Should we include study-management skills in the curriculum of pre-tertiary bridging programs?

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Abstract

The study reported here was essentially exploratory. It had two aims. The first aim was to investigate whether the ATOMS Test (Roberts et al., 2001) and/or Vermunt's (1994) ILS (ILS) were potentially useful instruments for the purpose of assessing the effectiveness of the teaching of study-management-related skills in the Tertiary Preparation Program (TPP), a pre-tertiary bridging program offered in a print-based distance education mode by the University of Southern Queensland (USQ). The term 'study-management-related skills' refers generally to a set of skills that have been identified in the literature as being necessary for the effective management by students of any formal program of study in which they attempt to engage. The second aim of the study was to identify relationships of potential heuristic interest between students' study-management-related skills and their academic achievement and persistence with study in the TPP. The sample was drawn from students enrolled in the two compulsory core courses of the TPP, who voluntarily agreed to participate in the study.

The ATOMS Test and the ILS were administered to all participating students by mail at the start of semester 2, 2005 (the pre-test) and again near the end of the semester (the post-test). The sample sizes were 142 for the first administration and 58 for the second administration. Various statistical analysis methods were used to test for the significance of difference between pre-test and post-test mean scores on each of the scales of the instruments, and for associations of significance between scores on the scales, scores on course assessment items, and students' persistence with, or non-completion of, the courses. The ATOMS Test and the ILS appeared to be not useful, in their present forms, for the purpose of assessing the effectiveness of the teaching of study-management-related skills in the core component of the program, and to be not useful as predictors of students' academic achievement in, persistence with, or completion of, the core courses. Interpretation of the results of the study was dependent on the assumption that the measurements obtained by the use of the instruments were valid for TPP students. This assumption was not tested in the study. It is recommended that further studies be carried out to test the validity of the factor structures underlying the ATOMS Test and Vermunt's (1998) learning

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styles for the entrant TPP population, and to further investigate relationships between variables measured by the instruments and student achievement/progress in the TPP core component, and changes in students' self-ratings on various scales of the instruments ostensibly associated with experience of studying.

Introduction and literature review

The importance of the study-management-related skills of students entering higher education studies to students' success with such studies has been referred to under various guises in the literature since the early 1980's. Numerous interventions aimed at developing higher education students' study-related skills have been reported in the literature (for example, Hattie et al., 1996, pp. 107-109).

Study-management skills have generally been regarded as a subset of study skills (for example, Hattie et al. 1996). The importance, to higher education students, of effective study-management skills is implied in Boud's (1981) advocacy of the development of student autonomy in learning in the higher education sector, in Zimmerman's (1994) framework for developing student's self- regulation of learning, and in the account by Minnaert and Janssen (1999) of student self-regulation of learning in relation to academic achievement.

Concern about claimed low levels of study-management skill performance of entrant higher education students has been expressed in various published studies (for example: Omesdahl, 1999; Sweidel, 1996). Indirect reference to higher education students' study-management skills has been made in literature on the importance of metacognitive skills in higher education studies (for example: Fleming, 1991; Hacker et al., 1998; Nelson, 1992).In particular, these authors referred to skills of planning, problem-solving, and of monitoring and regulating thinking processes and outcomes. Bennett & Dunne (1999) identified some study-management-related skills as routine decision-making skills, and various organising skills, such as study-time-scheduling, as 'transferable skills', in their study of study-related skills needed for success in higher education studies. They claimed that such skills are a subset of generic study skills that are necessary for success in higher education studies. Bedford (2001) used the typology of generic study skills expounded by Bennett & Dunne (1999), to distinguish between 'transferable' study-management skills, such as time-scheduling and routine decision-making skills, and 'transferring' study-management skills such as developing problem-solving strategies, and monitoring and regulating study activities and outcomes.

Within the past 30 years, attention has been given to the measurement of the study-management-related skills of higher education students, through the use of self-report inventories such as inventories of learning styles. Vermunt (1994), for example, developed an inventory of learning styles (ILS), for use with university undergraduates. The ILS

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includes a scale for measuring students' metacognitive regulation strategies with regard to their study activities. 'Metacognitive regulation', according to Vermunt (1998, p. 151), consists of mental activities that regulate cognitive processing, and is exemplified by planning, monitoring progress with the processing of content, and diagnosing difficulties encountered in processing the content. Vermunt's (1998; 1994) metacognitive regulation strategies correspond to generic study-management skills referred to as 'transferring skills' by Bedford (2001). Some published evidence supports a conclusion that higher education students' scores on some metacognitive regulation scales of the ILS may be related to the students' academic performance. Boyle et al. (2003) found moderate negative correlations between Vermunt's (1998) 'undirected learning style' and performance on measures of academic performance (Boyle et al., 2003, p. 282). At least one study of an intervention designed to increase higher education students' generic management skills has been reported (Adamson et al., 2004). Adamson et al. (2004) used an instrument developed by Roberts et al. (2001) in their study.

Roberts et al. (2001) developed an Australian management skills self-report instrument, viz. the *Australian Time Management and Organization Scale (ATOMS Test)* (ATOMS), which provides a measure of an individual's self-perception of her or his use of specified generic management skills within the general context of a work environment. Bedford (2001) identified the study environment of higher education students as a work environment. In the context of studying in higher education as a work environment, Adamson et. al (2004) used an abbreviated version of ATOMS in an evaluation study of the effectiveness of a time and organisational management skills training program for undergraduate students at The University of Sydney. The version of ATOMS used by Anderson et al. (2004) was the Abbreviated Time Management Indicator (ATMI) (Roberts et al., 2001). The results of the evaluation study were inconclusive, as a result of methodological limitations which were identified and discussed by Adamson et al. (2004). Prior to 2005 no attempt had been made to study the effectiveness of the Tertiary Preparation Program (TPP) offered by the University of Southern Queensland in increasing students' study-management-related skills. Relationships between TPP students' levels of these skills and the students' academic achievement in the program had not been formally explored. The study reported here attempted to investigate both of these aspects of students' experience of studying in the TPP, using Vermunt's (1994) ILS and the ATOMS Test of Roberts et al. (2001) as measures of students' study-management-related skills.

The instruments were chosen for the study because they were the only measures of ostensibly relevant skills located at the time of the study, which could be administered by mail to the distance education TPP students as self-report written questionnaires. However, there remains some doubt as to the validity of measurements obtained by the use of the

instruments with TPP students. In each case, the instruments were developed from factor structures derived from data collected from populations that may have had different characteristics, relating to the skills measured, from those of TPP students. The content and structure of the ILS was derived from studies of undergraduate students in The Netherlands and Britain (Vermunt, 1994), and those of the ATOMS from populations of employees in work organizations (Roberts, et al. 2001).

Aims of the study

The aims of the study were to:

1. Investigate the usefulness of the ATOMS Test and Vermunt's ILS in assessing the effectiveness of the study-management component of the TPP.
2. Identify relationships of potential heuristic interest between students' study-management skills and their academic achievement in, and persistence with, study of TPP courses.

Methodology

Instruments used

Standardised instruments

The instruments used to gather data on the students' study-related skills were the ATOMS Test (Roberts et al., 2001) and Vermunt's (1994) ILS (120 item version).

The ATOMS Test used in the study provided a measure on each of six scales. The scales corresponded to six factors identified by Roberts et al. (2004) in their analysis of the factor structure of the test. The test consisted of a total of 62 items. The names given to the scales by Roberts et al. (2004), and the number of test items which provided a measure on each of the scales are shown in Table 1.

Table 1: Scales of the ATOMS Test, and number of items for each scale

Name of scale	Scale code used in the study	Number of items
Sense of purpose	SP	12
Meeting deadlines	MD	12
Mechanics of time management	MTM	10
Coping with temporal flow	CTF	12
Propensity of plan	PP	8
Effective organization	EO	8

Vermunt's (1994) ILS provided a measure on each of 20 scales. The scales are grouped into four 'learning components' identified by Vermunt (1998), The learning components, corresponding scales, and the number of items for each scale are shown in Table 2

Table 2: Learning components, scales, and numbers of items of Vermunt's (1994) ILS

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Name of learning component	Name of learning component scale	Scale code used in the study	Number of items
Processing strategies	Deep processing – relating and structuring	PS DP R&S	7
	Deep processing – critical processing	PS DP CP	4
	Stepwise processing – memorising and rehearsing	PS SP M&R	5
	Stepwise processing – analysing	PS SP A	6
	Concrete processing	PS CP	5
Regulation strategies	Self-regulation – learning process & results	RS SR LP&R	7
	Self-regulation – learning content	RS SR LC	4
	External regulation	RS ER LP	6
	External regulation – learning results	RS ER LR	5
	Lack of regulation	RS LR	6
Learning orientations	Personally interested	LO P	5
	Certificate directed	LO C	5
	Self-test directed	LO S	5
	Vocation directed	LO VD	5
	Ambivalent	LO A	5
Conceptions of learning	Construction of knowledge	CL CK	9
	Intake of knowledge	CL IK	9
	Use of knowledge	CL UK	6
	Stimulating education	CL SE	8
	Co-operation	CL C	8

Vermunt (1998) constructed the following four general learning styles by which, he claimed, people could be characterised on the basis of their scores on the ILS:

Meaning directed

Reproduction directed

Application directed

Undirected

The method used by Vermunt (1998) to identify the general learning style of an individual was used in the study to identify the general learning style of each respondent to the ILS pre-test. The results were used in the analysis of the data from the study.

Measures of students' academic achievement

Students' academic achievement was measured by the graded assessment items normally used in the two TPP core courses, viz., TPP7120 *Studying to succeed* and TPP7181

Mathematics tertiary preparation level A.

<u>Data samples</u>

ATOMS Test and Vermunt's ILS

All students who were enrolled in course TPP7120 in semester 2, 2005 were invited by mail during the first two weeks of the 15 week semester to complete and return a copy of the ATOMS Test and the ILS within two weeks of receipt of the mailing. One hundred and forty-one students returned fully or partially completed copies of the two instruments and a signed consent to participate form, giving a return rate of approximately 46 percent. Scores obtained from this first round administration of the instruments are referred to as 'pre-test scores' in the remainder of this document.

During the final three weeks of the semester, all students who had returned completed or semi-completed survey instruments and a signed consent to participate form from the first mailing were sent a second copy of the two instruments. Fifty-eight students returned fully or partially completed copies of the two instruments, giving a return rate of approximately 37 per cent of the students who had returned the first set of instruments. Scores obtained from this second round administration of the instruments are referred to as 'post-test scores' in the remainder of this document.

Measures of academic achievement

Students' scores on each of the measures of academic achievement were obtained from the University's student administration data base at the end of the semester.

<u>Exploration and analysis of the data</u>

Exploration

The study was essentially exploratory in nature, as indicated by its stated aims. The general purpose of the study was to explore the data for apparent possible relationships between the variables, with a view to identifying needs for further research. The following statistical tests and other procedures were carried out on the data, where appropriate, using SPSS for Windows 14.0:

1. Paired t-tests for significance of difference between the means of sets of pre-test and post-test data.
2. Independent samples t-tests for significance of difference between means of independent sets of data
3. Linear regression analysis to identify relationships of potential further interest between interval-scale variables
4. Logistic regression analysis to identify relationships of potential further interest between interval-scale and nominal-scale variables.

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5. Correlation analysis to identify relationships of potential further interest between factor scores corresponding to Vermunt's (1998) four general learning styles and marks obtained on course TPP7120 and course TPP7181 assessment items

Main findings, discussion, and recommendations

Statistical tests and other statistical procedures could not be used with some of the sets of scores obtained because the distributions of these sets did not conform to the requirements of the statistical models, predominantly the requirement that the distributions approximate normal distributions.

The study provided no definite evidence of any association between students' experience of studying the study-management component of the TPP and changes in their study-management-related skills. However, there are difficulties involved in interpreting these results. No direct measurement of students' study-management-related skills was possible in the study. Indirect measures based on scores on ostensibly study-management-related self-report instruments were obtained. The design of each of the instruments was based on factor structures derived statistically from data drawn from studies of populations of people who may have been characteristically different, with regard to the skills measured, from TPP students. The applicability of these factor structures to the population of TPP students was unknown. The instruments may not have provided valid measures of the study-management or learning styles characteristics of TPP students.

Statistically significant differences between commencement and completion of the course in which study-management skills were taught were interpreted for mean pre-test and post-test scores on the following four of the six ATOMS Test scales:

Meeting deadlines (MD)
Coping with temporal flow (CTF)
Propensity to plan (PP)
Effective organisation (EO)

All of these differences were negative (the mean pre-test score was higher than the mean post-test score), and were relatively small. These results could be interpreted as possible minor effects of students' experience of studying the course. One possible explanation is that slight, negative changes in students' self-assessments of their management-related skills resulted from their experience of studying the course. For example, the majority of students, being relatively inexperienced in managing a formal study program, may have tended to over-rate their management-related skills at the time of entry to the program and to have re-assessed their ratings downwards after the experience.

No statistically significant differences were interpreted mean pre-test and post-test scores on the following ATOMS Test scales:

Sense of purpose (SP)
Mechanics of time management (MTM)

The ILS scales which appeared to be measures of students' self-reported study-management skills were the regulation (of study) strategies scales (RS SR LP&R , RS SR LC, RS ER LP, RS ER LR, and RS LR). Statistically significant differences were observed between mean pre-test and post-test scores on the following two ILS scales:

Self-regulation: learning process and results (RS SR LP&R)
Lack of regulation (RS LR)

In each case the difference in mean scores on these scales was negative. Apparently, students revised their ratings of their use of these regulation strategies downwards after their TPP experience of managing a formal study program.

Statistically significant, relatively small differences between mean pre-test and post-test scores were interpreted for most of the remaining ILS scales. These scales provided measures of students' self-reported skills which appear to be related in various ways to their academic performance. A significant, relatively large negative difference was observed for scores on the scale PS DP R&S (Processing strategy: deep processing: relating and structuring). After studying their TPP studies, students rated their use of this strategy much lower than before studying. A possible explanation of this finding is that it is an effect of students' experience of studying the academic communication skills component of the course. This component requires students to critically analyse information from various written academic text sources and to construct a logical synthesis of the information in the form of an academic essay. Presumably, most of the students were relatively inexperienced in the formal critical analysis and synthesis of information from academic sources before commencing the course. Students may have they made a lower rating of their skills of critical analysis and synthesis of information after attempting to meet this requirement than before studying the course.

In relation to discussion of differences between pre-test and post-test scores on ILS scales observed in the study reported here, it is noted that Vermunt and Minnaert (2003) reported substantial differences between individual undergraduates students' scores on some ILS scales over a period of three consecutive semesters of study. These findings provide some insights into the relationships between students' experience of studying and their self-ratings of their study-related skills, concepts of learning, and orientations to learning. Such insights may provide a basis for academic counselling of entrant TPP and undergraduate students regarding their approach to study, as well as some information which may be relevant to the design and content of the TPP and first-year undergraduate

programs.

The distributions of the samples of pre-test scores on three of the ILS learning orientation scales were highly skewed. The Certificate-oriented (LO C) and Self-test-oriented (LO S) samples were negatively skewed, indicating that a disproportionately high number of students had high pre-test scores on these scales. This result may indicate that the entrant TPP students tended to perceive the importance of learning in terms of gaining formal credentials and of self-assessment of personal suitability for formal study. This interpretation has some intuitive appeal if the following assumptions are made: most people enrol in the TPP to gain entry to an undergraduate program, and most have a relatively low level of confidence in their ability to succeed with formal studies. In contrast to the pre-test scores distributions, the distributions of the post-test scores on these scales were typical of samples drawn from normal populations. This result may indicate that, generally, students' belief in the efficacy of formal study as means of gaining formal credentials and of self-assessment diminished over the duration of the courses. The vocation-oriented (LO VD) samples of pre-test and post-test scores were both positively highly skewed. This result may indicate that, generally, TPP students do not regard vocational achievement to be a major reason for engaging in formal study. This tentative finding is inconsistent with the assumption that most people enrol in the TPP to achieve positive change in their vocational situation.

No apparent strong associations were observed between pre-test scores on any of the ATOMS Test scales or ILS scales and any of the measures of academic achievement included in the study. The pattern of findings for the associations between the ILS scales and the measures of students' academic achievement was generally similar to the pattern of findings by Boyle et al. (2003) for a sample of students at a British university. Boyle et al. (2003) found significant associations with only a few ILS scales. All of these associations were weak. Scores on the ATOMS scale EO (Effective organisation) were statistically significantly positively associated with marks obtained for three assessment items in course TPP7120. The skill performances assessed by two of these items appeared to be distinctly different from each other. One of the items was a course TPP7120 assignment designed to assess students' ability to plan and schedule two weeks of their study program, whereas the other item was designed to measure students' ability to construct correctly structured paragraphs from recalled information taught in the course. The apparent relationship between scores on EO and the two course TPP7120 assessment items discussed here may indicate that students who performed relatively well on a range of assessment items tended to be those who initially self-rated their skills of effective organisation relatively highly. Pre-test scores on the ILS scale LO CD (Learning orientation – certificate-oriented) were statistically significantly, weakly positively associated with marks obtained on an assignment designed to sample students' ability to interpret and use algebraic formulae and graphs.

No strong statistically significant differences were found between the mean pre-test scores on any of the ATOMS Test scales or the ILS scales obtained by students who persisted in the course and those who did not. A statistically significant weak positive association was observed between the ATOMS Test scale MD (Meeting deadlines) and students' non-completion of a course. This result seemed somewhat anomalous; students who rated themselves relatively highly on their propensity to meet deadlines were less likely to complete the course than other students. A statistically significant weak negative association was observed between the ATOMS Test scale CTF (Coping with temporal flow).and students' non-completion of a course. This result may indicate that students who perceived that they coped with change relatively well were more likely to complete the course than other students. A statistically significant weak positive association observed between the ILS scale RS LR (Regulation strategy: lack of regulation) and students' non-completion of a course seemed to be consistent with the intuitive notion that students who perceive that they lack strategies to regulate their progress with study are less likely than other students to complete a course of study.

A statistically significant moderate negative correlation was found between Vermunt's (1998) undirected learning style and students' achievement on a test used in the core mathematics course. This finding was consistent with the finding by Boyle et al. (2003, p.282) of a moderate negative correlation between the undirected style and students' achievement on exams. However, in contrast to the findings of Boyle et al. (2003), the reproduction-directed and the application-directed styles were each found to have statistically significant modest positive correlations with students' achievement scores in the mathematics core course, and the meaning-directed style was found to have no significant correlation with any of the measures of students' academic achievement in either of the courses. No statistically significant correlations were found between any of Vermunt's (1998) four general learning styles and students' achievements in the other (non-mathematics) core course.

In general, the findings from the study indicated that the ATOMS Test scales and the scales of the ILS relating to students' regulation of study did not appear to be useful for the purpose of evaluating the effectiveness of teaching study-management-related skills to TPP students. The findings also indicated that the ATOMS Test and the ILS did not appear to be useful as predictors of TPP students' academic achievement or persistence with study.

Interpretation of the findings was obfuscated by uncertainty as to whether the instruments used in the study provided valid measures of the variables, as, arguably, the study-management and learning styles characteristics of TPP students could be assumed to be different from the populations of people from whom data was drawn to develop the instruments. It is recommended that further studies be carried out to test the validity of the

factor structures underlying the ATOMS Test and Vermunt's (1998) ILS for the TPP population, with a view to further investigate relationships between variables based on the instruments and student achievement/progress in the TPP, and changes in students' self-ratings on various scales of the instruments ostensibly associated with experience of studying, as observed in the study.

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