REDESIGNING A LEARNING AND ASSESSMENT ENVIRONMENT: THE INFLUENCE ON STUDENTS' PERCEPTIONS OF ASSESSMENT DEMANDS AND THEIR LEARNING STRATEGIES

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Abstract

The study aimed to determine if students in a redesigned course, firstly, hold different perceptions of the assessment demands and, secondly, adjusted their learning strategies towards deeper learning. Contrary to expectations, the students in the original assignment-based (ABL) course (n = 406 students) adopted more deep-learning strategies and less surface-learning strategies than the students in the problem-based (PBL) course (n = 312 students). Although both course format as well as assessment clearly differed in the two conditions, this has not resulted in different perceptions of the assessment demands. Additionally, the results show clearly that the students who express their intentions to employ a certain learning strategy perceive the assessment demands as such and actually employ a related learning strategy.

Introduction

One of the main goals of higher education is to prepare students for professional life. As society is changing, there is a growing need for competencies such as critical thinking,
an aptitude for self-management, learning, reflective thinking and the ability to solve novel problems (Kember, Charlesworth, Davies, McKay, & Stott, 1997; Tynjälä, 1999). These types of skills are widely accepted as the main aims of higher education in today's society. However, higher education in general, and management education in particular, have been criticized for not developing these characteristics of professional expertise (Business Higher Education Forum, 1995; ACNielsen, 2000; Boyatzis, Stubbs, & Taylor, 2002). It has been argued that graduates frequently lack the very qualities consistent with a deep approach to learning (Kember et al., 1997), i.e., the ability to appropriately engage with and respond to the professional situations they encounter, to understand the structural complexity of the task, the rationale behind facts and to seek meanings.

There is a voluminous literature on educational innovations and many attempts have been made to implement new instructional approaches to encourage deep learning. It has been argued that the deep approach to learning is associated with constructivist teaching (Dart, 1997). There is a general consensus that one of the most salient contextual variables to influence students' approaches to learning is the assessment method (Crooks & Mahalski, 1985; Ramsden, 1992; Scouller, 1995; Scouller & Prosser, 1994; Thomas & Bain, 1984). Students can shift between surface and deep approaches to suit the assessment demands of their courses (Newble & Jaeger, 1983; Ramsden, 1979; Thomas & Bain, 1984; Wilson & Fowler, 2005). According to Biggs' presage-process-product systems model of teaching and learning, when students are exposed to a particular context they are differentially responsive to teaching context factors according to their perceptions of the teaching context and its requirements (Biggs, 1987; Entwistle, 1988; Meyer & Muller, 1990; Meyer, Parsons, & Dunne, 1990; Ramsden, 1984, 1988). This is especially the case with assessment. It appears that although students may have a preferred approach to their studies and enter a course or program with specific intentions regarding the study strategies they will employ, they may also vary that approach according to their perceptions of the assessment demands. As students interpret the demands of the assessment tasks they consciously or subconsciously vary their study approaches in order to cope with the assessment tasks. This is often referred to as the backwash-effect of assessment or the pre-assessment effect. If a particular assessment is perceived to require just passive acquisition and accurate reproduction of details students will then employ a surface approach with low-level cognitive strategies such as rote learning and concentrating on facts and details while preparing for the assessment. When assessment is perceived to require high-level cognitive processing to demonstrate a thorough understanding, integration and application of the context knowledge, then students are more likely to engage a deep approach in order to accomplish the task. This backwash of assessment affects particular "cue-seeking" students, who are constantly on the alert for cues that will help them prepare for assessment (Miller & Parlett, 1974). In this respect, McDowell refers to Snyder who suggested that "the hidden curriculum, which largely depended on students' interpretations of what the assessment system valued and required, in practice replaced the stated curriculum" (Snyder, 1971 in: Mc Dowell, 1995, p. 302).

Up till now, only a few studies have presented empirical evidence for the relation between students' intentional study approaches, their perceptions of the demands of new modes of assessment and their actual learning strategies. Additionally they present research studies focusing on a change in assessment format while they largely neglect the learning
environment in which the assessment is a part. However, as Biggs (1996) states, assessment can only steer learning when there is a constructive alignment between learning, instruction and assessment. Therefore, in the present study in order to enhance deep learning not only was the mode of assessment changed, but also the learning environment. We investigated to what extent students change their learning strategies as well as their perceptions of the assessment demands.

Students' Perceptions of the Assessment Demands and their Study Approaches

During the last decade, only a few studies have presented empirical evidence for the relation between students' perceptions of the demands of assessment and their learning strategies. Tang (1994) provided a case in point. She conducted a study in the Physiotherapy Section at the Hong Kong Polytechnic, in the subject of Integrated Professional Studies with first year students (N =158). The assessment of this subject has traditionally been by written tests consisting of short essay questions (test condition). In order to steer students' learning towards higher-level cognitive preparation strategies, course assignments have been introduced as the assignment condition. The aim of Tang's study was to compare students' habitual way of learning and their assessment preparation strategies in both conditions. Path analysis for the test condition demonstrated congruence between the students' study approaches and their assessment preparation strategies. "Those students who were surface-oriented were more likely to employ low level strategies when studying for the test, while those who were normally deep-oriented had a higher tendency to employ high level preparation strategies " (p. 6). The interviews indicated that deep-oriented students were not disadvantaged in this mode of assessment as they adapted to the perceived low level demands of the test and "orchestrated their study approach by adopting the deep-memorising strategy, and hence were able to do the test" (p. 6). The patterns of relationships for the assignment condition were different from those of the test condition. There was a relative lack of relationship between the students' habitual ways of learning and the subsequent adoption of preparation strategies in writing assignments. Tang suggests that writing assignments is a new experience for most of these first-year students and that, therefore, they cannot readily rely on their habitual strategies to handle the task. "Under such circumstances, their motives, whether extrinsic, intrinsic or achieving, become a more relevant reference for the decision for the actual strategies to be employed" (p.8). The results of the interviews demonstrated that high-level strategies such as understanding, application of information, relating to other subjects and previous knowledge are requirements perceived to be necessary for both assessment conditions. However, low-level strategies such as rote learning, memorisation and reproduction were perceived to be relevant only to the test condition.

Scouller (1996) used questionnaires to investigate students' learning approaches (classified as either deep or surface) and their perceptions of the intellectual abilities or skills being assessed (classified as lower or higher) within two assessment contexts of the same course: an assignment essay and an end-of-course short-answer examination. The sample consisted of 140 first-year Sociology students at the University of Sydney. The main findings reveal that the assessment method strongly influenced the way these students
learned and prepared the assessment tasks. The patterns that emerged were much more straightforward than those in Tang's (1994) study. The Sociology students were much more likely to employ surface strategies when preparing for their short-answer examinations than when preparing their assignment essays. In contrast, when writing their assignment essays these students were significantly more likely to employ deep strategies than when preparing for their short-answer examinations. Concerning their learning motives, students were significantly more likely to report surface motives when preparing their short-answer examinations in contrast to their preparation of their assignment essays when they were more likely to report deep motives. Finally, these students were significantly more likely to perceive the short-answer examination as assessing lower levels of intellectual abilities and skills than the assignment essay. In contrast, students were more likely to perceive the assignment essay as assessing higher levels of intellectual abilities and skills such as analysis and synthesis than their short-answer examination. Probably – in any case more than the Hong Kong students in the study by Tang (1994) – these students have prior experiences with different modes of assessment, including assignments and therefore can rely on habitual strategies to handle the assignments. In 1998, Scouller and Prosser extended the former research by investigating relations between students' study approaches and their perceptions of the assessment demands. The results indicated that in both assessment conditions (essay assignment and multiple choice questions), the students' study approaches were related to their perceptions of the assessment demands.

The study by Sambell, Mc Dowell and Brown (1997) took a broader perspective on the impact of assessment by looking at various new modes of assessment and at various ways of impacting students' learning. Their research aimed to illuminate some of the outcomes, consequences and unintended side-effects of alternative ways of assessing student learning through a number of case studies of assessment in practice. Thirteen case studies were conducted. They used semi-structured interviews, focussing on the particular assessment, probing what students understood to be required, how they were going about the tasks and what kind of learning they believed was taking place. The student interviews were completed by observations and documentary evidence. The results indicated that students often reacted very negatively when they discussed what they regarded as traditional testing. They perceived it as having a "severely detrimental effect on the learning process" (p. 357). "... They (the students) set out, quite consciously, to achieve second-rate or 'poor' learning for the purpose of a particular assessment point." By contrast, when students considered new modes of assessment, they made the point that they "were challenging their efforts into trying to understand, rather than simply memorise, or routinely document, the material being studied (p. 358)." Analysis of the interview data suggested a set of criteria students indicate for assessment in order to have a positive effect on their learning. Examples are: the authenticity of the assessment tasks; the demands of the assessment and how reasonable they are perceived to be by the students; the extent to which the assessment tasks accurately measure complex skills and qualities, as opposed to an over-reliance on memory or regurgitation of facts. However, Sambell et al. notice that there probably is a difference between students' beliefs that their learning has been enhanced under the conditions of alternative assessment, and their actual learning behaviours.
A recent study by Segers, Dierick and Dochy (2001) investigated the consequential validity of the OverAll Test. This instrument is case based and requires students to use knowledge (conceptual models, theories) as a tool to define, analyse, solve and evaluate the problems presented in the novel authentic case studies. The OverAll Test is implemented in a problem-based curriculum, where working on authentic problems is the core of the learning process. The results of an annual survey and semi-structured interviews with students and staff members indicated the importance of students' perceptions of key elements of the learning environment. Although the students as well as the staff members support the relevance of the goal of the OverAll Test and recognise its goals and characteristics in the assessment practice, they observe several reasons why this assessment instrument does not steer them towards more deep-learning strategies. One of the main reasons is the mismatch between the instructional approach (Problem-Based Learning) and their perception of the actual implementation of this approach. In their perception, there is no room for properly tackling authentic problems and for feedback on the problem-solving because of an overload of the program. The learning process is merely perceived as surface scanning one chapter after the other. Additionally, the transfer of problem-solving skills from the group learning process to the individual process of handling novel problems is seen as problematic. Finally, students mentioned that teachers lacked coaching skills for guiding the group problem-solving process. Segers et al. (2001) concluded that it is not the assessment that is problematic but the alignment of the instruction, students' learning process and the assessment as perceived by the students and the staff.

The present study intends to build on the findings of the aforementioned studies. It will further explore the conditions for assessment to steer learning by investigating the impact of the implementation of a specific assessment instrument, namely the OverAll Test. More than in the aforementioned studies, explicit attention is paid to the alignment of learning, instruction and assessment. The learning environment was redesigned with a view to the authenticity of the problem tasks, the quality of the problem-solving process in the tutorial groups and the availability of literature sources as a tool to tackle the problems. The OverAll Test is implemented as an integral part of the redesigned learning environment. The present study focuses on the comparison of students' learning strategies in both conditions, the original and the redesigned. The central question is: To what extent do students employ more deep-learning strategies in the redesigned course than in the original course? In order to unravel the mechanism through which assessment steers learning, two variables, indicated as relevant in the aforementioned studies, are taken into account: students' intended learning strategies as an indicator for their general, habitual learning strategies (Tang, 1994) and their perceptions of the assessment demands (Scouller, 1996, 1998). This leads to two additional questions: (1) Do students in the redesigned course differ from those in the original course in intentional learning strategies and perceptions of the assessment demands, and (2) Is there a relationship between the learning strategies students intend to employ, their perceptions of the assessment demands and the learning strategies they actually employ?
Method

Participants

The participants in this study were two subsequent cohorts of second-year students attending a course titled "International Business Strategy". An assignment-based format (Vermunt, 2003) was used for the course, which was attended by 406 students. In the following academic year the course was redesigned according to the problem-based learning format and was attended by 312 students.1

The International Business Strategy Course

The International Business Strategy course is an obligatory course at the beginning of the second year of the International Business Program. During their first year of study, the students experience courses with a variety of instructional approaches, varying from assignment-based to more problem-based (Vermunt, 2003). Additionally, they experience various modes of assessment, including performance-based assessment (assessment of writing skills), OverAll Tests (measuring the extent to which students are able to tackle novel problems) and Knowledge Tests (measuring reproduction and understanding of concepts, principles and models of the field of study).

Initially, the International Business Strategy course had an assignment-based format (ABL). This implies students were working in small tutorial groups on tasks called assignments. These tasks consist of a set of questions to answer. For each assignment, the relevant chapter in the text book is indicated. For some sample tasks see Figure 1.

Within the tutorial group, two students give a presentation containing a summary of the relevant chapter plus some additional material and their answer to the set of questions. Afterwards, there is room for discussion.
When comparing the course with the instructional principles derived from the constructivist propositions (Savery & Duffy, 1995), several mismatches can be observed. Firstly, the tasks have an assignment format rather than descriptions of a set of events (problems) that needed analysis. They consist of clear-cut questions, a situation that is rather uncommon in later professional life, where students have to formulate questions themselves, based on their observations. Therefore, it can be expected that the assignments do not stimulate students to develop multiple representations of a problem, nor to analyse a problem in depth by taking various perspectives into account. In this respect, the format of the tasks does not support the learner in developing ownership of the overall problem. Secondly, the study of relevant information sources is rather limited as there is only one textbook and the chapter to be studied is prescribed. As a result, the students are not invited to consult and compare different sources. Additionally, it can be expected that the learners do not feel ownership of the problem itself, nor of the problem-solving process. The student is told what to study and what to learn in relation to the so-called problem. In this respect, the learners are not encouraged to test ideas against alternative views and alternative contexts. As Savery and Duffy (1995, p. 33) state: "Clearly, with this pre-specification of activities, the students are not going to be engaged in authentic thinking and problem-solving in that domain." Thirdly, the course consists of small separate tasks which are rather loosely coupled. In this respect, it can be expected that learning is not anchored to a larger problem. Fourthly, because of the presentations where students have to describe the literature studied to their peer students, the latter probably develop a passive (listening) role. Fifthly, the assessment, with a dominant weighting towards knowledge reproduction tests in the students' final mark, tends to enhance surface learning rather than deep learning. In conclusion, comparing the ABL format with constructivist principles as described by Savery and Duffy (1995), there is room for improvement.

Based on the analysis of the course within a constructivist framework and several discussions with the tutors, the course was redesigned. Firstly, all problems presented to the students were described in the context of an existing company. This company starts as a local producer and enters progressively into other countries, becoming an international company. In this description of the company, basic information is given which can be used in the subsequent problems. These describe discussions in quarterly board meetings about decisions that were part of the internationalisation process. In the discussions, the different functional managers give their views on the topic at hand. Figure 2 presents an example of a problem used within the redesigned course.

Secondly, with regard to the format of the meetings, students are prompted to define the problem themselves. They are asked to brainstorm about possible explanations for the identified problems and based on this primary analysis of the problems, to formulate their own learning goals. The learning goals are the starting point for students' self study. The results are discussed in the so-called reporting phase where students discuss what they studied and conclude with a thorough analysis, synthesis and evaluation of the problems.
Task 10: Working together

The new expansion ideas of the management team is putting the company under a lot of stress. The future will become more complex, dynamic and uncertain. Another result is that the company will need more raw materials. Mr. Svennson (production and purchasing) suggests "The company should have closer relations with suppliers. In this way they could have more control over the supply. Furthermore more suppliers are needed." And regarding the production capacity he concluded that "this is insufficient, so expansion is needed. Collaboration with others could be a solution".

Also Mrs. Fältskog is looking for ways to collaborate with other parties, and she is even thinking about joining warehouses with one of the competitors. In any case, production should still stay in Sweden because the customers relate the products to Swedish wood. Mr. Ulvaeus (research and development) is not happy with collaboration in production because this would mean that they would give away the advanced production technology of the company.

Thirdly, no literature references are given and the number of potential sources is extended in order to stimulate more diverse searching for information and to challenge the learners' thinking through testing ideas against alternative views. The sources are: a textbook, *International Business Strategy* (Ellis & Williams, 1995); chapters of various textbooks in the library; and articles that can be retrieved from an automated database.

The open-ended, open-book questions are based on a case. This case is a two-page description of Hofbrau. The case information can be summarized as follows:

Hofbrau is a brewery located in Munich, a large city in the southern part of Germany. It produces a beer for a broad target group. Furthermore, it distributes a limited assortment of soft drinks to take advantage of economies of scale in distribution. The company employs 500 people who are spread over different departments, e.g., purchasing, production and marketing. One of the elements of the purchasing strategy used is buying in large volumes, so that they can claim price discounts. There are more brewers in this region because of the supply of water and raw materials (e.g., bottles). Also, barley is produced nearby. In general the region is very famous for its beer production. The actual production is concentrated in one big brewery. The production steps are closely interlinked with pipes between the kettles and every product follows the same steps of the production process. Most marketing people work at the six combined sales offices/warehouses, which are spread out over Germany. It is very important to own a warehouse in the region if the company wants to have market presence. A special staff department has been created recently to analyze opportunities to go abroad. One of the options is to export to some European countries. There is a total budget for initial investments available of 500,000 euro. For each country relevant economic and business data have been collected.

1. Describe clearly the organisational structure, the business strategy and the production process of Hofbrau. Quote from the case description to illustrate your descriptions.
2. To which countries would you advise the company to export? Provide arguments!
Fourthly, to stimulate active participation by all group members in the reporting phase, the presentations are replaced by discussions within the tutorial group.

Fifthly, in order to align the assessment with the teaching and learning in this course the assessment is changed by implementing the OverAll Test. The assessment tasks not only measure the extent to which students have insight into the main concepts and principles. Questions are formulated that require students to use their knowledge as a tool to define, analyse, solve and evaluate novel problem situations. The students have to analyse various case studies of companies on the basis of the knowledge they acquired during the course. They have to relate information presented and ideas explored in the case studies to the main concepts and theories learned during the course. Furthermore, students are asked to give specific advice to the company described in the case, based on relevant arguments.

In summary, with the redesign of these five variables, the course is designed in line with the PBL format. Figure 4 summarises the main differences between the original and the redesigned course.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>ABL course</th>
<th>PBL course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure of the course</td>
<td>Structured around the sequence in the book</td>
<td>Structured around a case</td>
</tr>
<tr>
<td>Structure of problems/tasks</td>
<td>Well structured study tasks with an assignment format</td>
<td>Ill structured, real-life problems</td>
</tr>
<tr>
<td>Literature</td>
<td>One text book</td>
<td>Variety of information sources</td>
</tr>
<tr>
<td>Format of the meetings</td>
<td>Each session a presentation by two students</td>
<td>Problem-analysis using the seven-jump learning procedure</td>
</tr>
<tr>
<td>Assessment</td>
<td>Knowledge reproduction questions</td>
<td>Knowledge reproduction and knowledge application questions</td>
</tr>
</tbody>
</table>

Figure 4: The Main Differences between the ABL and the PBL Courses

**Instruments**

To measure the students' perceptions of the assessment demands we used the Scouller Perceptions of the Assessment Demands Questionnaire (Scouller & Prosser, 1994). We measured the students' learning strategies with an adapted version of the Study Process Questionnaire (SPQ) (Biggs, 1987).

**Assessment Perception Questionnaire**

The questionnaire measures the students' perceptions of the level of cognitive skills measured by the assessment task. It contains twelve questions on a Likert scale. Two scales result from this questionnaire: one for low-level surface skills and one for high-level deep skills of intellectual processing. Figure 5 presents examples of items from different scales.
of the questionnaire, measuring students' perceptions of the learning environment as well as the Cronbach's Alpha reliability for each scale as measured in the present study.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Sample question</th>
<th>Cronbach's Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment of surface learning skills</td>
<td>I expect the test to assess my ability to reproduce key terms and definitions</td>
<td>0.76 0.75</td>
</tr>
<tr>
<td>Assessment of deep learning skills</td>
<td>I expect the test to assess my ability to integrate from a variety of sources</td>
<td>0.69 0.69</td>
</tr>
</tbody>
</table>

Figure 5: Examples of Items Measuring the Students' Perceptions of the Assessment Demands (sample questions and reliability)

**Study Process Questionnaire**

The learning strategies were measured by using an adapted version of the Study Process Questionnaire (SPQ) (Biggs, 1987). According to Kember et al. (1997), the SPQ can be used to measure the results of innovations aimed at enhancing deep learning. The standard questionnaire contains 42 questions, measuring three learning approaches: surface, deep and achieving. Each approach is composed of two sub-scales: motive and strategy. For the present research, both the deep and surface strategies are relevant since they describe ways in which students engage with the actual task. The achieving strategy concentrates on organization of time and workspace to obtain highest marks, whether or not the material is interesting (Biggs, 1987). This is not linked to the learning context but to students' personality characteristics. Therefore the section on the achieving strategy was not included in the current instrument. Some questions had to be adapted to the PBL setting. Given that the tutor has a coaching role and the fellow students play an important role in knowledge acquisition the questions referred to other students rather than to the tutor. This resulted in 13 questions which had to be answered on a Likert scale. Figure 6 presents examples of items from different scales of the questionnaire, measuring students' learning strategies as well as the Cronbach's Alpha reliability coefficients for each scale.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Sample questions</th>
<th>Cronbach's Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface strategy</td>
<td>I learned some things by rote, going over them until I knew them by heart</td>
<td>0.44 0.45</td>
</tr>
<tr>
<td>Deep strategy</td>
<td>I related material, as I was reading it, to what I already knew on that topic</td>
<td>0.58 0.60</td>
</tr>
</tbody>
</table>

Figure 6: Examples of Items Measuring Students' Learning Strategies (sample questions and reliability)
Procedure

All questionnaires were processed in the tutorial groups. In this way, problems that students faced when answering the questions could be solved directly. The Study Process Questionnaire was processed twice, following the procedure of Sivan, Wong, Leung, Woon & and Kember (2000). This procedure consisted of the following steps. At the start of the course, the learning strategy the students intended to employ was measured. It is assumed that this reflects their habitual learning strategy as it is mainly based on prior experience and is not influenced by knowledge about the course in question. In the last session before the assessment took place students were asked to frame their actual learning strategies. Additionally, the Perceptions of the Assessment Demands Questionnaire was processed.

Method of Analysis

Several statistical techniques were part of the analysis. The analysis of the differences between students' intended learning strategies, the actual learning strategies and students' Perceptions of the Assessment Demands in both conditions (original and redesigned course) was conducted with a t-test. Furthermore, the results of correlational analysis are presented.

Results

In the original course 406 students were enlisted, resulting in 29 tutorial groups. Eleven tutors supervised the groups. In the redesigned course, 312 students were enlisted, yielding 24 groups. There were nine tutors for this course. The group size for both courses ranged between 13 and 15. Because some students did not attend either the first or last session, the number of paired cases is lower than the response rate in each of the sessions (Table 1).

Table 1: Response Rates for the ABL and the PBL Course

<table>
<thead>
<tr>
<th></th>
<th>Subscriptions</th>
<th>First session</th>
<th>Last session</th>
<th>Paired cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABL course</td>
<td>406</td>
<td>363 (89%)</td>
<td>314 (77%)</td>
<td>305 (75%)</td>
</tr>
<tr>
<td>PBL course</td>
<td>312</td>
<td>248 (79%)</td>
<td>200 (64%)</td>
<td>196 (63%)</td>
</tr>
</tbody>
</table>

In both courses the ratio of men to women was 55% male, 45% female. Nationalities were distributed as follows: 70% Dutch, 12 % German, 18% other, mainly European, countries. In analysing the results, the main aim was to explore the relationship between students' intentional learning strategies, their perceptions of the assessment demands and the learning strategies they employed in this course.
Table 2: Students' Intended Learning Strategies, Actual Learning Strategies and Perceptions of the Assessment Demands in the ABL and the PBL Course

<table>
<thead>
<tr>
<th></th>
<th>ABL</th>
<th>PBL</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to employ deep learning strategies</td>
<td>24.72 (3.05)</td>
<td>24.40 (3.47)</td>
<td>1.08</td>
<td>0.282</td>
</tr>
<tr>
<td>Intention to employ surface learning strategies</td>
<td>16.80 (3.16)</td>
<td>17.30 (2.96)</td>
<td>-1.78</td>
<td>0.075</td>
</tr>
<tr>
<td>Deep perception of assessment demands</td>
<td>21.46 (3.92)</td>
<td>21.50 (3.99)</td>
<td>-0.129</td>
<td>0.897</td>
</tr>
<tr>
<td>Surface perception of assessment demands</td>
<td>20.38 (3.63)</td>
<td>20.89 (3.95)</td>
<td>-1.59</td>
<td>0.112</td>
</tr>
<tr>
<td>Actual deep learning strategies</td>
<td>23.50 (3.28)</td>
<td>22.22 (3.48)</td>
<td>4.52</td>
<td>0.000</td>
</tr>
<tr>
<td>Actual surface learning strategies</td>
<td>16.54 (3.11)</td>
<td>17.98 (2.93)</td>
<td>-5.64</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 2 shows the differences between the students' intentional learning strategies, actual learning strategies and perceptions of the assessment demands in both courses. The results indicate that there are significant differences in the learning strategies adopted. Contrary to expectations, the students in the ABL course adopt more deep-learning strategies and less surface-learning strategies than the students in the PBL course. There were no differences in the learning strategies they intended to employ or in their perceptions of the assessment demands.

Table 3 shows the correlation matrices for both courses. This table shows that for the ABL course there are substantial and significant positive correlations between students' intended deep-learning strategies, the actual deep-learning strategies and their perceptions of the assessment demands i.e., "deep assessment". This is also the case for the PBL course. In both conditions, the correlation indices indicate that students who intend to employ surface-learning strategies perceive the assessment demands as surface and actually use surface-learning strategies. The results show clearly that the students who express their intentions to employ a certain learning strategy perceive the assessment demands as such and actually employ a related learning strategy. This association between the intended learning strategies and students' perceptions of the assessment demands and their actual learning strategies is clear under both conditions.

However, although the correlation between the actual deep-learning strategies and students' deep perceptions of the assessment demands is significant, the association is clearly weaker than for the students' intended deep learning strategies and deep perceptions of the assessment demands. For the actual surface learning strategies, the correlation with the students' surface perception of the assessment demands is very weak to negligible.
Table 3: Correlations between Students' Intended Learning Strategies, Actual Learning Strategies and Perceptions of the Assessment Demands for the ABL and the PBL Course

<table>
<thead>
<tr>
<th>Variable/ABL condition</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intention to employ deep learning strategies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Actual deep learning strategies</td>
<td>-.144*</td>
<td>-.168**</td>
<td>.128*</td>
<td>.082</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Intention to employ surface learning strategies</td>
<td>.478**</td>
<td>.055</td>
<td>.214**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Actual surface learning strategies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Deep perception of assessment demands</td>
<td></td>
<td></td>
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<td>6. Surface perception of assessment demands</td>
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<td>1. Intention to employ deep learning strategies</td>
<td>.428**</td>
<td>-.086*</td>
<td>-.031</td>
<td>.334**</td>
<td>.056</td>
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<td>2. Actual deep learning strategies</td>
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<td>3. Intention to employ surface learning strategies</td>
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<td>.023</td>
<td>.147**</td>
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<td>4. Actual surface learning strategies</td>
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<td>5. Deep perception of assessment demands</td>
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<td>6. Surface perception of assessment demands</td>
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Discussion and Conclusion

The findings of the study presented here are partly consistent with the results of Tang's (1994) study. In the ABL (test) condition, students who enter the course with the intention to employ a deep study strategy, perceive the assessment demands as deep and employ a deep study strategy. Students who intend to employ surface strategies, show a higher tendency to employ surface strategies. However, opposite to Tang's findings indicating a lack of relationship between habitual and actual learning strategies in the assignment condition, in our study, the same pattern appears in the PBL condition.

In addition, our study does not confirm the results of Scouller's (1996) study. Students in the PBL condition do not differ in their perceptions of the assessment demands from the students in the ABL (test) condition. Contrary to what could be expected on the
basis of Scouller's study, they adopt even more surface strategies and less deep study strategies than the students in the ABL condition.

Looking at the association between perceptions of the assessment demands and actual learning strategies, our findings confirm Scouller's (1998) results. There seems to be a relationship between students' actual learning strategies and their perceptions of the assessment demands in the test as well as the assignment condition. However, although most correlations are significant, they are relatively moderate.

Finally, additionally to Tang's (1994) study and both studies by Scouller (1996, 1998), in the present study, the association between the intentional strategies and the students' perceptions of the assessment demands as well as their actual learning strategies, were measured. The results indicate positive relations.

Why do the students in the PBL condition employ more surface learning strategies than those in the ABL condition? There are two possible answers to this question. First, Thomson and Falchikov (1998, p. 388) support that probably other contextual elements characterising the experiences of the students in both courses might have forced them into a surface approach. This is in line with Meyer, Parsons and Dunne (1990) who refer to the concept of *study orchestration* as the contextualised study approach adopted by individual students or groups of students. They emphasize that orchestrations are affected by the qualitative level of perception of the individual towards certain key elements of the learning environment. This might explain why, in the redesigned PBL course, students employ even more surface strategies than in the original ABL course, although there are no differences in intentional learning strategies and perceptions of the assessment demands. It also offers an explanation for the relatively moderate to weak association between students' perceptions of the assessment demands and their actual learning strategies. In this respect we refer to Segers et al. (2001) indicating that, although some students perceive the assessment demands as asking for higher level cognitive skills, many still employ surface learning strategies. The results of the interviews show that students perceive the learning environment as overloaded and therefore offering no room for exercising these skills. The students indicate this forces them to employ surface learning strategies. These results are confirmed by a follow-up study by Nijhuis, Segers, and Gijselaers (2005). They indicate the influence of students' perception of three elements of the learning environment on their learning strategies: the clarity of the goals, the appropriateness of the workload, and the usefulness of the literature. When students perceive these elements as negative, they are inclined to employ surface learning strategies. These results are in line with the findings of Thomson and Falchikov (1998). They refer to high levels of stress among students because of the perception of a lack of time. They state:

Students appear to be aware that, if they manage their time effectively, they will be able to deal with assessments in a way that will help their learning and understanding of the subject, which is consistent with a deep approach. However, they rarely succeed in managing their time in this way, and end up rushing assignments and feeling that they are approaching the work superficially (p. 388).
Second, Tang (1994) indicates that students, provided that they have the appropriate learning strategies at their disposal, will orchestrate their study to accomplish the task. However, in the absence of previous experience and the lack of a suitable repertory of coping strategies, students will have to rely on their study orientation or develop new coping strategies. This might explain why students with intentional surface learning strategies in the PBL condition rely on these learning strategies. Former research (Segers et al., 2001) within the same program as the one studied here indicated that students in their first year of study perceive that they are approaching the work superficially. These earlier experiences in the program in combination with a lack of coping strategies might explain why many students (in their second year of study) relied on their surface study strategies even when the learning and assessment environment had changed. However, these conclusions should be considered with caution. Although in former research the SPQ showed acceptable values for the Cronbach's Alpha reliability coefficient (Albaili, 1995; Zangh, 2000), the Alpha reliability for the scale measuring surface learning in both the ABL and PBL course was low (about 0.40 in our study).

Why did the students in the PBL condition not differ from the ABL students in perceptions of the assessment demands? The students' surface perceptions of the assessment demands in the PBL condition is especially striking. The surface perception of the assessment demands in the PBL condition by students with the intention to employ surface strategies may be explained by the comment of Entwistle and Entwistle (1992) concerning the different levels of students' understanding of the concept "understanding". In this respect, Scouller and Prosser (1994) argue that, in contradiction with students with deep learning strategies, students with surface learning strategies may not differentiate between the concepts "understanding", "recall" and "factual recall". These concepts are frequently used in the Perceptions of Assessment Demands Questionnaire, the former referring to deep perception of the assessment demands, with its focus on meaning, active integration and transformation of material and the latter focussing on reproduction and passive acceptance of material, representing surface perception. However, the high Cronbach's Alpha coefficient for the surface scale of the Perceptions of the Assessment Demands Questionnaire in this study does not support this argument.

Although the results presented in this study are promising, we agree with Scouller and Prosser (1994, p. 275) that "although caution must be taken in interpreting such patterns in terms of causal relationship on the basis of these results, the partial association between students' perceptions and employment of strategies reported above suggests this is a fruitful area of future research."

Further research is currently being designed to study the association between the students' perceptions of the demands of new modes of assessment, such as the OverAll Test, their intended and actual study strategies. First, the context of the study presented here will be expanded. Studies will be conducted in vocational secondary education as well as in the context of professional external qualification (assessment) programs. Taken into account the potential influence of prior experiences with new modes of assessment, this variable will be included in the design. Additionally, students' as well as teachers' perceptions of key elements of the learning environment will be investigated. Finally, the variables measured in the study presented here will be related to the students' performance.
Implications for Educational Practice

The present findings tend to indicate that while assessment steers learning, the mechanism is far more complex than is often thought. Changing a learning and assessment environment in order to align it with constructivist principles did not result directly in more deep-learning approaches, but rather had a contrary effect. Additionally, in the redesigned course, it was surprising that students' perceptions of the assessment demands did not change: they did not perceive the redesigned learning and assessment environment as being oriented towards deep learning. When changing assessment towards more deep learning, how can teachers support students' in changing learning strategies? Firstly, given that the students did not perceive differences in assessment demands between both conditions, it is important that "the teachers make the assessment demands as clear as possible so that students can accurately perceive the intended task demands, and hence, respond appropriately" (Tang, 1994, p. 13). This is confirmed by Mc Dowell (1995, p. 313): "As lecturers attempt to increase openness and clarity, students are becoming more and more part of the debate on such issues, making it increasingly difficult to retreat to former closed and covert approaches." Most of our students have prior experiences with testing practices which heavily rely on knowledge reproduction. These experiences form the basis for students to decide on the employment of study strategies and might impact upon their perception of the demands of future assessment. However, explanation of the aim of the assessment and clarification of the cognitive processes measured by the assessment is not enough. Together with Black and William (1998), we suggest giving more attention to formative assessment; this means assessment for improving learning, not only on the level of the content but also on the level of study strategies. The teachers' and peers' feedback on the extent to which students master the objectives measured in the assessment as well as on the way they study might contribute to a better understanding of the assessment demands as well as to the employment of deep study strategies.

Secondly, although the correlations are relatively moderate, the association between students' perceptions of the assessment demands and their actual learning strategies suggests that teachers and curriculum planners should pay explicit attention to how students perceive the various key elements of the learning environment. Although the learning and assessment environment might be designed according to current learning theories, the question is how students experience the learning environment, the assessment and the alignment between both. It is not the constructive alignment as designed but as perceived that impacts upon students' learning. Regular meetings with students might illuminate how they perceive the learning environment and on the basis of which perceptions they decide on a study strategy to adopt.

Finally, innovation is an incremental rather than a revolutionary activity. The finding that students in both conditions rely on their intended study strategies and perceive the assessment demands accordingly indicates the importance of students' prior experiences. At the start of the innovation one might even observe resistance to change and even a stronger tendency to rely on habitual approaches. Students probably need time to fully understand the changes and respond appropriately.
Note

1. The reduction in the number of students was caused by an inflow limitation in the first year, ordered by the faculty board.

References


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