CHANGES OVER TIME IN LEARNING AND SELF-REGULATION STRATEGIES OF BEGINNING AND MATURE-AGE UNIVERSITY STUDENTS: IMPLICATIONS FOR LEARNING FOR LIFE

Barbara de la Harpe and Alex Radloff RMIT University

ABSTRACT

This paper considers the findings from two studies that looked at the learning strategies that beginning and mature-age students use, to explore the implications for learning and teaching. We argue that, for students to be well prepared for lifelong learning, they need to experience learning environments that encourage and support effective learning.

BACKGROUND TO EFFECTIVE LEARNING

University students need to be effective learners in order to be successful in lifelong learning. For some time now, universities have identified the critical importance of learning how to learn as an outcome of a university education. As the Australian Vice-Chancellor's Committee (AVCC) *Guidelines for Effective Teaching* state, "university teaching aims to enable students to reach their highest possible level of learning ... and to prepare them for life-long learning. In practice this means that staff collectively are responsible for ensuring that the design, management and teaching of their subjects facilitate effective learning by their students" (AVCC, n.d.).

Research into how students approach their learning, and the strategies they use, has been conducted for over thirty years now. The findings from this work point to the value of effective learning strategies for successful study. One of the major characteristics of effective learners is that they have, and use, a repertoire of strategies (Candy, Crebert, and O'Leary, 1994; Sternberg, 2001; Weimar, 2002); that is, they use strategies that foster and promote deep learning (Biggs, 2003).

Broadly speaking, the term "learning strategies" refers to any sequence of activities that learners engage in in order to achieve learning goals. These are typically categorized into cognitive, metacognitive, and adaptive strategies. Cognitive strategies include rehearsal, organization, and elaboration (Pintrich, Smith, Garcia, and McKeachie, 1991; Weinstein and Mayer, 1986). Rehearsal strategies enhance attention and the encoding of information; organizational strategies help with the selection and connection of information; and elaboration strategies help with storage of information in the long term memory by building connections between new and existing information. Metacognitive strategies include knowledge and control of learning. Being metacognitive about learning means that students have a thorough knowledge of the factors that facilitate their learning; are aware of the effect that specific learning strategies might have on their learning; and are able to control their learning through the use of planning, monitoring, adapting, and evaluating learning (Boulton-Lewis, 1994; Hartman, 2001; Schraw, 2001). Adaptive strategies include managing time and study environment, effort regulation, peer learning, and help seeking. Use of these strategies helps learners to manage their environments and available resources and to achieve learning goals despite obstacles (McKeachie, Pintrich, Lin, and Smith, 1986; Newman, 2002).

There is some evidence that the kinds of learning strategies that students use may be linked to the approach to learning they adopt when they study (Biggs, 2003). For example, students who use a deep approach to learning, that is, who attempt to understand and to determine the meaning of the material they are studying; may be more likely to use elaboration and organization learning strategies. On the other hand, students who only use a surface approach, that is who concentrate on memorising for reproducing rather than memorising for understanding, may be more likely to use rehearsal strategies. The kinds of learning strategies that learners use are also linked to the quality of their learning outcomes. Students' use of learning strategies fosters their cognitive engagement in learning, leads to effective learning, and may result in higher levels of academic performance (Archer, 1998; Gibbs and Simpson, 2003; Hattie, Biggs, and Purdie, 1996; Janssen, 1996; Tate and Entwistle, 1996; Zimmerman, 1998).

The development and use of learning strategies is influenced by the learning context at a number of levels. At the institutional level, whether the orientation is learner-centred or content-centred can influence institutional climate and student expectations and behaviours (Pascarella and Terenzini, 1991; Ramsden, 1998; Tagg, 2003). At the discipline level, the quality and perceived relevance of the curriculum, instruction, and assessment – and the associated student – workload can influence how learners view learning, the strategies they use, and their motivation to use them (Brand, 1994; Chambers, 1992; Seymour, 1995).

Below, we describe the learning strategies (cognitive, metagcognitive, and adaptive) that two groups of students used, and how these strategies changed over time, based on data from two studies – one looking at changes in learning strategy use in beginning students during the first year of study, and the other looking at changes in mature-age students during two years of study.

STUDENTS' USE OF LEARNING STRATEGIES

The two studies from which we draw our data investigated the learning of students enrolled in education, and/or nursing, undergraduate courses. Both studies gathered data on student use of learning strategies during their course of study; were longitudinal; adopted a naturalistic approach; and used both quantitative and qualitative methodologies (de la Harpe, 1998; Radloff, 1997).

In the first study, all first-year Education students completed the Motivated Strategies for Learning Questionnaire (MSLQ). The MSLQ is an 81-item, self-report questionnaire designed to assess university students' motivational orientations and their use of different learning strategies (Pintrich et al., 1991). Data reported here are based on responses to only the learning and resource management (adaptive) strategies sections of the MSLQ completed at the beginning and end of the first semester (n=85)and the end of the second semester (n=46) by a subset of students who did not participate in a learning support program in either semester (hence the difference in sample sizes). Students were predominantly school leavers and aged less than 21. In addition, samples of these students were interviewed at the end of the first semester (n=6) and at the end of second semester (n=8) about the learning strategies that they used when doing their set tasks. Interviews

were semi-structured and included a focus on students' use of learning strategies, and a question asking students to describe how they undertook particular learning and assessment tasks.

In the second study, Education and Nursing students (*N*=34) completed, at the beginning and end of two years of study, the Study Process Questionnaire (SPQ). The SPQ is a 42-item, self-report survey designed to assess student motives and strategies for learning in terms of surface, deep, and achieving approaches (Biggs, 1987). The participants in this study had vocational qualifications and were aged 30 and above. In addition, all the students were interviewed at the beginning of the first semester and at the end of the second semester of study. Semi-structured interviews included a focus on student goals for learning and student learning strategies.

Questionnaire data were analysed using the Statistical Package for the Social Sciences (SPSS). In the first study, pre-post MSLQ scores were used to calculate effect sizes following Carver (1996). Effect sizes greater than 0.20 were deemed educationally significant. In the second study, pre-post SPQ deep, surface, and achieving-approach subscores – as well as composite SPQ scores – were compared using *t*-tests for paired samples. Interviews were analysed using NUDIST. Analysis of data indicated that there were some common outcomes as well as some differences for the beginning and mature-age student groups.

For the beginning students, as shown in Table 1, by the end of the first semester of study, there were significant decreases in their reported use of organization, time and study-environment, effort-regulation, and help-seeking strategies. In addition, their reported use of elaboration, metacognitive self-regulation, and peer-learning strategies all decreased, although the change was not significant. The reported use of rehearsal and critical-thinking strategies increased, but not significantly.

By the end of the second semester, there was a significant decrease in reported use of time and study-environment strategies. Reported use of rehearsal, elaboration, critical-thinking, and metacognitive self-regulation strategies either remained the same or decreased, but not significantly. In addition, reported use of peerlearning strategies increased significantly while use of organization, effort regulation and help seeking increased but not significantly. Further, interview responses from students at the end of both the first and the second semesters supported the above findings.

In terms of the learning strategies students used most and least often, at the beginning of study students reported using organization and elaboration strategies the most and peer-learning and critical-thinking strategies the least. By the end of the second semester of study, students again reported using organization and elaboration strategies the most, with peerlearning and effort-regulation strategies being the least used.

	Effect size	
Strategy	Sem. 1	Sem. 2
rehearsal	0.18	-0.10
elaboration	-0.02	-0.01
organization	-0.40 ^a	0.19
critical thinking	0.07	-0.14
metacognitive self-reg.	-0.11	-0.05
time & study environ.	-0.36 ^a	-0.22 ^a
effort regulation	-0.32 ^a	0.12
peer learning	-0.11	0.21 ^a
help seeking	-0.25 ^a	0.18

^{*a*} *Effect sizes greater than 0.20 were deemed educationally significant.*

Table 1. Pre - post effect sizes for learning and adaptive strategy use at the end of first semester (n=85) and at the end of second semester (n=46) for beginning students.

For mature age students, as shown in Table 2, students' motives and strategies for learning did not change significantly over two years of study, despite there being a small increase in the deep approach and decreases in the other two approaches.

SPQ scale		pre	post
Surface Approach (SA)	М	45.21	42.68
	SD	9.86	6.84
Deep Approach (DA)	М	47.09	48.59
	SD	6.16	7.46
Achieving Approach (AA)	М	44.59	42.47
	SD	7.42	8.95
Deep plus Achieving	М	91.74	91.15
Approach (DAA)	SD	12.28	15.41

Table 2. Comparison of mean SPQ scores for matureage students the beginning and end of study (N = 34).

Based on interview data, for mature age students – by the end of second semester, there were increases in their reported use of cueseeking, help-seeking, organization, and elaboration strategies, and decreases in rehearsal strategies. In terms of the learning strategies students used most and least often, at the beginning of study students reported using rehearsal and metacognitive self-regulation strategies the most, and cue-seeking and helpseeking strategies the least. By the end of the second semester of study, students reported using help-seeking and organization strategies the most, and time and study-environment, and elaboration strategies the least.

The use of learning strategies reported by students appeared to be related to the context specifically, the type of assessment task set. Interview data for beginning students showed that, when completing the assessment tasks (i.e., the three short-answer tests, a multiple-choice examination, and written reports - two in first semester and one in second semester), the overwhelming majority of students reported using rehearsal strategies the most. Students were more likely to report using elaboration and organization strategies when completing the report writing task. In addition, few or no students reported using peer-learning, helpseeking, effort-regulation, and time and studyenvironment strategies, other than when completing the report writing task. In fact, many students, especially when studying for the examination, reported that they did not cover all the set material, did not put enough time and

effort into studying, or resorted to cramming, as illustrated by the following comments:

I did not bother to read it all because it was just so much, there was no point. It was better to learn specific points. (S_116)

I did more cramming for the examination, more than the other ones [tests]. When you're cramming you know that you're not studying properly and you just know that there could be a better way of doing it, but it is too hard to do. (S_106)

Overall, by the end of the first year of study, for cognitive strategies, both groups of students reported decreased use of rehearsal strategies and increased use of organization strategies. In terms of adaptive strategies, both reported increased use of help-seeking and peer-learning strategies and a marked decrease in the use of time and study-environment strategies. Further, mature age students' approach to learning did not become any deeper over time, which is surprising given the decrease in the use of rehearsal strategies. Neither group reported significant or increased use of metacognitive strategies. In addition, adaptive strategies were consistently used the least; in particular, for beginning students, peer-learning, help-seeking and effort-regulation strategies; and for mature age students, cue seeking, help seeking, and time and study environment. Finally, the findings suggest that changes in the use of learning strategies may be sensitive to the learning context and, particularly, assessment tasks.

Given that the findings reported here have come from two separate studies, with their different contexts, comparisons based on age alone, or generalizations about beginning and mature-age students, must be made with caution.

ENCOURAGING AND SUPPORTING LEARNING FOR LIFE

The findings presented above have implications for supporting effective student learning. These implications relate to the learning strategies that students use, the importance of context in promoting learning strategy use, and the opportunities for designing learning environments that will encourage effective learning for life.

There is evidence that students may not be well prepared for university study (Cornford, 2002). Many students may not consistently use strategies associated with effective learning – particularly when they first come to university. Indeed, students may not necessarily become more effective learners over time, and may graduate without having developed a repertoire of learning strategies that support learning for life. Such findings are not limited to younger students.

Further, despite evidence of the importance of metacognitive and adaptive learning strategies for effective learning, students' minimal use of strategies to manage time and study environment is cause for concern. It appears that students may be able to progress without needing to use metacognitive and adaptive strategies. As the latest national, first-year experience study (Krause, Hartley, James and McInnis, 2005) reports, almost 10% of students said that they came to class unprepared or did not attend at all, with school leavers being more likely than older students to report this behaviour. In addition, less than a third of students mentioned working collaboratively with peers.

As already shown, learning strategy use is sensitive to context. In particular, assessment tasks make a difference to how students approach learning and the learning strategies they use (Entwistle, 2000: Scouller, 1998; Scouller and Chapman, 1999). Students are more likely to use surface approaches when preparing for examinations regardless of the form these take (i.e., multiple-choice, short answer,r or essay). Moreover, different learning activities are linked to different learning strategies. For example, where group projects are set, students are more likely to engage in peer learning in and out of class (Krause et al., 2005).

Further, the kinds of learning, metacognitive and adaptive strategies that learners use are linked to the quality of their learning outcomes. First-year students who reported greater use of elaboration, managing time and study environment, and effort regulation, were more likely to do well in their course (de la Harpe, 1998). For mature-age students, while the relationship between reported use of learning strategies and achievement was not clear-cut, it appeared that grades increased in line with increased use of organization strategies and cue and help seeking (Radloff, 1997). Given that students' use of appropriate learning strategies is linked to effective learning, and is sensitive to the learning context, there are promising opportunities to promote effective learning through thoughtful design of learning environments appropriate to the discipline.

University teachers using a constructivist pedagogy can create a context for the development and use of effective learning strategies by designing courses with not only appropriate levels of cognitive challenge, but also social and emotional support. they can achieve this by carefully planning both curricula, and learning and assessment activities. Such courses could include opportunities for learners to set and evaluate appropriate goals; develop positive beliefs about themselves and about learning; and identify and use effective strategies to plan, monitor, adapt, and evaluate the task, themselves, and the learning environment, and engage in collaborative learning with peers on authentic tasks (Fink, 2003; Weimar, 2002). Moreover, courses are most likely to help learners develop and use appropriate learning strategies if they are taught by the discipline teacher (de la Harpe and Radloff, 2000), involve instructional and assessment practices that provide choice about what and how to learn (Zimmerman, 1998), engage students in learning (Kuh, 1996), and encourage them to achieve high grades through use of a wide repertoire of learning strategies.

The work of university teachers in designing effective learning environments that underpin lifelong learning will flourish best in institutions that are committed to aligning the system to "produce learning" (Tagg, 2003) and that pay close attention to the human environment; that is, the physical layout, the characteristics of people, and the organizational structures – and how these are perceived by those experiencing them (Strange and Banning, 2001).

All students need and deserve every opportunity to become successful lifelong learners. University study can provide a solid foundation for the development of effective learning strategies that students can continue to use when learning throughout life.

REFERENCES

Archer, J. (1998). *Turning motivation into self regulation.* Paper presented at the annual meeting of the Australian Association for Research in Education, November 29 – December 3, Adelaide, South Australia.

Australian Vice-Chancellor's Committee. (n.d.). Guidelines for Effective University Teaching. Retrieved from http://www.gu.edu.au/centre/gihe/teachinglearning/po

http://www.gu.edu.au/centre/gihe/teachinglearning/portfolios/portfolio_avcc.htm

Biggs, J. (1987). *Student approaches to learning and studying*. Hawthorn, Victoria: ACER.

Biggs, J. B. (2003). *Teaching for quality learning at university* (2nd ed.). Buckingham: SRHE and Open University Press.

Boulton-Lewis, G. (1994). Tertiary students' knowledge of their own learning and a SOLO taxonomy. *Higher Education*, *28*, 387-402.

Brand, D. L. (1994). Those students who could have but didn't - early attrition from college science. *Journal of College Science Teaching*, *24*(3), 89-106.

Candy, P., Crebert, G., & O'Leary, J. (1994). Developing lifelong learners through undergraduate education. (Commissioned Report No. 28 for NBEET). Canberra: Australian Government Publishing Service.

Carver, R. P. (1996). The case against statistical significance testing, revisited. *Journal of Experimental Education*, 61(4), 287-292.

Chambers, E. (1992). Work-load and the quality of student learning. *Studies in Higher Education*, *17*(2), 141-153.

Cornford, I. R. (2002). Learning-to-learn strategies as a basis for effective lifelong learning. *International Journal of Lifelong Education*, 21(4), 357-368.

de la Harpe, B. (1998). Design, implementation and evaluation of an in-context learning support program for first year Education students and its impact on educational outcomes. Unpublished doctoral dissertation, Curtin University of Technology, Western Australia.

de la Harpe, B., & Radloff, A. (2000) Informed teachers and learners: The importance of assessing the characteristics needed for lifelong learning. *Studies in Continuing Education*, 22(2), 169-182.

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

Fink, L. D. (2003). *Creating significant learning experiences. An integrated approach to designing college courses.* San Francisco: Jossey-Bass.

Gibbs, G., & Simpson, C. (2003). Does your assessment support your students' learning? *Journal* of Learning and Teaching in Higher Education, 1(1).

Hartman, H. J. (2001). Developing students' metacognitive knowledge and skills. In H. J. Hartman (Ed.), *Metacognition in learning and instruction* (pp. 33-68). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Hattie, J., Biggs, J., & Purdie, N. (1996). Effects of learning skills interventions on student learning: A meta-analysis. *Review of Educational Research*, *66*(2), 99-136.

Janssen, P. J. (1996). Studaxology: The expertise students need to be effective in higher education. *Higher Education*, *31*, 117-141.

Krause, K-L., Hartley, R., James, R., & McInnis, C. (2005). *The first year experience in Australian universities: Findings from a decade of national studies*. HEIP Report. Canberra: Department of Education, Science and Training.

Kuh, G. D. (1996). Guiding principles for creating seamless learning environments for undergraduates. *Journal of College Student Development*, *37*(2), 135-148.

McKeachie, W. J., Pintrich, P. R., Lin, Y., & Smith, D. A. F. (1986). *Teaching and learning in the college classroom. A review of the research literature.* (Technical report No. 86-B-001.0). Ann Arber, Michigan: University of Michigan, National Centre for Research to Improve Postsecondary Teaching and Learning.

Newman, R. S. (2002). How self-regulated learners cope with academic difficulty: The role of adaptive help-seeking. *Theory into Practice*, Spring/Autumn.

Pascarella, E. T., & Terenzini, P. T. (1991). *How* college affects students. San Francisco: Jossey-Bass.

Pintrich, P. R., Smith, D. A., Garcia, T., & McKeachie, W. J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire* (*MSLQ*). Ann Arber, Michigan: University of Michigan, National Center for Research to Improve Postsecondary Teaching and Learning.

Radloff, A. (1997). A longitudinal study of selfregulation of learning in adult university students. Unpublished doctoral dissertation, Murdoch University, Western Australia.

Ramsden, P. (1998). *Learning to lead in higher education*. London: Routledge.

Schraw, G. (2001). Promoting general metacognitive awareness. In H. J. Hartman (Ed.), *Metacognition in learning and instruction* (pp. 3-16). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Scouller, K. (1998). The influence of assessment method on students' learning approaches: Multiple choice question examination versus assignment essay. *Higher Education*, *35*, 453-472.

Scouller, K., & Chapman, E. (1999, July). *What students learn when they write essays.* Paper presented at the HERDSA Annual International Conference, Melbourne. Seymour, E. (1995). Revisiting the "problem iceberg": Science, mathematics, and engineering students still chilled out. *Journal of College Science Teaching*, 24(6), 392-400.

Sternberg, R.J. (2001). Metacognition, abilities, and developing expertise: What makes an expert student? In H. J. Hartman (Ed.), *Metacognition in learning and instruction* (pp. 247-260). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Strange, C. C., & Banning, J. H. (2001). *Educating by design. Creating campus learning environments that work.* San Francisco: Jossey-Bass.

Tagg, J. (2003). *The learning paradigm college*. Bolton, MA: Anker Publishing.

Tate, H., & Entwistle, N. (1996). Identifying students at risk through ineffective study strategies. *Higher Education*, *31*, 97-116.

Weimar, M. (2002). *Learner-centered teaching. Five key changes to practice*. San Francisco: Jossey-Bass.

Weinstein, C. E., & Mayer, R. E. (1986). The teaching of learning strategies. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 315-327). New York: Macmillan Publishing Company.

Zimmerman, B. J. (1998). Academic studying and the development of personal skill: A self-regulatory perspective. *Educational Psychologist*, *33*(2/3), 73-86.