction of further development in the local context. Such contributions also provide evidence of the relevance of psychologically-based design principles in practical contexts.
Although a contemporary psychological perspective provides the basis for the integrations discussed above, there remains considerable diversity in the field of educational psychology. While a majority of educational psychologists accept a constructivist perspective on learning, cognition and motivation, and would agree with the quotation in the introduction to this paper, some would actively disagree with the central assumption in the quotation, and there are major differences amongst those who would agree. Not all have accepted the constructivist philosophy; for instance Anderson, Reder & Simon (1995) have strongly attacked the application of constructivist theory in mathematics education. J. R Anderson is the originator of an approach to problem solving and transfer, highly regarded by many educational psychologists, which has its origins in an empiricist epistemology and the work of behaviourist psychologists. Amongst those who accept the constructivist perspective there are also major philosophical and other differences; Steffe & Gale (1995) identify six different forms of constructivist theory, but Mathews (2000) suggests there are many more. These constructivist theories differ on a range of issues, chief amongst them being their concern with the personal construction of knowledge as opposed to the construction of public bodies of knowledge, and the extent to which they adopt an idealist or realist epistemological position. It is, therefore, possible to categorise constructivist theories (Bredo, 2000) according to their position on these two important dimensions. This somewhat simplified classification demonstrates the considerable diversity amongst constructivist researchers in terms of their underlying philosophical commitments.

The situation is further complicated by the fact that although many educational psychologists have embraced the constructivist view of learning, some have done so without aligning their epistemology with their conception of learning, thus producing what radical constructivist von Glasersfeld (1993) has called "trivial constructivism". The recent work of Richard Mayer, one the most productive educational psychologists in the field (Kiewra & Creswell, 2000), provides an example of this trivial constructivism. While Mayer accepts the active, constructive nature of learning, his work into learning from illustrations and multimedia over the last decade has been based on a dual coding theory of verbal and visual information. Dual coding theory derives from information processing psychology and an empiricist or realist epistemology in which cognitive representations have a direct correspondence with the world from which they are derived. There is, thus, a considerable gap between Mayer's constructivist rhetoric and the psychological theory on which his recent research has been based. In fact, realist assumptions are implicit in many of the terms commonly used in the contemporary psychology perspective, for instance "prior knowledge", "knowledge base" and "transfer of learning."

The diversity in educational psychology has also been evident in the debates (e.g. Anderson, Reder & Simon, 1996; Greeno, 1997) which have taken place over the last decade into fundamental issues of learning and cognition. The debate between Anderson et al (1996) and Greeno (1997), for instance, has revealed major differences over the nature
of learning and cognition, the extent to which learning is situated, and the nature, extent and magnitude of transfer of learning. While these researchers have debated the nature and extent of transfer, yet others (Detterman, 1993) have questioned whether available evidence supports the existence of transfer of learning; others (Beach, 1999; Bransford & Schwartz, 1999) have recently advanced new and more optimistic conceptions of transfer. The current literature also shows diversity concerning the nature of knowledge construction, as well as the existence and role of cognitive representations in learning and cognition; yet others explain learning in terms of human activity systems or enculturation into cultural practices. Learning and cognition are considered by some to involve individual processes, while others consider them to be social and distributed across persons, tools and contexts. While major differences exist amongst researchers contributing to the contemporary psychological perspective, as well as between them and socio-cultural-historical theorists, there are important differences amongst socio-cultural-historical theorists. For instance, there are differences over the importance accorded to activity systems, cultural practices, and discourse. More specifically, socio-cultural-historical researchers (Matusov, 1998; Valsiner, 1998) have debated an "internalisation" model, as opposed to a "participation in cultural practices" model, of learning.

Debate between and among researchers from the contemporary perspective and the emerging socio-cultural-historical perspectives has contributed to the assessment of educational psychology as a dynamic field. These debates have also been productive in that they have led to the clarification of difference, commonality (Anderson, Greeno, Reder & Simon, 2000), and complementarity (Salomon & Perkins, 1998) amongst these perspectives. They have also been important in helping educational psychologists to better understand the philosophical commitments inherent in their theories, and they have opened educational psychologists up to a much wider range of conceptualisations concerning the nature of learning, cognition and motivation.

**RELEVANCE OF EDUCATIONAL PSYCHOLOGY FOR TEACHER EDUCATION**

With the changes in perspective occurring across several decades have come changes in the view of the ways in which educational research may contribute to the improvement of professional practice and teacher education. Earlier views in the 1960s and 1970s saw research as specifying behaviours for teachers to use in the classroom. Teacher behaviours found to be associated with enhanced learning outcomes were prescribed as "Teachers should" recommendations in what came to be termed a "technical skills" approach. The focus was on teacher behaviour without substantial attention to the teacher's beliefs and attitudes underlying their teaching. With the enhanced emphasis on teacher cognition, knowledge and beliefs as components underlying teaching and the concept of the reflective practitioner, there is a change in perspective on the potential role of research in relation to educational practice.
In the light of these new concepts, the role of educational psychology and other social science disciplines in relation to teacher education may best be seen as "to develop integrative explanatory concepts that provide people with a useful framework for considering action under particular circumstances" (Battistich, Solomon, Watson & Schaps, 1997, p.150). Formal research of the kind published in academic journals of educational psychology may provide "new and useful ways of thinking about teaching [which] may eventually enter into teachers' practical reasoning and affect their practices" (Richardson, 1994, p.6). These concepts and empirical evidence on their relation to learning outcomes are thus relevant to the teacher's questioning and reflection about his/her practice. This represents what Richardson (1994) has termed the teacher's "practical inquiry" into their own teaching.

In bringing these concepts into relation with student teachers' experiences, we have clearly moved on from some superseded assumptions reflected in previous teaching of educational psychology. No longer can we assume that "principles, concepts and theories can be learned first out of the context of practice, and then retrieved and applied when a practical problem is encountered" (Anderson et al., 1995, p.143).

They can contribute to the empirical premises of practitioners' practical judgments (Fenstermacher & Richardson, 1993). They have some bearing on the pedagogical content knowledge teachers form and perhaps even more, can make a direct contribution to the concept of pedagogical learner knowledge formulated by Grimmett & MacKinnon (1992). They viewed pedagogical learner knowledge as revolving around "procedural ways in which teachers deal rigorously and supportively with learners" (p.387) to enhance learner-focused teaching. Clearly the yield of research on goal orientations and situated motivation and the general learner-centred psychological principles (Lambert & McCombs, 1998) have a very substantial contribution in framing the teacher's formation of pedagogical learner knowledge.

Educational psychology, arguably, has more to contribute to teacher education today, both preservice and inservice levels, than at any earlier period in the history of the field. The contemporary psychological perspective on learning, cognition and motivation presented in the paper has, of course, great relevance to teacher education. The improved understanding of the role of knowledge in learning and cognition, and of the development of competence and expertise has much to offer teachers; the emphasis on the understanding of learning and cognition in specific knowledge or disciplinary domains is of even greater value to teachers in those disciplines. Likewise, the understanding of motivation from the contemporary psychological perspective provides teachers with insights into motivational processes operating in their students, and of aspects of learning environments likely to motivate students. In general, it can be said that the contemporary perspective provides teachers with valuable insight concerning the design of effective learning environments.
Insights from socio-cultural-historical theories of learning, cognition and motivation also have much to offer teachers in their teaching practice. Although there is considerable debate about these approaches, and much work needs to be done in developing an understanding of their implications for learning in schools, they provide important directions for understanding learning and for school reform. Chief amongst them are the recognition of the social, situated, distributed and tool-supported nature of learning and thinking. In addition to learning about such socio-cultural-historical notions, it is important that teacher education students have the opportunity to experience learning in environments designed to reflect such understandings. The HENRE electronic environment (Walker & Lambert, 1997) was designed and implemented at the University of Sydney with this purpose in mind.

The new views of learning and cognition emerging from socio-cultural-historical theories also have important implications for teacher learning in teacher education programs (Putnam & Borko, 2000). Recognition of the social and constructive nature of learning leads to the conclusion that teacher learning should be inquiry oriented, and that it should take place in learning or discourse communities. Understanding of the situated nature of learning leads to the conclusion that teacher learning should take place, to the extent that this is possible, simultaneously in multiple contexts (Putnam & Borko, 2000), and specifically in both academic and classroom contexts. Additionally, the situative view of learning supports the use of case-based approaches to teacher learning. Cases provide the prospective teacher with the experience of aspects of the situatedness of classroom practice, but in an environment which "afford(s) reflection and critical analysis that is not always possible when acting in the setting" (Putnam & Borko, 2000, p.8). In implementing its inquiry and case based approach, and in its school observation visits, the Master of Teaching program at The University of Sydney has acknowledged the relevance of these new views of learning and cognition for teacher education.

Finally, as Walker (2001) notes, the view of learning as enculturation into cultural practices has much to offer to all engaged in professional education. Seen from this perspective teacher educators assist prospective teachers to move from peripheral or marginal participation in the practices of the profession to central or legitimate participation in these practices. This continuum from peripheral to central participation provides a useful way of understanding the formation of teachers’ professional identities as well as providing a framework for the analysis of their professional development.

NOTE

1. A similar conclusion has been drawn by contributors to a special issue of Educational Psychologist which became available after the oral presentation of this paper. Contributors saw the field as “rich and diverse” (Good & Levin, 2001, p. 69) and providing “an exciting proliferation of useful ideas for teachers and students” (Paris & Paris, 2001, p. 89)
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