

Innovative performance – how can it be assessed?

Inga-Britt Skogh, Stockholm Institute of Education, Sweden

Abstract

In 2004 the Technology Education Research Unit (TERU) at Goldsmiths College in London developed a system of evaluative methods which measure and reward innovative performance (possessing ideas, developing ideas, as well as evidentially testing ideas). Together with Professor Richard Kimbell (Goldsmiths College) a group of researchers from Sweden have tested this evaluative tool in a Swedish upper secondary school. The Swedish research project involved a testing series based on the TERU assessment methods as well as studies carried out with pupils/students and teachers alike, revealing their thoughts on assessment issues in general. Some preliminary results from this very first application of TERU's assessment tool outside the UK, are presented in this paper.

The results from the Swedish pilot testing project have been found to be similar to the results found in the UK. The student's individual level of achievement in the test corresponds almost identically. Student attitudes to the test and test situation are also very similar. Just as in England, girls are relatively direct in terms of openness and reflection compared to the male students, while the boys on the other hand, tend to have relatively stronger ideas when compared with the female students. Another similarity is found in the fact that the Swedish students test performance did not match their design grades achieved prior to the TERU based test, carried out by their teacher.

The Swedish research project includes studies on the student's attitudes towards different aspects of assessment issues. This portion of the study results is preliminary only. Among the results which have become apparent to date, are the tendency of many Swedish students to possess strong views about what they believe teachers bases their evaluations on, as well as on what criteria they would prefer their teachers to assess them on. Few students appear capable of defining orally how the concept of design or the involvement of technology could better serve the ultimate goal of more effective evaluation.

Keywords: *assessment, D&T, evaluation, performance, secondary school, assignment, United Kingdom, Sweden*

Introduction

In Sweden the interest for research related to the assessment process has increased in recent years especially among researchers and teachers. The fact that assessment criteria govern the direction of education has become more and more evident. Professor Lars Lindström is one of the leading researchers in Sweden in this field. He and his research group at the Stockholm Institute of Education have been working on several research projects related to this research field. In 1999 the group presented a study on the use of portfolios in Swedish schools (Lindström, Ulriksson & Elsner) that attracted much national attention. In his most recent research Lindström (2005) is focusing the progression from 'novice' (apprentice) to 'expert' (master). In this study Lindström is particularly interested in the relationship between the learning culture of school and that of working life.

Developing reliable methods of evaluating student knowledge and educational development within the practical and aesthetic subject disciplines is an important objective for educationalists and research, in both the UK as well as Sweden. Particularly with regard to how to capture and focus the student's creative and innovative characteristics which traditional learning by rote methodology has been shown to be incapable of.

Recently a research group (Technology Education Research Unit, TERU) at Goldsmiths College under the leadership of Professor Richard Kimbell, developed an evaluation instrument which is especially designed to identify and evaluate creative characteristics such as creative qualities as well as imagination, innovative risk-taking and the ability to develop ideas.

As a result of Professor Kimbell's association with the Stockholm Institute of Education as guest professor during the autumn of 2004, an idea emerged that the TERU group's evaluation instrument be applied in the context of a Swedish Secondary School. Would the analytical instrument which was developed in an English environment prove itself reliable and usable in a Swedish context?

Within the framework of the Swedish research project 'Assessing Design and Technology', the



TERU's evaluation instrument has now been tested outside the UK for the first time. The Swedish research project encapsulates beyond actual tests of the evaluation instrument, actual analysis and recording of what students think about and about how they think about it, as well as knowledge assessment and grading in the subjects of technique and design. With regard to the datorised collation of these aspects, the results are not yet wholly complete and because of this only a small number of results from the studies are presented in this paper.

The Evaluation Instrument

That which now follows, describes the overall design of TERU's evaluation instrument. The presentation is by way of a short introduction to the method. A reader who wishes to further familiarise her/himself with the method and the thought from which it stems, is warmly recommended to read the TERU-Groups own material, reports as well as articles which outline in detail how the tool is applied (Kimbell, 2005).

TERU's evaluation instrument is composed of two parts, - a class room activity where the students under close observation, get to work with a practical technique/design assignment and during a subsequent evaluation phase, the teacher grades the students work with the help of a specially designed evaluation form.

The classroom assignment provides for a student who is tasked with a project problem which is expected to be solved on an individual basis within a stipulated time. The nature of the test environment is such that the students may discuss their varying problems ideally finding solutions together. However, the teachers instructions/script, as well as the students work is rigorously monitored. Each student documents her/his own working process in a specially prepared note book. The students working progress is also documented with the help of photographs which are attached to each students note book.

The evaluation of the test occurs in three stages with the help of a specially prepared assessment form. At 'Stage 1' the teacher/evaluator gets an overall overview of the standard of the students effort. The assessment is framed on the basis of pre-prepared criteria on a twelve grade scale, where innovation is valued highly at (12) and predictability is valued at the lowest level

possible, (1). At 'Stage 2' evaluation is carried out on the basis of assessment via the note books and project examples which directly reflect the degree to which the students work has developed and displayed evidence of a capacity to implement ideas. Also here, we employ given criteria, arranged in a twelve grade scale which the teacher/evaluator can rely upon. At 'Stage 3', the individual students work is focused upon in terms of the design aspects, (D), technical aspects, (T) and or the aesthetical aspects, (A).

The Test Environment in Sweden

The Student Group

The student group which towards the end of January 2005, participated in the testing of TERU's evaluation instrument in Sweden, were chosen under the following criteria:

At an early stage, one of our teachers at the Institute of Educations Technical Department, expressed an interest in participating in such a test within a classroom environment. The teacher who we may call 'Lynn' works on a part time basis as a teacher in design with the Institute of Educations Technical Education courses, as well as on a part time basis as a secondary school teacher on a design course held under the auspices of the technical curriculum of a Higher secondary school in Stockholm.

The secondary school class in question was composed of 30 students between the ages of 17 and 18, who were participating in the second year of their three year technical studies in industrial design. At the time of the tests 27 students were present in a class composed of 14 girls and 13 boys. One of the students (a girl) broke off the test after an hour and a half.

The students were informed verbally about the test by Lynn as well as via a letter from the project leader, which was directed both towards the students as well as their parents. From the information (which was sent out a couple of weeks before the actual test) it was made clear that the students would participate in a design assignment, comprising of two lessons of three hours in length respectively. The information contained in the letter made clear that the lessons were part of the scheduled education programme and that the methodology was developed by UK researchers and would be monitored both by them as well as by the Institute of Education in Stockholm.



The Assignment

The assignment, the students in the Swedish test were confronted with, was a project which required the development of a light bulb packaging design. The project which was entitled 'Light Fantastic', with the aim of developing a product which could replace current light bulb packaging. The current light bulb packaging, has outlived its usefulness once the light bulb is removed from it. The new wrapping was to, in one respect or another, relate in some way with the light bulbs function - the provision of light. Among the ten or so projects which the TERU Group has developed within the framework of its evaluation project, this exercise is the one tested most often with UK citizens. For this reason it was chosen by TERU as a norm setting and standardized problem solution.

The Test

The test took place in the students school, in a hall normally used as an examination hall. The students sit during the exercise in groups of three per table. On each table there are a number of different light bulbs, all of them packaged in a (handling collection or group collection) as well as the students note books and pens. The students choose themselves who they want to work with. A majority chose to work with class members of the same sex. Among the nine groups created, seven are single sex, (with four all girl groups and three boy groups). At two tables both boys and girls worked together. At one table sat two boys and a girl¹, at another sat two girls and a boy. At one table where only girls sat, a tape recorder was placed nearby which recorded the content of group conversations during the exercise.²

At the front of the hall, tools and working material such as modelling kit was placed on a table. On another table a number of items and objects were on display with the aim of stimulating the students prior to them working with the project.

The assignment was introduced in Swedish by the teacher in the recommended manner, which was in fact a direct translation of the English instructions and which the teacher adhered to carefully. The students were informed that the project was to be attempted on an individual basis but that it was permitted for group members to speak to each other during the work. They were given the option of writing their project notes in English or Swedish. The class's English teacher was also present throughout the entire test to

assist students who required help with their English project instructions.

The students were told that they could decide as individuals how they wanted to develop their product (with sketches, drawings and/or written notes), - namely any method which would lead to the development of an end product.

Cultural Differences and Linguistic Nuance

During the test the students were constantly supervised. Of the memorised notes which were recorded, it is apparent that the student's engagement was both attentive and interested. From time to time during the exercise, students asked elementary questions, they mainly were related to the different activities which the teacher initiated. On some occasions the questions revolved around how the teacher formulated his instructions (according to the test format). Students reacted to the cultural differences which here and there became apparent from the teachers manuscript. The message in for example, the phrase, "*You won't lose any 'points' - what we are interested in is your ideas*", were for these Swedish students not as self evident as they may have been for the more examination oriented, English students. The challenge "*Don't be shy - it's very important that everyone understands so that all of you can do your very best*", provoked an amused murmur among the students. Avoiding asking questions of a teacher on the grounds of shyness is for a majority of Swedish students at secondary school an unusual thought!

The Swedish translation of the manuscript revealed a number of difficulties on several points. This became clear among other things with the translation of the word "*wackiest*". In the Swedish translation the word has a similar, but not an exact, respective linguistic meaning. It is likely that these and other linguistic and cultural differences which are present in the material, played little or no role with regard to the students possibilities for conducting a fair and representative exercise without being influenced by such factors with the evaluative methodology (e.g. within the teachers instructions, in the students note books, and in the evaluation forms which are to be studied and analysed).

¹ The girl broke off the test after about an hour and a half because of illness.

² Data from the sound recording at this moment is not fully reproducible as yet.



Some Reflections on the Student Performances during the Tests

As we have pointed out earlier, the students in the test class were from a design group within the framework of the secondary school syllabus Technical programme. It is in other words a specially oriented group of students who were confronted with the test assignment. The students overall were extremely clever at sketching and drawing and a majority of them successfully applied a number of different techniques.

The student's capacity to transform their ideas into concrete 'end products' on the other hand was not of the same quality. Problems with the material as well as technical construction problems popped up during the work in progress and the difficulties experienced by several students were simply never resolved.

An impression emerged that the fact that the students could themselves choose which class members they wished to work with, had in fact influenced how the students approached the project. This was noted following a review of the student's efforts which revealed that a majority of the girl students from the start, worked with the aesthetical aspects of the different solutions. The responses the girls gave their class companions revealed that in the first instance these aspects were prioritised.

Among the boys it appears to be more normal to concentrate most energy on the technical aspects of a functioning solution. The responses the boys gave one another were primarily oriented towards reaching a technical solution.

Before the material is fully analysed, it would be risky to draw too many long range conclusions about this but on the other hand more awareness about the composition of the working groups which might well serve to enrich not only the group discussions but also the individual student's actual end products. In the same fashion perhaps other constellations of students based upon earlier fore-knowledge and motivational qualities might well contribute to student stimulation and inspiration.³

Some Results

In the Swedish test the student's efforts were evaluated by two adjudicators, Marker (1), Lynn and Marker (2) who with the help of the pre-prepared

evaluation form separately assessed the efforts of the students from the notebooks and the models.

Marker (1) was the class design teacher who attended the test. Marker (2) was an 'outsider' with experience as a secondary school teacher and as a teacher trainer with picture and design. Marker (2) was not present during the test and did not know the students. Following Marker (1) and (2)'s analysis and assessment, a calibration of the result grades, the actual grading placement was discussed at a meeting. At that meeting an evaluator attended who has had long experience of the instrument (Professor Kimbell), as well as Marker (1) and myself in the capacity of an observer. Marker (2) could not participate unfortunately, but did however, place her notes at the disposal of the group. The discussion lead to these revised evaluations or moderated marks.

In Table 1 the students average grading is fairly apparent from a holistic perspective. Here, we can note that Marker (1) (i.e. the class teacher) tends to award higher rather than more moderate marks to both boys and girls. Marker (2) tends to award lower grades to the girls and higher than moderate grades, to the boys.

	Marker 1	Marker 2	Moderate marks
	hol	hol	hol
Girls	7,4	6,5	7,2
Boys	7,8	7,9	7,3

Table 1: The overall average grading (holistically (hol)) of the students work (based on a 12 grade scale where 1 is the lowest value and 12 the highest)

Marker (1) and Marker (2) both judged the boys efforts higher than those of the girls. This difference in evaluation results is most apparent in the case of Marker (2). If we examine the revised evaluation (moderate remarks) we see that the difference between the girls and the boys tends to even out notwithstanding the fact that the boy's efforts tend to be judged as being marginally better than the girls. Here the Swedish results reveal a difference with the test results in the UK.⁴ According to Professor Kimbell, it is generally the girls who achieve the best results in the UK. What may lie behind this situation provides reasoning for further investigation.

³ The students views on this issue; I will return to in the second report on the project which will be published in October, 2005.

⁴ The account of the situation in the UK in this paper is based on information supplied by Professor Kimbell from notes taken during interviews conducted while visiting Sweden 25/04/2005 - 29/04/2005.



Just as in the UK, the students grading in the test is not reflected in the school grading received by the student on the Design course. Three of the students in the class (two boys and one girl) particularly excelled in the test. Each of them has been graded in the highest category group. (10 - 12). The girl and one boy achieved the grade 11, the other boy was graded at 10.

The two students who achieved 11 in the test were both assessed earlier as being 'average' students by their teacher prior to the test. When it came to the boy who was graded 10, his teachers earlier assessment corresponded with the test result more closely however, not completely. This was also the case with a girl who the teacher, prior to the test had been assessed as being the best student in the class. In the test she achieved a score of 9 just below the leading trio.

The Students' Opinions

At the conclusion of the test, the students were asked to fill out a questionnaire. They were asked for their opinions on the test. The questionnaire is identical to the one used in the UK and was not translated into Swedish. In the questionnaire, the students expressed their views about a number of assertions by choosing one of a number of possible answers per line "strongly agree", "agree", "disagree", "strongly disagree". Table 2. shows how the possible alternatives "agree" or "strongly agree" are distributed among the different assertions.

Statement	"agree" "strongly agree"
having 6 hrs to work	88%
the task	92%
handling collection	85%
worksheet (booklet) note book	88%
group generated ideas	92%
photo story-line	96%
modelling kit	81%
sketching/notes	85%
group evaluation of ideas	96%
timing	54%
fair assessment?	100%

Table 2: A percentage distribution of the students' questionnaire answers with the responses "agree strongly" and "agree".

From the compilation above, we observe that the overwhelming majority liked the projects design

and the way the work assignment was organized. The students are especially positive towards the photographing of their work, the give and take discussions with their classmates and with regard to the (modelling kit), they had access to during the test. In these respects, the Swedish student's answers corresponded closely with the responses of English students who have experienced the test.

On one point, the Swedish students differ from their English counterparts. According to the questionnaires, the Swedish students were more positive towards the use of the notebook and how it is designed to allow room for sketches and drawings. The impression that the test gives a firm basis for the evaluation of Design and Technology as subjects, received a noticeably positive response from the students.

Teacher/Evaluator Opinions

Both the class teacher and the evaluator have been asked for their opinions on the students' efforts at the evaluation phase. The results are preliminary ones only as the work on the data based material is still ongoing. However, some results can be presented, nonetheless.

With regard to the classroom activity, both the teacher, Marker (1) (Lynn), and the outside evaluator had a very positive impression of the experience. The assignment is fun for the students and is regarded as being exciting and unusual. The question about whether the students are used to this kind of project, is in the view of Lynn, not all that different from the kind of assignments she usually gives her students. What is different however, is that students have not before worked through a development process in an examination environment where a whole process is pursued from inception to arrival at an actual solution? Both evaluators have had some difficulty in translating the grading criteria. It has shown to be difficult to find Swedish words with appropriate nuance.

Both point also to the fact that the evaluative criteria can and indeed should be used as a basis for the guidance counselling sessions with the students. With regard to the grading criteria, should they be taken into account by the evaluators? Should a student who dares to be innovative but fails to complete the project be evaluated at a higher level than a student who takes fewer risks and has more control over the development process? Particularly how should one evaluate some of the students who have not yet managed to develop the idea they chose to explore?



Future Study?

The project 'Assessing Design and Technology' will of course continue. Further analysis of the completed material particularly the computerised material needs to be closely studied. Just now we are conducting follow up interviews with a representative selection of the test class. Even the highest preliminary results awaken new and exciting questions. For example, how important is the gender of the students and indeed the teacher/evaluators for the success or failure of the testing instrument? What part does foreknowledge play in influencing the evaluators' decisions when grading students? Does conditioning occur? Exactly how are we to assess the effectiveness of the instrument?

One aspect which is relevant to the analysis work is the question as to what extent the functioning of the instrument actually effects results. Among the students there were in fact very few who actually met the full demands of the actual function specified in the model exercise.

The students themselves don't seem to place much emphasis on this consideration and the fact that the evaluation instrument has not put its finger on why this is the case, also raises interesting questions.

Students' thoughts about the evaluation also raise other questions. In interviews and via the follow up questionnaires which they replied to about a month after the test; the students expressed firm opinions with regard to what they believed that teachers in terms of aesthetic and respectively theoretical subjects based their evaluations on and what they wished the teachers would actually base these assessments on. Particularly in terms of identifying and defining the terminology relevant to Technique and Design when students feel vague and uncertain.

There are indeed many questions which remain to be answered and hopefully within the framework of our project, we will shortly be in a position to provide at least some useful answers.

References:

Kimbell, R. (2005), Assessing Design Innovation, in Lindström, L. (Ed.), *Technology Education in New Perspectives*, pp17-35. Stockholm: HLS Förlag. (Stockholm *Library of Curriculum Studies 14*)

Lindström, L, Ulriksson, L & Elsner, C (1999), *Portföljvärdering av elevers skapande i bild*. Stockholm: Skolverket/Liber Distribution

Lindström, L (2005), Novice or Expert? Conceptions of Competence in Metalwork, in Lindström, L. (Ed.), *Technology Education in New Perspectives*, pp.61-83. Stockholm: HLS Förlag. (Stockholm *Library of Curriculum Studies 14*)

