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The evaluation of different styles of teaching and learning in the context of design and technology education

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Abstract
This paper reports two elements of a small scale investigation concerning the preferences of undergraduate students in relation to elements of the teaching and learning process. The work was conducted with students who were engaged in a four year undergraduate programme of Industrial Design and Technology.

Data collected from a questionnaire administered half way through the first year of the course sought to identify the styles of teaching and learning that students preferred during the early period of their transition between school and university. Subsequently, the same cohort of fifty, first year students was involved in peer review and evaluation sessions, linked to the practical design outcome and the design folio from two coursework design projects that they had completed. Following these review and evaluation exercises, data relating to the potential benefits and problems associated with the incorporation of this style of teaching and learning was collected using a group discussion and reporting technique.

Positive and negative reactions of the students to their involvement in the process of design evaluation and assessment will be considered, along with how this element might be incorporated into a balanced framework of teaching and learning in technology project work.

Background
Research into student learning reveals a significant and recurrent finding: it can never be assumed that the impact of different teaching strategies on student learning is what the teacher might expect it to be. Whilst the teacher always makes an assumption about how students learn, student reactions to teaching and assessment strategies are difficult to predict. (Ramsden, 1995) The teacher’s assumption about how students learn is largely based on their own personal experiences as a learner and also from evidence gained through direct observation of learning. (Eble, 1988)

All too often a major focus for student learning is how to please tutors. Gaining high marks when work is assessed is seen as a major goal by most students. This type of achievement strategy is likely to have been established and encouraged during earlier phases of education, when the student is often directed to operate in what can be described as a strategic mode of learning. Evidence suggests that this mode of learning may initially be encouraged by the teacher. Subsequently, the students adopt it as a successful strategy for matriculation. (Mockford and Denton, 1996)

From the student perspective, this strategic mode of learning is seen more as an achievement approach. They focus on the product rather than the process. The achievement approach can be academically positive. (Biggs and Moore, 1993) However, it is an approach to learning that is likely to lead students towards surface learning. This can be seen in contrast to the alternative approach to learning, described as a deep approach. (Entwistle and Ramsden, 1983)

During the transitional phase of education between school and university, a key objective is to facilitate changes in learning style, leading to more effective learning. One approach is to seek to modify student learning through the action of the teacher. Whilst varying or changing the teaching approach to a
programme or module is assumed to bring about changes in patterns of student learning research highlights a confused picture. The correlation between the desired change in the learning that has taken place and the teaching strategy that was adopted is difficult to confirm and predict. (Ramsden, 1995)

One alternative approach that might lead to a modification of student learning styles is to examine the assessment framework that is to be used. It would seem apparent that if students seek to please the teacher by matching their activity and learning performance to the production of an outcome satisfying the assessment criteria, then by introducing different strands of assessment, opportunities to modify predominantly strategic approaches to learning could be provided.

Examining one of the more abstract aims that is associated with higher education reveals an essential factor that can be seen to support this move away from a focus on the teacher. The action of critical thinking is frequently articulated as a fundamental aim of teaching and learning at this level. (Entwistle and Percy, 1974; Hale, 1964) To analyse ideas or issues in a critical, objective and positive manner requires structured learning experiences. In the context of technology project work there are numerous opportunities where this style of learning can be facilitated. Typically, this can be during different phases of design work: research; development of ideas; analysis of similar products. Whilst all these activities are largely familiar to the student prior to arrival at university, what is missing is deep engagement: strategic, assessment-related targeting is the norm.

It is acknowledged that an improvement in learning performance requires intervention at different stages of the educational process. Structuring these interventions to promote effective learning and promoting the development of critical self-awareness as a fundamental attitude is vital across all disciplines. (Entwistle and Ramsden, 1983) However, confirming effective pedagogy is not simple.

Appropriate to the study of learning style in the context of technology project work is the SOLO taxonomy (Structure of the Observed Learning Outcome). This hierarchy contains five levels of outcome that are used to classify the structural complexity of students' responses to a task. (Biggs and Collis, 1982) Defining and classifying learning outcomes in this way may prove to be a more objective measure of the style of learning that a student has adopted during a project.

An additional problem concerns different project contexts. Whilst students exhibit a predominant learning style, it will be adapted according to the project undertaken. This adaptation is dependent on a number of factors. An attempt to summarise these factors in a consistent way becomes very difficult when set against the complex range of activities evident in technology project work. Progress towards the establishment of an appropriate methodology for classifying learning styles using this approach is difficult to foresee. However, in conjunction with questionnaire responses, this taxonomy could prove to be helpful.

Against this background, the author sought to introduce, establish and monitor alternative elements of assessment in the form of peer review. These activities, structured by the teacher during assessment and during design development were seen as a significant vehicle to encourage critical thinking and self-awareness amongst the student population.

It should be noted that the term peer review has been used throughout the paper: this is significant and different to the more familiar peer assessment. In the work reported no marks have been allocated during the exercise, only judgements relating to attainment levels defined as very good, encouraging, needs improvement, poor. Numerical marks were not applied.

Methodology

A cohort of fifty first year students of Industrial Design and Technology was sampled regarding their preferences towards different teaching contexts. This data was obtained at the end of the first semester of their course,
as part of a wider questionnaire survey concerned with their perceptions of the programme of industrial design and technology education. It should be noted that all the teaching contexts described in the questionnaire were situations which the students had met and participated in during the course. It was intended to use this data to identify preferred learning contexts and to examine whether any clear pattern of preferences was evident following the transitional learning period between school and university.

In order to examine the positive and negative perceptions of students to the incorporation of alternative learning context, in this case peer review and evaluation, data were collected using a group discussion and reporting technique. Two sessions were conducted. The first examined practical outcomes and the quality of three dimensional modelling. The second was focused towards design folio work using a tracking form developed during previous peer review exercises. (Mockford, 1995)

All the peer review and evaluation work was conducted in groups. Four students, grouped alphabetically, were asked to examine the work of four of their peers. A system was used to ensure that groups did not sit in close proximity to their own work. In this way, distraction was minimised and the temptation to try to influence the judgements of the review group was largely eliminated.

After the second of these review sessions, following discussions in the review groups, each student was asked to report individually up to six things they felt were good about the exercise and six things that they felt were poor. These report forms were categorised by the author to find any consistent reactions, either positive or negative.

**Results**

The data collected in relation to student preferences of different teaching contexts are shown in figure 1.

Students responses to the inclusion of peer review into the assessment framework for
technology project work are summarised on this page. Positive responses are shown in table 1, negative responses are shown in table 2.

Discussion
The results concerning preferred learning contexts reveal a largely positive attitude. The only deviation from this positive response relates to lectures, where a neutral profile is evident. The responses recorded for all other learning situations do not show discrimination to any significant degree: they are all equally positively rated. A more varied and interesting profile both for the cohort and for individual students had been anticipated. The data does not reflect this expectation.

The second set of data collected from the feedback following peer review sessions shows a more interesting set of characteristics. Distinctive, consistent responses to this activity are revealed. The positive responses will be described first, followed by the negative responses. These will be described in order of significance.

Seeing the work of other students was cited by fifty percent of the student cohort as the most rewarding aspect of this activity. This is significant and surprising. For this module of design practice the students work in what can be described as a studio context. It might be reasonable to expect they would have

<table>
<thead>
<tr>
<th>Summary of comment</th>
<th>Number of responses (% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>See the work of other students</td>
<td>27 (50%)</td>
</tr>
<tr>
<td>Obtain another view of your own work</td>
<td>16 (32%)</td>
</tr>
<tr>
<td>Learn about ideas and techniques for modelling</td>
<td>16 (32%)</td>
</tr>
<tr>
<td>Learn about different approaches to designing</td>
<td>12 (24%)</td>
</tr>
<tr>
<td>Understand the process of marking</td>
<td>10 (20%)</td>
</tr>
<tr>
<td>Practise evaluating</td>
<td>6 (12%)</td>
</tr>
<tr>
<td>It is fun to do !</td>
<td>5 (10%)  n=50</td>
</tr>
</tbody>
</table>

Table 1

Negative student responses to the inclusion of peer review in the assessment framework for design and technology project work

<table>
<thead>
<tr>
<th>Summary of comment</th>
<th>Number of responses (% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal preferences/relationship influence judgments</td>
<td>7 (14%)</td>
</tr>
<tr>
<td>Inappropriate or poorly defined criteria</td>
<td>6 (12%)</td>
</tr>
<tr>
<td>Distressing or embarrassing</td>
<td>5 (10%)</td>
</tr>
<tr>
<td>Unfair on weak work</td>
<td>5 (10%)  n=50</td>
</tr>
</tbody>
</table>

Table 2
Mockford 4.3

Knowledge about the work of their peers. Viewed from the tutors' perspective, it appears that students move freely around the room, looking at work and discussing approaches to the task under consideration. However, from the interpretation of the data collected it is suggested that this is largely a social interaction rather than a design interaction. Promoting a design dialogue is clearly an important role for the tutor in this learning context.

Obtaining an alternative view of their design work and practical models was reported as a positive aspect of peer review. All too often students see a tutor as the absolute judge. Using peer review to provide an alternative feedback mechanism can help to communicate a different perspective of the assessment submission. It also exposes the subjectivity of some elements of assessment in technology project work. From the tutors' perspective this can be used as a positive learning experience: students can be encouraged to adopt a more independent and potentially more creative approach to work.

Another major feature of the data collected concerned student learning in relation to techniques, both for design folio work and model making. It was clear that the consideration in a formal setting of both physical models and design folios had exposed the students to a range of alternative approaches and techniques. Moreover, many had reflected critically on their own approach to designing and modelling, making note of alternative styles and techniques that had been used by their peers. In seeking to modify learning styles the action of critical reflection provided an opportunity for change. In addition, the students were encouraged to reflect more deeply upon their own approach to designing.

Since this cohort was intending to become teachers of design and technology in schools it was not surprising to see a positive response towards learning about the mechanics and judgements required during assessment. Equally encouraging from the tutor’s perspective was that some students found the whole activity of peer review fun to complete.

Negative aspects of the inclusion of peer review into the assessment framework were not so clearly defined nor as numerous as positive responses. An overriding feature of the negative responses concerns organisational issues. For this type of activity to be successful, the system of review, the textual materials presented to students and the layout of the room need to be carefully planned. Accurate and clearly defined criteria or statements of attainment are of vital importance if learning is to be facilitated. In addition, through efficient organisation, the tutor must remove ambiguity concerning the mechanics of the session, whilst also eliminating situations where personality conflict may adversely influence objectivity.

Summary

It has been shown through a number of studies that when students feel dominated by the demands of assessment then they largely adopt approaches to a task that focus on meeting the assessment criteria. Planning, composing and reviewing are not complex. In the area of technology project work this will result in the adoption of surface approaches. The consequence will be a restricted outcome at a low level. Alternatively, deep approaches provide the student with an opportunity to produce high quality outcomes. (Hounsell, 1984; 1985) The focus for engagement in the project is not the assessment framework.

Using peer review as a regular feature of assessment frameworks can provide a stimulus for change in learning style, encouraging deep approaches to learning. However, such activities require commitment on the part of the tutor and a high level of organisational efficiency if they are to be effective. Several key points can be highlighted.

With this cohort of fifty students the paperwork for students to use for peer review, room layout and the actual work to be reviewed were all prepared and set out in advance of the teaching session. This consumes a significant amount of time. Review sheets for students to use during the session, coupled to statements explaining different levels of attainment need careful preparation: students are relatively naive in...
this domain. Equally, if design folio work is to be reviewed, a tracking form or a similar tool needs to be prepared to provide a focus for the activity. (Mockford, 1995)

Time allocation and management of the session is also critical. From experience, a single session runs most effectively if it lasts for a maximum of one hour. This allows each group to sample up to eight pieces of work. Working beyond this time can result in peer review fatigue, adversely affecting the session.

In seeking to provide a balanced framework for assessment, where learning can become the focus as opposed to achievement, peer review and evaluation of technology project work can be seen to have a significant role to play. Students can begin to see the activities of learning and designing in a higher position relative to simple achievement goals related to matriculation. Using opportunities presented during assessment to encourage deep approaches to learning is a positive mechanism for stimulating a change in styles of learning and designing during the transitional period between school and university.

References


