Educational Psychology Review, Vol. 16, No. 4, December 2004 (© 2004)

The Conceptual Bases of Study Strategy Inventories

Noel Entwistle[1,2] **and Velda McCune**[1]

This article describes the historical origins and development of a series of well-known study strategy inventories and seeks to identify their conceptual bases. The theories and evidence influencing the development of 6 contrasting instruments are considered before examining empirical evidence of similarities and differences between the measurement instruments. This analysis is tackled in three stages, looking first at inventories developed in the 1970s and 1980s that focused mainly on motivation, study methods, and learning processes. The more recent work that brought in mental models, metacognition, and self-regulation is then introduced, leading to a concluding section that discusses the conceptual bases of the whole set of inventories. The trends found in this research area are described and used to explore the current confusion of overlapping terms describing apparently similar aspects of learning and studying in higher education.

KEY WORDS: approaches to studying; study strategy inventory; student learning; higher education; university.

There has recently been an upsurge in interest in describing and measuring the study strategies of students in higher education. This development can be attributed, in part, to the increasing requirements on universities to justify public funding by demonstrating effectiveness and efficiency in their teaching. Moreover, convincing empirical evidence is increasingly being sought to inform policy decisions, some of which relate to the training

[1]University of Edinburgh, Edinburgh, Scotland, United Kingdom.
[2]Correspondence should be addressed to Noel Entwistle, University of Edinburgh School of Education, Moray House, Paterson's Land, Holyrood Road, Edinburgh, EH8 8AQ, Scotland, United Kingdom; e-mail: noel_entwistle@education.ed.ac.uk.

1040-726X/04/1200-0325/0

and certification of teachers in higher and further education (see, for example, Dearing Committee, 1997).

Research into student learning initially built up evidence about the relationships of motivation and study methods with academic performance (Biggs, 1970, 1976; Brown and Holtzman, 1966; Entwistle and Entwistle, 1970; Entwistle and Wilson, 1977; Schmeck *et al.*, 1977). Subsequently, the link between teaching methods and study strategies has been demonstrated, indicating the indirect influences that faculty members have on students' study behavior. University teachers not only affect academic performance directly by their methods of presenting information and ideas, they also have an often unrecognized impact on the ways in which students study (Biggs, 1999; Prosser and Trigwell, 1999; Ramsden, 1992). It is also clear that the effects of teaching go well beyond the influence of the teacher to include other features of the whole teaching-learning environment, particularly assessment procedures (Biggs, 1999; Entwistle, 1998, 2000).

The recognition of this web of influences has been paralleled by the development of a variety of self-report questionnaires designed to assess differences in how students learn and study. Although these instruments use similar formats and psychometric principles (Likert scales), they were developed for rather different purposes, derived from contrasting theoretical perspectives, and labeled in differing ways. As a result, other researchers or university teachers may find it difficult to determine which instrument best suits their purposes. This article seeks to clarify the conceptual bases of some of the most frequently used and best-documented inventories. Those selected were three from the USA (developed by Schmeck, Weinstein, and Pintrich), and three from other countries (Biggs – Australia, Entwistle – Britain, and Vermunt – Netherlands), together with a new version currently being developed.

This conceptual analysis starts with the historical origins of attempts to measure study methods and strategies and leads to a consideration of four of the earlier inventories. Each instrument is examined in detail using evidence from content analyses of items, factor structures and correlation analyses, along with a consideration of the research aims and theoretical perspectives that informed its design. Then, we look at more recent developments, including a description of the other three inventories, which introduce additional aspects of studying to provide a more complete description. Comparisons among scales from all the inventories are set out in tabular form (Table I) to allow the conceptual bases of the different instruments to be more fully considered. In some cases there is also empirical data to support the equivalence of the subscales and scales; these findings are discussed later in this paper.

DEVELOPING INVENTORY MEASURES OF STUDY STRATEGIES, LEARNING PROCESSES, AND MOTIVATION

The measurement of study methods became possible only after techniques of attitude measurement had been established in the 1930s and more elaborate statistical procedures had been developed (see Fishbein, 1967). Research at that time stressed the importance of the student's own effort and application in determining levels of academic achievement. The responsibility for high attainment was seen as the student's alone, with effort explained in terms of the student's motivation, and application shown through study habits. It was also believed that generally effective study methods could be described. In the USA, these ways of studying were defined by Brown and Holtzman (1966) through one of the first inventories in this field. It contained four subscales: work methods (effective study procedures); delay avoidance (promptness in completing work); teacher approval (favorable opinions about teachers); and educational acceptance (approval of educational objectives).

One of the first British instruments also described generalized "good" study methods but added "academic motivation" (Entwistle and Entwistle, 1970), derived from a competitive and self-confident form of "achievement motivation" (Atkinson and Feather, 1966). Study methods were also found to be related to personality, indicating that students with differing personality and motivation were likely to study in contrasting ways (Entwistle *et al.*, 1974). Even in this early research, the complexity of interrelationships affecting different ways of studying was becoming clear. Extroverts generally had "worse" study methods than introverts, and yet extroverts who had high motivation achieved as much as introverts with the same level of motivation. And anxiety worked in different ways too. Fear of failure was linked to conscientious study methods, high motivation, and high academic performance, and yet anxiety could also be debilitating or associated with ineffective studying, leading to poor grades (Entwistle and Wilson, 1977; Wankowski, 1973).

Biggs (1970), too, had recognized the importance of personality and motivation within studying and had developed an inventory that also drew ideas from the emerging literature in cognitive, information-processing psychology. Information enters the memory system through the senses; the model then suggested a series of processing systems activated through "arousal" (such as interest or anxiety). Information is taken into short-term or working memory and coded so as to make links with prior knowledge within a long-term memory store (Broadbent, 1966). A development of this basic model suggested different levels of processing, distinguishing a surface level, involving "repetition of analyses already carried out," from a deep

level using "a greater degree of semantic or cognitive analysis" (Craik and Lockhart, 1972, pp. 675–676). Around the same time, a similar distinction was made within educational psychology between *rote learning* and *meaningful learning* (Ausubel, 1968), and their distinct memory processes.

Within an early form of Biggs' inventory, test anxiety and academic motivation were scales describing differing forms of arousal. The distinct learning processes were labeled as "fact-rote" and "meaningful learning." This inventory was developed further into 10 subscales that included differing forms of motivation and study strategies within three main domains (Biggs, 1976, 1979). *Utilizing* described studying directed toward obtaining the necessary grades, unquestioning acceptance of the knowledge presented, and anxiety about course work and assessment. *Internalizing* indicated intrinsic interest in the course content, matched by a determination to understand, and an openness to alternative interpretations and values. Finally, *achieving* focused mainly on study skills linked to the need for achievement (Biggs, 1987).

About the same time, Marton and Säljö (1976) introduced the distinction between deep and surface *approaches to learning* and Pask (1976) identified holist and serialist *learning strategies*. Both concepts came from naturalistic experiments in which students were required to learn complex material under controlled conditions. In Marton and Säljö's study, students were asked to read an academic article and to be ready to answer questions on it afterwards. These instructions left the specific demands of the task somewhat ambiguous. The students' descriptions of how they went about studying suggested differences in what was initially described as "levels of processing," with an acknowledged link to Craik and Lockhart. However, the deep learning process was found to be associated with an intention—to understand—while surface learning was accompanied by an intention to reproduce. The coexistence of intention and process suggested that the categories might better be described as "approaches to learning" (Marton and Säljö, 1997) and implied differing ways of interpreting the requirements of the task as it was presented within a specific learning context.

Pask (1976, 1988) also set a learning task for students, but required the students to *understand* the material and be able to explain that understanding to the researcher. In effect, students were being forced to learn deeply, and yet he found that students still tackled the task in distinctly different ways. Again a dichotomy could be discerned, with some students seeing the task in a broad context and in personal terms; they also tended to be impulsive in reaching conclusions (holist strategy). Other students were more comfortable with a step-by-step and impersonal strategy, focusing on the particular task and using the evidence critically and cautiously

(serialist). Where students adopted one or other strategy fairly consistently, Pask saw this as a learning style or preferred learning process (comprehension learning—holist; operation learning—serialist). Extremes of either strategy led to learning pathologies and incomplete understanding.

In the light of these alternative conceptualizations of student learning, Entwistle recast his earlier inventory on the basis of interviews that focused on the everyday experience of studying (Entwistle *et al.*, 1979). Deep and surface approaches were apparent across differing tasks, suggesting that these approaches had developed into relatively consistent study habits. Yet, students also indicated that their approaches varied, depending on the course and the lecturer. In everyday contexts, assessment strongly affects studying, and so an additional category was introduced, namely a *strategic* approach *to studying* (as opposed to learning). The items for the new inventory were derived partly from interview transcripts and partly from the defining features of the categories that Marton and Pask had identified. Factor analyses of the subscales of this new instrument—the *Approaches to Studying Inventory* (*ASI*) (Entwistle and Ramsden, 1983) produced three main factors that brought together three distinctive sets of intentions, motives, and processes of learning and studying. These combinations of subscale scores were described as *orientations to studying*, covering very similar dimensions to those identified by Biggs (see Table I).

The *reproducing orientation* indicated the use of a surface approach, with an emphasis on rote memorizing, and a narrow syllabus-bound attitude, associated with both extrinsic motivation and fear of failure. In contrast, *meaning orientation* indicated an intention to understand for oneself—comprehension learning, relating ideas, and using evidence being all motivated by interest in the ideas presented. The *achieving orientation* involved a strategic approach (being aware of study requirements and making sure they were achieved), linked positively to achievement motivation and negatively to disorganized studying. The final and less well defined orientation—*nonacademic*—indicated negative attitudes to studying and was associated with both of Pask's learning pathologies—improvidence and globetrotting.

Biggs (1987) subsequently adopted Marton's terminology in describing his revised inventory—the *Study Processes Questionnaire* (*SPQ*)—in which deep, surface, and achieving factors were each subdivided into a motive and an accompanying strategy (see Table I). This structure is conceptually similar to that of *ASI* and the relationship has been confirmed empirically in a recent study (Wilson *et al.*, 1996). Biggs argued that the links between motive and strategy in his inventory are not just empirical, but also forms of "psycho-logic"

Table I. Comparison of Scales From Inventories Measuring Study Strategies

ASI	SPQ	ILP-R	LASSI
Meaning orientation	***Deep approach***		
Deep approach (intention)			
Relating ideas	Deep strategy	Deep semantic	Information processing
Comprehension learning		Elab. self-actualization	
		Elaborative episodic	
Use of evidence		Deep critical thinking	
		Self-effic. critical thinking	
			Selecting main ideas
Intrinsic motivation	Deep motive	Motivation - interest	
Reproducing orientation	***Surface approach***		
Surface approach	Surface strategy	Literal memorisation	
		Self-effic. fact retention	
		Self-effic. organization	
Syllabus boundness			
Operation learning		Agentic serial	
		Agentic analytic	
Extrinsic motivation	Surface motive		
Fear of failure		Self-esteem	Anxiety
Achieving orientation	***Achieving approach***		
(-ve Disorganised studying)	Achieving strategy	Methodical study	Time management
Strategic approach			
			Concentration
			Study aids
			Self-testing
			Test-strategies
Achievement motivation	Achieving motive	Motivation - effort	Motivation
Nonacademic orientation			
Negative attitudes			Attitude
Improvidence			
Globetrotting			
Self-rating of performance		Self-efficacy (all three scales)	
		Self-assertion	
		Motivation - responsibility	

in describing how people construe their role in a situation, and in deciding to do something about it. If, in a learning situation, one decides that a pass is sufficient, then it seems to make best sense to rote learn only those facts and details which are judged (or guessed) as most likely to be tested. If one is interested in a particular subject, then it makes sense to find out as much as possible about it, and work out what it all means, regardless of any testing which might ensue. (Biggs, 1987, p. 11)

Table I. Continued

ILS	MSLQ	ALSI
Meaning directed		***Deep approach***
		Intention to understand
Relating and structuring	Elaboration	Relating ideas
Critical processing	Critical thinking	Use of evidence
Concrete processing		
	Organization	
Personally interested orientation	Intrinsic goal orientation	
	Task value	***Monitoring studying***
Self-regulation	Self-regulation	Monitoring study effectiveness)
Construction of knowledge model		Monitoring understanding
		Monitoring generic skills
Reproduction directed		***Surface approach***
Memorizing and rehearsal	Rehearsal	Memorising without understanding
		Unthinking acceptance
		Fragmented knowledge
Analyzing		
Certificate oriented		
Self-test oriented		
	Test anxiety	
External regulation		
Intake of knowledge model		
		Organized studying
	Time/study environment	Time management
		Study organization
		Effort management
		Concentration
Self-regulation	Self-regulation	
	Effort regulation	Effort
	Extrinsic goal orientation	
Undirected		
Ambivalent		
Lack of regulation		Unreflective studying (with surface)
Stimulating education model		
Cooperative learning model	Peer learning/ help seeking	
Application directed		
Concrete processing		
Certificate oriented		
Vocation oriented		
Use of knowledge mental model		
	Self-efficacy	
	Control beliefs about learning	

This "psycho-logic" could be extended to the strategic or achieving approach, by suggesting that, if you really want to do well, you need to know what "counts" in getting high marks and then work hard and systematically to meet those requirements. In spite of this logical association between motive and strategy, subsequent research has queried the empirical

consistency and strength of the connection (for example, Richardson, 2000). Nevertheless, the most recent, short form of the inventory still retains the motive/strategy distinction, although now just on two scales—deep and surface (Biggs *et al.*, 2001).

The combination of ideas derived from cognitive psychology and educational research, which is reflected in the work described so far, was a more general trend (Biggs, 1993). Building on the earlier work, researchers in the USA had also combined measurements of study methods with ideas about learning processes coming from cognitive psychology. Schmeck *et al.* (1977) reported the development of their *Inventory of Learning Processes* (*ILP*), which contained items "generated by applying information processing theory (e.g. Craik and Tulving, 1975) to analyze the activities that can be employed in academic studying" (Schmeck *et al.*, 1991, p. 344). By the mid-1970s, the main information processing dimensions distinguished between *deep* and *elaborative* processing. In Schmeck's inventory, these emerged as distinct factors, along with *fact retention* (which was seen as a judgement of self-efficacy) and *methodical studying*. Drawing on the ideas on student learning embodied in the *SPQ* and *ASI* and extending the notion of self-efficacy into the broader area of academic self-concept, a revised inventory was produced (*ILP-R* – Schmeck *et al.*, 1991). Four main domains were established through factor analysis—academic self-concept (in various forms), reflective processing (both deep and elaborative), "agentic" or conforming serial-reiterative processing, and methodical study. Since then, the scales have been revised again to produce the set of scales shown in Table I (Geisler-Brenstein and Schmeck, 1996), where the elements of motivation and self-efficacy have been disaggregated further, and additional social and emotional aspects have been included. It proved difficult to establish convincing parallels with other inventories for some of the scales within the most recent *ILP-R* on the basis of the evidence currently available; one scale (conventional attitudes) was omitted from Table I through a lack of equivalence to other inventory scales.

The main purpose of the previous inventories was to describe the different ways in which students went about their academic work. In contrast, Weinstein and her colleagues (Weinstein, 1982; Weinstein *et al.*, 1987; Weinstein and Meyer, 1991) linked inventory development directly to a programme of training in study skills. Their *Learning and Study Strategies Inventory* (*LASSI*) incorporated a wide range of the study strategies typically found in training schemes, supplemented by the developing ideas about learning processes. They distinguished rehearsal, elaboration, and organizational learning strategies, which parallel the three main domains identified by Biggs and Entwistle. While the majority of *LASSI* subscales shown in Table I describe aspects of study methods, two of them cover

the areas of information processing (elaborative and relational), and an undifferentiated form of academic motivation.

So far, only the descriptive similarities of the inventories have been mentioned, but there is also empirical evidence of conceptual overlap between some of the scales. Both Entwistle and Waterston (1988) and Speth and Brown (1988) compared *ASI* with *ILP*. Cano-Garcia and Justicia-Justicia (1994) included both of these inventories, and also *LASSI*, in their analysis, which produced three main factors. Based on loadings above 0.45, the first factor described methodical studying (*ILP*) along with time management, concentration, and positive attitudes (all *LASSI*); it correlated negatively with disorganized study methods (*ASI*). The second factor combined positive loadings on surface approach (*ASI*), anxiety (*LASSI*), fear of failure (*ASI*), and improvidence (*ASI*), with negative loadings on deep processing (*ILP*) and test strategies (*LASSI*). The final factor was defined by information processing (*LASSI*), relating ideas (*ASI*) and elaborative processing (*ILP*), and was supported by deep approach and use of evidence (both *ASI*).

These empirical findings, in combination with conceptual considerations and a detailed analysis of individual items, informed the mapping of the inventories presented in Table I in which subscales that are broadly equivalent in conceptual terms are placed in the same row. Where scale names exist for a particular questionnaire, these have also been included (in bold type). This Table draws attention to the overlap between the inventories, and also brings out more clearly several recurring study strategies. The common elements found in all four instruments are the two distinctive types of learning process (deep/reflective/elaborative vs. surface/serial-reiterative/rehearsal), each with associated intentions and motives. The third aspect of studying describes methodical, well-organized studying linked to effort and achievement motivation.

RECENT ADVANCES IN CONCEPTUALIZATION

The earlier inventories had often been used to predict future academic performance and so emphasized the relative stability of study strategies, but approaches to studying are substantially affected by students' perceptions of their teaching-learning environments. Students can also adapt their ways of tackling academic work to circumstances, and more recent inventories have thus emphasized self-conscious reflection on studying, drawing on the ideas of *metacognition* and *self-regulation*. In education, "metacognition" has been used to encompass beliefs and knowledge about learning, as well as monitoring, regulating, and reflecting on, learning (Entwistle, 1997;

McKeachie, 1990; Vermunt, 1996, 1998). The term "self-regulation" overlaps with this grouping, also referring to students monitoring and regulating their learning (Garcia, 1996; Schunk and Zimmerman, 1994; Vermunt, 1996, 1998; Vermunt and van Rijswijk, 1988; Zimmerman, 1989). Conceptualizations of deep and strategic approaches in the earlier inventories implicitly included certain aspects of these ideas; "time management," for example, can be seen as a form of self-regulation. The newer inventories, however, made these dimensions explicit and emphasized their value in encouraging reflection on study processes. This new approach can be seen most clearly in Vermunt's (1998) *Inventory of Learning Styles* (*ILS*) and the *Motivated Strategies for Learning Questionnaire* (*MSLQ*) developed by Pintrich and his colleagues (1991).

MSLQ was developed from a theoretical model that brought together an information processing view of cognition with a social-cognitive perspective on motivation (Pintrich *et al*., 1993; Pintrich and Garcia, 1993, 1994). It was derived from an extensive body of literature, including much of the research already described, and particularly the distinction made by Weinstein and Mayer (1986) between rehearsal, elaboration, and organizational strategies (Pintrich and Garcia, 1991). Development of the *MSLQ* began in the early 1980s with a range of self-report instruments designed to evaluate the effectiveness of a "learning to learn" course, and continued subsequently through psychometric analyses and by investigating predictive relationships with grades (Pintrich *et al*., 1993). Besides being a research and evaluation tool, *MSLQ* has been used by both students and faculty to enhance student learning (Pintrich and Garcia, 1994).

The motivational scales in *MSLQ* describe three main constructs—expectancy, value, and affect. Expectancy refers to students' beliefs about whether they can perform a task and is operationalized in terms of scales describing "self-efficacy" and "control beliefs about learning" (Pintrich *et al.*, 1993). From Table I, it can be seen that the closest parallels with these scales are those of the "self-efficacy" and "personal responsibility" scales from the ILP-R. The value component within *MSLQ* indicates why students engage in particular academic tasks, and is covered partly by contrasting intrinsic and extrinsic "goal orientation" and partly by "task value." This latter scale explores the extent to which students find a particular task interesting, useful, and important. The only scale related to "affect" in *MSLQ* is "test anxiety," which maps on to similar scales in other inventories (Pintrich *et al.*, 1993).

MSLQ contains a number of learning strategies scales, several of which map on to deep, meaningful learning processes. The "rehearsal" scale from *MSLQ* also has parallels in several other inventories, but its explicit and detailed metacognitive and self-regulation elements are

distinctive. The "effort regulation" scale from the *MSLQ* overlaps with items from *LASSI*, and relates to the theme of *volition*, which is emerging as an issue in the higher education literature. Volition can be seen as students' ability to maintain the effort needed to achieve their goals, even in the face of adversity (Wolters, 1998). The work of Volet (1997) considered disengagement versus preoccupation, indicating how well students are able to put study problems into perspective and carry on working. Initiative versus hesitation was also addressed, in terms of students' ability to initiate study activity without external pressure. Volet also measured the amount of effort students intended to put into the course, and their ability to persist with their studies, which suggested that "surface" intentions are not necessarily associated with minimal effort, nor are "deep" intentions always associated with greater effort.

The *Inventory of Learning Styles* has also been used partly as a research tool, and partly to allow students to reflect on, and develop, their ways of learning. The term "style" is used here rather in the same sense that "orientation to studying" was used earlier—to indicate a grouping of inter-related scales. It is seen in terms of "relatively stable, but not unchangeable, ways in which students learn . . . —*not* . . . as an unchangeable personality attribute, but as the result of the temporal interplay between personal and contextual influences" (Vermunt, 1996, p. 25, 29). The initial set of items was derived from analyses of student interviews, together with an examination of existing inventories (particularly those developed by Janssen, 1996) and the more general literature on student learning. The groupings of inventory items were refined through psychometric analyses and, in conjunction with qualitative analyses of the interview transcripts, four "learning styles" were identified (Vermunt, 1996, 1998; Vermunt and van Rijswijk, 1988) (see Table II). This led to a model of studying in which conceptions or mental models of learning, along with learning orientations, influenced study regulation strategies, which in turn affected processing strategies.

Vermunt uses the term *mental model* to describe how students think about the nature of learning. Perry (1970) was the first to describe a developmental trend in students' *epistemological beliefs*, distinguishing between dualist and relativist thinking. Säljö (1979) introduced a similarly broad construct describing differences in adults' conceptions of learning in terms of a hierarchy of five categories, with learning seen as a quantitative increase in knowledge at the simplest level, leading to an interpretative process aimed at understanding reality as its highest category. Vermunt describes similar categories, seeing learning in terms of the "intake of knowledge," the "use of knowledge," and the "construction of knowledge." The other two mental models describe a dependence on "stimulating education" and "cooperative learning," which is associated with "intake of knowledge"

Table II. Four Distinctive Learning Styles (based on Vermunt, 1996, 1998)

Constructs at differing levels of analysis	Meaning directed	Reproduction directed	Application directed	Undirected
Mental model	Construction of knowledge	Intake of knowledge	Use of knowledge	Relying on teachers or other students
Learning orientation	Personal orientation	Certificate and self-test orientations	Vocational orientation	Ambivalent
Regulation of learning	Mostly self-regulation	Mostly external regulation	Both external and internal regulation	Lack of regulation
Cognitive processes	Deep processing	Stepwise processing	Concrete processing	Processing not identified
Affective processes	Intrinsic interest	Fear of forgetting	Practical interest	Low self-esteem and expectation of failure

rather than "construction of knowledge." Subsequent work on conceptions of learning has suggested additional categories, including a higher level — "changing as a person" (Marton *et al.*, 1993; Van Rossum and Schenk, 1984) and additional qualitative variants intended to take account of cultural variations, such as "learning as a duty" (Meyer, 2000a).

In related work, Beaty identified contrasting *learning orientations*, which capture differences in students' reasons for taking courses and are categorized in terms of their orientations (vocational, academic, personal, social) and the type of interest shown (intrinsic or extrinsic) (Beaty *et al.*, 1997). Vermunt incorporated five learning orientations in the *ILS* to explore students' aims and goals in relation to higher education. The "certificate directed" orientation describes a focus on passing examinations or earning credits, whereas the "vocational orientation" involves a focus on the professional application of the content studied. The "personally interested orientation" is similar to scales describing interest or intrinsic orientations in other inventories. The "self-test directed orientation" describes students' testing or proving their capabilities, while the "ambivalent orientation" indicates students' doubts about both the value of their courses and their ability to cope with the work.

Vermunt also included three aspects of regulation in his inventory— "self-regulation," "external regulation," and "lack of regulation." The processing strategies were similar to the process components of the ASI, with "relating and structuring" along with "critical processing" being equivalent to deep, and "analyzing" with "memorizing and rehearsal" being surface. But he also included "concrete processing," not found in other inventories but linked with vocational orientation.

Principal component analyses suggested four groups of subscales within the ILS (Vermunt, 1998). The first component linked self-regulation

combined with deep and concrete processing to a mental model of constructing knowledge. It also incorporated orientations that indicated personal interest in the subject matter, rather than in obtaining certificates. The second component was essentially the reverse of this with loadings on the surface processing scales and external regulation, associated with being certificate-oriented and seeing learning as the intake of knowledge. The remaining components accounted for much less variance. One linked a model of learning as depending on stimulating education and cooperative learning to an ambivalent orientation and a lack of regulation; the other was defined mainly by learning as the use of knowledge and a vocational orientation, together with smaller loadings on concrete processing and being certificate-oriented.

EMERGING CONCEPTUALIZATIONS

It is apparent in all of this research that the development of succeeding generations of inventories has built on the earlier ones. This evolution process is illustrated here by developments in the *ASI*. That instrument incorporated motivation and study methods from an earlier inventory, but was designed mainly to explore the interrelationships between the approaches to learning described by Marton and the learning styles introduced by Pask. Since then, it has been revised to suit the purposes of successive projects, and so exists in several versions which have steadily refined the conceptualization of the original scales and added new scales to keep up with more recent research. Some of these versions appear only in research reports, while others, such as *RASI* (Tait and Entwistle, 1996) and *ASSIST* (Tait *et al.*, 1998), have been described in more accessible forms. The term "orientation" used to describe the factors in the *ASI* was replaced by "approach" as the latter term was being increasingly used in higher education. The most recent inventory— *Approaches to Learning and Studying Inventory* (*ALSI*)—is currently being developed for a project designed to investigate how specific changes in the teaching-learning environment affect students' approaches to studying. The *ALSI* forms part of two more extensive questionnaires, the *Learning and Study Questionnaire* (*LSQ*) and the *Experiences of Teaching and Learning Questionnaire* (*ETLQ*). The component elements of the *ALSI* are shown in Table I; details of its development can be found on the project web site— http://www.ed.ac.uk/etl/publications.html.

ALSI contains five scales. *Deep approach* is defined explicitly by a combination of intention and process, with items covering "intention to understand," together with the associated thinking processes of "relating

ideas" and "use of evidence" that parallel Pask's holist and serialist strategies. "Relating ideas" was broadened to include aspects of constructivist thinking (Phillips, 2000) and an additional scale—*monitoring studying*—was created by combining items describing "monitoring understanding," "monitoring generic skills" and "monitoring study effectiveness." This scale is empirically related to deep approach, but is conceptually distinct, describing metacognitive aspects of learning. In the *surface* domain, the items describe four aspects—"unreflective studying," "unthinking acceptance," "memorizing without understanding" (Meyer, 2000b), and "fragmented knowledge" (Meyer, 1991). The achieving orientation within *ASI* was subsequently labeled "strategic approach" (Tait *et al.*, 1998), but successive changes in the inventory have gradually lost the strategic element in this domain. It is now covered by two scales, one indicating *organized studying* (including time management), and the other describing *effort management* (including concentration).

Within item factor analyses, the majority of items load on only one of the three main domains, but a few do show overlap with another factor in conceptually understandable ways. Some interconnection between domains should not be seen as a weakness; rather it is an inevitability of the seamlessness of human behavior that we are seeking to simplify by creating analytic categories. Looking at the patterns of loadings emerging across the three main factors has helped to see how the underlying processes work together to create effective studying (see Janssen, 1996).

CONCLUDING DISCUSSION

This analysis has concentrated on six distinct inventories widely used in higher education to measure study strategies and associated constructs. The development of inventories in the USA, compared with Europe and Australia, followed rather different tracks in the early stages. The *ILP* and *MSLQ* both had strong roots in the mainstream psychological literature, and the *MSLQ* has kept quite close to those origins by defining many tightly focused concepts that retain their psychological meaning and nomenclature. Although the *SPQ* and the *ASI* both acknowledged links to the psychological literature, they were guided strongly by conceptualizations drawn from educational research. Both these inventories, along with the *ILS*, also grouped subscales into broader composites derived from factor analyses, and having distinctive meanings. As the instruments have been developed further, the distinction between American and non-American conceptualizations has diminished (Biggs, 1993), with the ILS, for example, having several aspects in common with the MSLQ, and the most recent version

of the ASI (ALSI) including elements of both metacognition (monitoring studying) and self-regulation (effort management).

One of the main problems in reading this literature on study strategies for the first time is the different meanings given to the same term, and the existence of different terms apparently covering the same aspect of studying. For example, Entwistle and Ramsden (1983) used the term *orientation to studying*—meaning, reproducing, achieving, and nonacademic—to describe the four factors that emerged from the *ASI*. The term "orientation" implied sufficient breadth to include intention and process, but also remained narrower than either "epistemological beliefs" or "conceptions of learning." Vermunt uses the term, still at a general level, to describe what Beaty *et al.* (1997) referred to as "learning orientations" or contrasting ways of valuing vocational, academic, personal, and social goals in higher education.

The term *approach to learning* was seen by Marton and Säljö (1976) as a specific reaction to the content of the task and the context within which it was experienced. It has, however, also been used to indicate a more consistent or "typical" way of studying across contexts with similar demands (as in *ALSI*). The term *style* has also been given different meanings. Pask (1976, 1988) used it to suggest not just relative consistency over time and context, but also a *preference* in choosing between contrasting learning processes. Messick (1994), in particular, has argued that *style* brings together aspects of personality and ability, and that contrasting poles exist which represent alternative, but equally effective, learning processes: Vermunt, however, uses the term "style" to indicate the collection of related subscales within his inventory.

Researchers' conceptualizations depend on their previous academic training and experience, which lead initially to a particular choice of terminology, and subsequently to the defence of their own conceptual scheme, once it has been buttressed by extensive work and publication. It then becomes extremely difficult to change terminology, or even to bring in additional dimensions, which may threaten the "purity" or elegant simplicity of the original conception. Yet, without some compromise between the competing descriptions and theoretical positions, future researchers will be forced into choices between inventories without necessarily understanding the reasons for the differences. Ideally, we would need factor analyses of the whole set of inventories to provide empirical evidence of what are the main dimensions through which to describe student learning and studying. The total number of items would make any such analysis impracticable, and so we are forced to rely mainly on descriptive similarity or face validity through the detailed analysis of the items within the inventories considered here.

Table I drew on that analysis to suggest that the three main factors, repeatedly found in the separate analyses, are variants of the same underlying dimensions. The close similarity between *ASI* (or *ALSI*) and *SPQ* is already accepted. While there is less equivalence of subscales between those and the ILP-R, the three main dimensions remain essentially equivalent; the main difference lies in an extensive exploration of differing forms of self-efficacy and esteem which merge into the affective area. *LASSI* concentrates on the aspects of studying that are "coachable" through workshops, but the inventory also contains subscales covering distinct types of information processing that have a descriptive similarity to factors found in other inventories. *ILS* emphasizes study regulation but the two most prominent factors—meaning directed and reproducing directed—map directly on to deep and surface respectively, using items at different levels of analysis. It has no explicit motivational items, nor does it cover effort or study organization, and so the achieving dimension is lacking. However, the "application directed" style represents a potentially valuable addition to the lexicon and conceptualization of study strategies by suggesting a more practical way of thinking, linked to the vocational and certificate orientations. Finally, *MSLQ* concentrates predominantly on the positive "deep" and "self-regulation" aspects of studying, with just two elements that might be seen as in the "surface" domain. It does, however, draw attention to components of motivation and self-regulation to indicate how these more specific aspects affect studying. However, perhaps the most important addition in this inventory (and *ILS*) is the more explicit recognition of collaboration within studying. Most of the inventories describe studying essentially as a solitary activity affecting the individual. In higher education today, collaboration of various forms is being given greater prominence, and this should now be reflected in the descriptions of study strategies.

Looking through all the inventories there is a surprising lack of emphasis on emotion in learning. The positive forms are implicit in some of the scales describing academic interests and motivation, but only a negative form—anxiety or fear of failure—has been developed explicitly. Again, current work in educational psychology (see, for example, Boekerts *et al.*, 2000), has begun to trace the interplay between cognition and emotion in relation to self-regulation, and that might be a way of extending inventories in the future. However, much as the wealth of interesting but closely inter-related aspects of studying tempt scale constructors to cover them all, parsimony urges caution both theoretically and practically. The longer the inventory, the less care students take in completing it, and the less likely are staff to use it. In the British context, the maximum acceptable length is generally around 75 items, while 50 items is more manageable, taking about

15 min to complete and producing little loss in reliability for three or four main scales.

There are continuing debates in the literature about how many dimensions are really needed. Richardson (2000), in his extensive review of the psychometric properties and usage of study strategy inventories, sees no advantage in including the achieving/strategic dimension. To other researchers, the overlap between deep and strategic suggests a single scale of effective studying, while "surface" and "nonacademic" can also be seen as simply the negative ends of "deep" and "strategic." However, this analysis of six distinct inventories leaves the strong impression that at least three dimensions are required to cover the main elements of variance found in studying. Conceptually, the "deep" approach, with its emphasis on learning processes to develop understanding, can be clearly distinguished from the self-regulation of study strategies allied to effort and concentration. Of course, the combination of these is bound to enhance the quality of learning outcomes, and so empirical relationships are to be expected. While there are negative correlations between factors describing deep and surface approaches, these are typically quite low, and there are distinct learning processes associated with each approach. A possible fourth dimension, mentioned in discussing the *ILS*, centres on vocational orientation and concrete processing, perhaps distinguishing the practical from the theoretical, and this grouping of scales could prove to be a valuable way of describing differences in study strategies in professional courses in higher education.

Finally, the validity of any inventory describing study strategies depends on relative consistency in ways of studying. Inventories have been used to predict future academic performance, and so have anticipated relative stability over substantial time intervals. But they have also been used to detect changes attributable to a particular approach to teaching, thus accepting the influence of the teaching-learning environment on the processes of learning and studying. Study strategies must thus be somewhat consistent, but also affected by the specific situation or context. Pervin (2001) reached a similar conclusion from his extensive research on personality.

> Over the years, I have become increasingly impressed with the contextualization of behavior and the idiosyncratic nature of individual perceptions of situations. I have been struck with the importance of cultural differences and taken seriously the suggestions . . . that meaning is all-important . . . and that meaning is highly idiosyncratic . . . At the same time, . . . I believe that regularities can be found . . . —(that) a science of personality may need to be based on principles of person-system functioning . . . (Moreover,) the person has a construct system, providing some stability (i.e. structure), but the system also is dynamic in that different constructs apply to different situations and become more or less important in different contexts. (pp. 313–315).

Learning and studying has surely to be considered in similarly complex terms, with study strategy inventories making a contribution to the investigation of the principles and general construct systems relating to person–environment functioning. At the same time, the limitations of this methodology have to be accepted, and alternative approaches to research used to capture change and individuality more fully.

REFERENCES

Atkinson, J. W., and Feather, N. T. (1966). *A Theory of Achievement Motivation*, Wiley, New York.

Ausubel, D. P. (1968). *Educational Psychology: A Cognitive View*, Holt, Rinehart and Winston, New York.

Beaty, L., Gibbs, G., and Morgan, A. (1997). Learning orientations and study contracts. In Marton, F., Hounsell, D. J., and Entwistle, N. J. (eds.), *The Experience of Learning* (2nd edn.), Scottish Academic Press, Edinburgh, UK, pp. 72–88.

Biggs, J. B. (1970). Faculty pattern in study behaviour. *Aust. J. Psychol.* 22: 161–174.

Biggs, J. B. (1976). Dimensions of study behaviour: Another look at a.t.i. *Br. J. Educ. Psychol.* 46: 68–80.

Biggs, J. B. (1979). Individual differences in study processes and the quality of learning outcomes. *Higher Educ.* 8: 381–394.

Biggs, J. B. (1987). *Student Approaches to Learning and Studying*, Australian Council for Educational Research, Melbourne, Australia.

Biggs, J. B. (1993). What do inventories of students' learning processes really measure? A theoretical review and clarification. *Br. J. Educ. Psychol.* 63: 3–19.

Biggs, J. B. (1999). *Teaching for Quality Learning at University*, Open University Press, Buckingham, UK.

Biggs, J. B., Kember, D., and Leung, D. Y. P. (2001). The Revised Two Factor Study Process Questionnaire: R-SPQ-2F. *Br. J. Educ. Psychol.* 71: 133–149.

Boekerts, M., Pintrich, P., and Zeidner, M. (eds.). (2000). *Handbook of Self-Regulation*, Academic Press, San Diego, CA.

Broadbent, D. E. (1966). The well-ordered mind. *Am. Educ. Res. J.* 3: 281–295.

Brown, W. F., and Holtzman, W. H. (1966). *Manual of the Survey of Study Habits and Attitudes*, Psychological Corporation, New York.

Cano-Garcia, F. C., and Justicia-Justicia, F. J. (1994). Learning strategies, styles and approaches: An analysis of their interrelationships. *Higher Educ.* 27: 239–260.

Craik, F. I. M., and Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *J. Verbal Learn. Verbal Behav.* 11: 671–684.

Craik, F. I. M., and Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. *J. Exp. Psychol. (Gen.)* 104: 268–294.

Dearing Committee. (1997). *Higher Education in the Learning Society*, National Committee of Inquiry into Higher Education (also HMSO), London.

Entwistle, N. J. (1997). Metacognitive and strategic awareness of learning processes and understanding. In *Paper presented at the 7th EARLI conference*, Athens, Greece.

Entwistle, N. J. (1998). Improving teaching through research on student learning. In Forest, J. J. F. (ed.), *University Teaching: International Perspectives*, Garland, New York, pp. 73–112.

Entwistle, N. J. (2000). Approaches to studying and levels of understanding: The influences of teaching and assessment. In Smart, J. C. (ed.), *Higher Education: Handbook of Theory and Research* (Vol. XV), Agathon, New York, pp. 156–218.

Entwistle, N. J., and Entwistle, D. M. (1970). The relationships between personality, study methods and academic performance. *Br. J. Educ. Psychol.* 40: 132–141.
Entwistle, N. J., Hanley, M., and Hounsell, D. J. (1979). Identifying distinctive approaches to studying, *Higher Educ.* 8: 365–380.
Entwistle, N. J., and Ramsden, P. (1983). *Understanding Student Learning*, Croom Helm, London.
Entwistle, N. J., Thompson, J. B., and Wilson, J. D. (1974). Motivation and study methods. *Higher Educ.* 3: 379–396.
Entwistle, N. J., and Waterston, S. (1988). Approaches to learning and levels of processing: A comparison of inventories derived from contrasting theoretical bases. *Br. J. Educ. Psychol.* 58: 258–265.
Entwistle, N. J., and Wilson, J. D. (1977). *Degrees of Excellence: The Academic Achievement Game*, Hodder and Stoughton, London.
Fishbein, M. (1967). *Readings in Attitude Theory and Measurement*, Wiley, New York.
Garcia, T. (1996). Self-regulation: An introduction. *Learn. Individ. Differences* 8: 161–163.
Geisler-Brenstein, E., and Schmeck, R. (1996). The revised inventory of learning processes: A multifaceted perspective on individual differences in learning. In Birenbaum, M., and Dochy, F. (eds.), *Alternatives in Assessment of Achievements, Learning Processes, and Prior Knowledge*, Kluwer Academic, Norwell, MA.
Janssen, P. J. (1996). Studaxology: The expertise students need to be effective in higher education. *Higher Educ.* 31: 117–141.
Marton, F., Dall'Alba, G., and Beaty, E. (1993). Conceptions of learning. *Int. J. Educ. Res.* 19: 277–300.
Marton, F., and Säljö, R. (1976). On qualitative differences in learning: I. Outcome and process. *Br. J. Educ. Psychol.* 46: 4–11.
Marton, F., and Säljö, R. (1997). Approaches to learning. In Marton, F., Hounsell, D. J., and Entwistle, N. J. (eds.), *The Experience of Learning* (2nd ed.), Scottish Academic, Edinburgh, UK, pp. 39–58.
McKeachie, W. J. (1990). Research on college teaching: The historical background. *J. Educ. Psychol.* 82: 189–200.
Messick, S. (1994). The matter of style: Manifestations of personality in cognition, learning and teaching. *Educ. Psychol.* 21: 121–136.
Meyer, J. H. F. (1991). Study orchestration: The manifestation, interpretation and consequences of contextualised approaches to studying. *Higher Educ.* 22: 297–316.
Meyer, J. H. F. (2000a). An overview of the development and application of the Reflections on Learning Inventory (RoLI). In *Paper presented at the invitational RoLI Symposium*, Imperial College, London, July 25.
Meyer, J. H. F. (2000b). Variation in contrasting forms of "memorising" and associated observables. *Br. J. Educ. Psychol.* 70: 163–176.
Pask, G. (1976). Styles and strategies of learning. *Br. J. Educ. Psychol.* 46: 128–148.
Pask, G. (1988). Learning strategies, teaching strategies and conceptual or learning style. In Schmeck, R. (ed.), *Learning Strategies and Learning Styles*, Plenum, New York, pp. 83–100.
Perry, W. G. (1970). *Forms of Intellectual and Ethical Development in the College Years: A Scheme*, Holt, Rinehart and Winston, New York.
Pervin, L. A. (2001). Persons in context: Defining the issues, units, and processes. In Collis, J. M., and Messick, S. (eds.), *Intelligence and Personality: Bridging the Gap in Theory and Measurement*, Erlbaum, Mahwah, NJ, pp. 307–317.
Phillips, D. C. (ed.). (2000). *Constructivism in Education*, National Society for the Study of Education, Chicago, IL.
Pintrich, P. R., and Garcia, T. (1991). Student goal orientation and self-regulation in the college classroom. In Maehr, M. L., and Pintrich, P. R. (eds.), *Advances in Motivation and Achievement: Vol. 7. Goals and Self-regulatory Processes*, JAI, Greenwich, CT, pp. 371–402.

Pintrich, P. R., and Garcia, T. (1993). Intra-individual differences in students' motivation and self-regulated learning. *Ger. J. Educ. Psychol.* 7: 99–107.
Pintrich, P. R., and Garcia, T. (1994). Self-regulated learning in college students: Knowledge, strategies and motivation. In Pintrich, P. R., Brown, D. R., and Weinstein, C.-E. (eds.), *Student Motivation, Cognition and Learning*, Erlbaum, Hillsdale, NJ, pp. 113–134.
Pintrich, P. R., Smith, D. A. F., Garcia, T., and McKeachie, W. J. (1991). *A Manual for the Use of the Motivated Strategies for Learning Questionnaire (MSLQ)*, National Center for Research to Improve Postsecondary Teaching and Learning, Ann Arbor, MI.
Pintrich, P. R., Smith, D. A. F., Garcia, T., and McKeachie, W. J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educ. Psychol. Meas.* 53: 801–813.
Prosser, M., and Trigwell, K. (1999). *Understanding Learning and Teaching: The Experience of Higher Education*, SRHE/Open University Press, Buckingham, UK.
Ramsden, P. (1992). *Learning to Teach in Higher Education*, Kogan Page, London.
Richardson, J. T. E. (2000). *Researching Student Learning: Approaches to Studying in Campus-Based and Distance Education*, SRHE/Open University Press, Buckingham, UK.
Säljö, R. (1979). *Learning in the Learner's Perspective. I. Some Common-sense Conceptions* (Report 76), University of Gothenburg, Department of Education, Gothenburg, Sweden.
Schmeck, R., Geisler-Brenstein, E., and Cercy, S. P. (1991). Self-concept and learning: The revised inventory of learning processes. *Educ. Psychol.* 11: 343–362.
Schmeck, R., Ribich, F., and Ramanaiah, N. (1977). The development of a self-report inventory for assessing individual differences in learning processes. *Appl. Psychol. Meas.* 1: 413–431.
Schunk, D. H., and Zimmerman, B. J. (eds.). (1994). *Self-Regulation of Learning and Performance: Issues and Educational Applications*, Erlbaum, Hillsdale, NJ.
Speth, C., and Brown, R. (1988). Study approaches, processes and strategies: Are three perspectives better than one? *Br. J. Educ. Psychol.* 58: 247–257.
Tait, H., and Entwistle, N. J. (1996). Identifying students at risk through ineffective study strategies. *Higher Educ.* 31: 97–116.
Tait, H., Entwistle, N. J., and McCune, V. (1998). ASSIST: A reconceptualisation of the Approaches to Studying Inventory. In Rust, C. (ed.), *Improving Student Learning: Improving Students as Learners*, Oxford Centre for Staff and Learning Development, Oxford.
Van Rossum, E. J., and Schenk, S. (1984). The relationship between learning conception, study strategy and learning outcome. *Br. J. Educ. Psychol.* 54: 73–83.
Vermunt, J. D. (1996). Metacognitive, cognitive and affective aspects of learning styles and strategies: A phenomenographic analysis. *Higher Educ.* 31: 25–50.
Vermunt, J. D. (1998). The regulation of constructive learning processes. *Br. J. Educ. Psychol.* 68: 149–171.
Vermunt, J. D., and van Rijswijk, F. A. W. M. (1988). Analysis and development of studentsí skill in self-regulated learning. *Higher Educ.* 17: 647–682.
Volet, S. E. (1997). Cognitive and affective variables in academic learning: The significance of direction and effort in students' goals. *Learn. Instr.* 7: 235–254.
Wankowski, J. A. (1973). *Temperament, Motivation and Academic Achievement*, Birmingham University Educational Survey, Birmingham, UK.
Weinstein, C.-E. (1982). Training students to use elaboration learning strategies. *Contemp. Educ. Psychol.* 7: 301–311.
Weinstein, C.-E., and Mayer, R. (1986). The teaching of learning strategies. In Wittrock, M. C. (ed.), *Handbook of Research on Teaching* (3rd edn.), Macmillan, New York, pp. 315–327.
Weinstein, C.-E., and Meyer, D. K. (1991). Cognitive learning strategies and college teaching. In *New Directions for Teaching and Learning* (45), Jossey-Bass, San Francisco.
Weinstein, C.-E., Schulte, A., and Palmer, D. (1987). *Learning and Study Strategies Inventory (LASSI)*, H. and H., Clearwater, FL.

Wilson, K. L., Smart, R. M., and Watson, R. J. (1996). Gender differences in approaches to learning in first year psychology students. *Br. J. Educ. Psychol.* 66: 59–71.
Wolters, C. A. (1998). Self-regulated learning and college students' regulation of motivation. *J. Educ. Psychol.* 90: 224–235.
Zimmerman, B. J. (1989). Models of self-regulated learning and academic achievement. In Zimmerman, B. J., and Schunk, D. H. (eds.), *Self-Regulated Learning and Academic Achievement: Theory, Research and Practice*, Springer-Verlag, New York, pp. 1–26.