What happens when learning intentions are made explicit in a design and technology project?

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Abstract

The paper discusses the results of two studies that investigated a particular design and technology project undertaken by higher education students. The project is unusual in that the intention of learning is made explicit rather than its implicit status in the more usual design and technology project brief. Although a range of themes emerged in both studies, future professional practice and assessment were the dominant influences on respondents' intentions during the project. Assessment, analysed from a constructivist perspective, influenced respondents to produce an outcome that was in keeping with a certain class of finished, three dimensional artefact. In many cases this constrained and limited the pursuit of learning intentions.

Introduction

The paper describes and analyses two studies which sought to identify the dominant influences on higher education students during a specific design and technology project. The studies, conducted in 1994 and 1996, have looked at two different cohorts of the same course engaged on the same project brief. Two researchers undertook the studies, each utilised different research methods but both worked in the qualitative tradition. The studies investigated the Individual Learning Project (ILP) which explicitly prompts students to identify, and address, an area of perceived weakness.

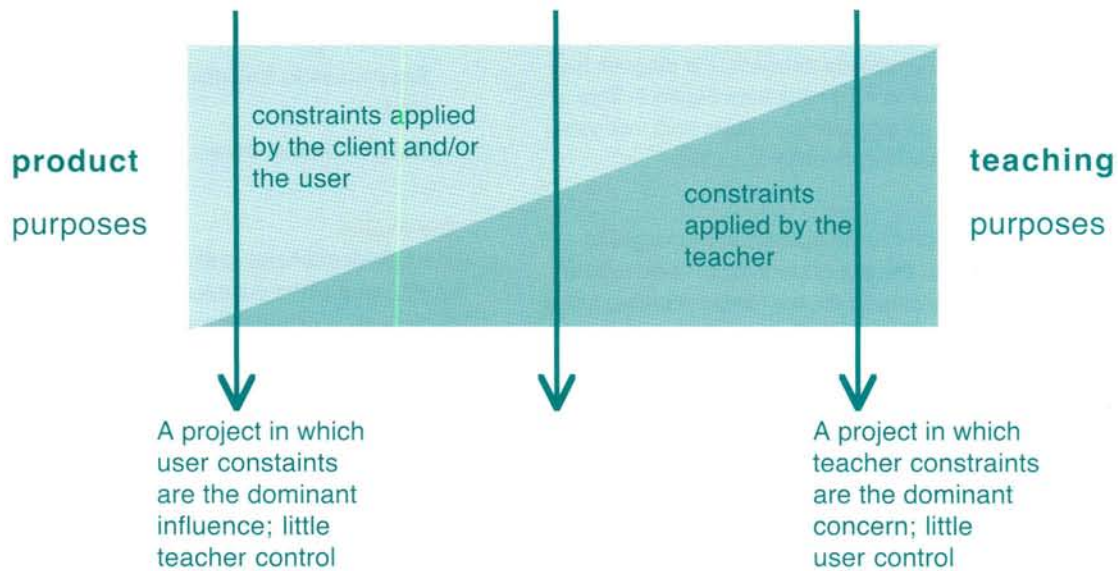## The individual learning project

The ILP is undertaken near the end of the third year of a four year course. The course's central award is a BA (Hons) degree in Design and Technology, but concurrent with the degree the course also offers a choice of one of two certificates: a Certificate in Education for those who wish to teach in secondary schools (Education Pathway); or a Certificate in Industrial Studies for those choosing a career in industry (Industrial Pathway). For the initial two years of the course all students follow a common programme and it is only at the end of the second year that a commitment is made to one of the two certificates. The ILP is part of the degree and its assessment outcome contributes to a student's degree classification.

In the first two years of the course projects are predominantly tutor instigated and students work primarily as individuals. At the outset of the third year a substantial group project is undertaken with an outside client/sponsor which has some very important but potentially difficult learning objectives. Students have to work with, and sometimes for, others, rather than themselves. One issue, amongst many, that arises during the group project is whether they should work to a personal strength or to a weakness. Working to a strength can greatly assist the achievement of the client's and their own group's intentions, but it may not further their own learning and achievement on course. Students frequently feel that during the group project that they have experienced a loss of control over their work. The fourth year of the course is focused on the individual, with course elements consisting of a placement in school or industry, a major personal project and a dissertation.

The ILP (an edited version of the brief as given to students is given in Appendix 1) is instigated with two purposes: to re-orient the student to working as an individual rather than as a member of a group; to make a personal audit of skills, knowledge and values and then to address a selection of them. The first purpose is accomplished through the ILP's individual nature, the second through each student identifying her/his prioritised learning needs and a project that will require these to be addressed. Each student submits a project proposal that outlines 'learning needs' and 'designing needs' (see below) and for the purposes of the ILP it is acceptable to give a higher priority to learning than designing. Group tutorials are used to discuss progress, and at the end of the project students submit two written evaluations: one evaluates to what extent they have achieved their learning needs, the other evaluates the 'vehicle' chosen by them to facilitate these learning needs.

'Designing Needs' and 'Learning Needs'

This section is concerned with distinguishing between the terms 'designing needs' and 'learning needs' as used in this paper and to achieve this it commences with a more general review of purpose in design and technology education.

product

purposes

constraints applied
by the client and/or
the user

constraints
applied by the
teacher

teaching

purposes

A project in which
user constraints
are the dominant
influence; little
teacher control

A project in which
teacher constraints
are the dominant
concern; little
user control

Design and technology tasks in schools and colleges and design and technology tasks in industry may have similar outcomes but the purpose behind these outcomes is fundamentally different. For the industrial professional context the purpose is to achieve a workable product or system; in an education context it is to achieve learning. A number of authors refer to this diversity of purposes (Schon, 1987; Stables, 1993) and particularly the Assessment of Performance Unit (APU):
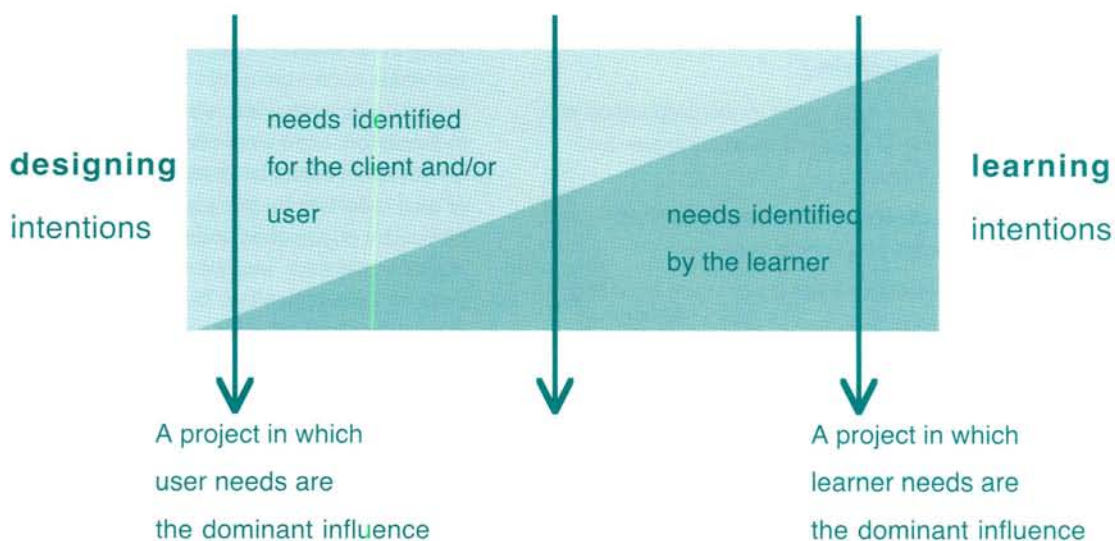
"There is some confusion between industrial and educational perspectives on the activity. In education the concern is to expose pupils to designing technological experiences in order that they may develop understanding and

capability. In industry that design and technological capability is directed towards a manufacture of a product or system. Whilst a product is less important than the process of education we must recognise the inter-dependence of these two perspectives of the activity." (Kelly et al 1987, p.7).

In design and technology education learning is prompted by the identification of a need in the made world and then enabled by learners attempting to meet that need. This duality of outcome, and a concomitant duality of who controls the process, is articulated in various publications but succinctly in Kimbell *et al* (1996, p 37). Fig. 4.1 (*op cit*) is reproduced as Figure 1.

Figure 1: The Dual Purpose of Tasks. From Kimbell et al (1996, p.37)

Figure 2: A reconfiguration of Figure 1

designing

intentions

needs identified
for the client and/or
user

needs identified
by the learner

learning

intentions

A project in which
user needs are
the dominant influence

A project in which
learner needs are
the dominant influence

Utilising this diagram in principle but shifting the emphasis from teaching to learning, from constraints to needs, the diagram has been reconfigured to form Figure 2. This is seen as a proper pedagogic shift, not solely a superficial, terminological one.

The ILP brief is unusual in two respects. Firstly, the aim of learning is made explicit rather than its implicit status in project briefs the students have previously experienced. Secondly, they are prompted to place the major emphasis on meeting learning needs rather than designing needs. In terms of Figure 2 the expectation is that they should be operating at its right hand margin, or at least in its right hand sector.

Once students have established their learning needs a suitable vehicle has to be found through which these can be addressed. This vehicle will have, to a greater or lesser extent, user/client needs associated with it; its designing needs. Both sets of needs are translated into intentions through the action of writing two specifications, one for learning and the other for designing. In this act of translation some needs may be prioritised, some discarded if incompatibilities are found. A typical initial proposal, from study 1, was:

Brief
A piece of furniture which could be used in a one-bedroom/studio flat.

Learning Objectives
To gain experience in the wood and metal shops and become more confident on wood-mill plant. (This is an important element as I wish to combat my fear of this machinery.)

To gain experience in the preparation of stock as opposed to ordering pre-cut materials.

To continue my interest in furniture design and construction.

Investigate a variety of topics including ergonomics, use of colour and texture and form.

Research: to investigate the thinking and influences behind furniture design.

Designing Objectives
The furniture is to have a double role, sleeping and seating.

Strong yet lightweight in construction; manageable weight.

Easy to use in transition from bed to seat.

Ease of transportation.

The studies
Two different cohorts of students were investigated whilst engaged on the ILP. Each study was undertaken by different researchers, utilising different approaches in the field, but both worked in the qualitative tradition. Teaching and supervision were similar for both cohorts of students.

Study 1, conducted in 1994, is based on 7 respondents from a cohort of 15 students. Five respondents were undertaking the Certificate in Education, two the Certificate in Industrial Studies. Data consisted of two recorded interviews with each respondent, one interview during and the other immediately after the project's completion, and the respondent's project proposal and subsequent evaluation. Prior to an interview respondents would track on a 'schema' (reported in Elmer, 1995) what was happening for them whilst on the project task and these completed schema then formed a central stimulus for the interview. The interview probed further the meanings recorded in the respondent's completed schema sheets, and in particular the respondent's intentions and, if possible, reasons for change to these intentions. The use of a typology, grounded in data from a larger study, to analyse the interview data is reported in Elmer (1996).

Study 2, conducted in 1996, was based on the whole cohort group of 13 students. Five respondents were undertaking the Certificate in Education, eight were undertaking the Certificate in Industrial Studies. The method of data collection for this study was participant observation at tutorials between students and tutor, and the respondent's proposal and evaluation. The tutorial observation was followed by semi-structured interviews with some of the respondents to confirm respondents' intentions.

The next section identifies the dominant influences on the respondents' intentions during the ILP and this is followed by a

general discussion. Within the scale of this paper each study will not be individually reported.

Dominant influences

Although a range of themes emerged in both studies, future professional practice and assessment were the dominant influences on respondents' intentions during the ILP.

Future Professional Practice

Career expectations had a significant influence on both education and industrial students when they were asked to consider learning needs. Career intentions not only affected what weakness they focused on but also the type of artefact they chose to make in order to address their perceived weakness.

A major, if not the major, prompt for Education Pathway respondents was their perception of their ability as practitioners in classrooms and workshops, coupled with comments made to them by teachers and college tutors. A number of Education Pathway respondents identified an additional purpose: their learning vehicle might at a later date assist the learning of others; it would be a teaching resource in their future career. Industrial Pathway students also gave careful consideration to their future professional careers when identifying learning needs, and in particular to improving the communication of their design ideas. For these students the artefact had only one purpose, a means of addressing their identified weakness, and consequently it appeared to be a more personal statement; a thing for themselves.

Assessment

At its commencement students recognise the ILP as an important opportunity for them to pursue their learning needs and they were able to identify these needs relatively easily (but found it more difficult to select an appropriate vehicle through which they could be addressed). During the early tutorials students talked enthusiastically about the learning they hoped to achieve: *"I am interested in the learning process rather than the finished article."* (Study 1), but during the period of the project there was a significant shift away from these learning needs; from the right hand domain of Figure 2 to its left hand domain. In a small number of cases end-user needs influenced this shift but in the majority of cases it was assessment, and its influence was twofold:

• the tension between learning needs and course assessment

• the dominance of producing a 'recognised' artefact.

Assessment of the ILP is the same as for all project work on the BA: formative at the end of a project ; summative at an examination by display at the end of year two or year four. The ILP brief (Appendix 1) gives no specific marking criteria for its formative assessment; rather the emphasis is on students' reflective evaluation of their own achievements. At this time the tutor has a voice but one directed solely to the quality of these evaluations and in a quantitative sense a minor one (20%). The ILP brief reminds students that they are able to make changes prior to summative assessment.

The tension between learning needs and course assessment

Research suggests that assessment criteria in higher education are a predominate influence on the way students approach assignments and their subsequent learning, (Davis, 1966, p 147): *Assessment of the subject is likely to have the biggest effect on students' approach to and concept of learning than any other factor.* These two studies indicate that despite the assurances given at the commencement of the ILP, that the project was premised on learning, assessment of its outcome featured considerably in students' perceptions:

"Well, it doesn't matter what we do in here. We know it's going to be assessed by someone else, so therefore you're consciously or sub-consciously designing to meet those standards which are set by other people. Even on an individual learning project like this you've still got that at the back of your mind and it's still going to influence the way you design things." (Study 1).

The dominance of producing a 'recognised' artefact

The examination by display is the summative point at which all project work of the preceding two years is assessed. It is very different in two significant ways to the other two means of assessment (coursework and written examinations). Firstly a student's work is accessible, to their peers and others; it is a public arena. Secondly, students expect that not only is an artefact (and its attendant documentation and modelling) the recognised physical outcome of their project work, but an artefact that has been brought to an advanced level of prototyping. This is quite proper; artefacts need to be brought to this degree of completion in order that they can be subjected to as rigorous an evaluation as possible, against a range of criteria, in their context of use in the made world. In the terminology of this paper, students' designing intentions are given as high a degree of test as is possible. One consequence is that the artefacts contained in the display are all very 'finished'. It should be noted that although elements of the BA course will have outcomes such as a "bread-boarded" circuit or sheets of numerical calculations, these are assessed as coursework; they do not contribute to the examination by display.

For many students, as the ILP developed it became apparent to them that their planned physical outcome, the learning vehicle, which would be displayed in this public forum, did not fit the recognised archetype of a highly finished object. Their response in a large number of cases was to shift their intentions so that the physical outcome of the ILP was more in accordance with a perceived archetype: "*I'm conscious that I'm designing something which is going to be on my final display.*" (Study 2). The casualty of this shift was learning intentions that were not directed to the realisation of highly finished objects.

Discussion and conclusion

Although the paper identifies two dominant influences the focus of this discussion is assessment and specifically its influence on students' intentions to produce a 'recognised' artefact. Assessment, used increasingly as a mechanism for educational change (Broadfoot, 1996), has received far greater research attention of late. Davis (1996) and Jackson (1995) report emergent

work in art and design whilst Kimbell (1997) summarises the most recent work in design and technology education. The discussion here will utilise a constructivist perspective.

Since the 1980s a constructivist view of learning has been dominant in many spheres of education and educational research, particularly in science and mathematics (Fosnot, 1966), (Murphy, 1996). Constructivism is essentially a theory of knowledge that construes learning as an interpretative, recursive, building process by active learners interacting with the physical world. Adherents of *social* constructivism (Wertsch, 1991) argue that such a view is inadequate; individuals cannot be considered in isolation from their social and historical context. Consequently, in an established 'community' there will be established social practices. These theories raise pertinent and important issues for assessment in general and design and technology education specifically.

If learners are active meaning-makers then attention must be given to learners' interpretations of assessment tasks and the administrative frameworks these tasks are situated in. The ILP aims to prompt BA students to focus on their individual learning needs and it appears initially that they agree with and pursue this aim. However this learning will be assessed, and most importantly the physical outcome of this learning will be assessed on a stage where it could be substantively different to anything else there; both their own work and the work of their peers. It is recognised that there is a change of criteria, from the ILP's criteria-less formative to the examination by display's summative criteria-given assessment, but this paper proposes that this change is minor in comparison to the nature of what is assessed and the setting of the assessment. From a constructivist perspective, the physical outcome of learning does not fit the established social practices, the *authentic culture* (Brown, Collins and Duguid, 1989) associated with an examination by display. The result is that students shift in their intentions and shift in such a way that the outcome does fit their shared cultural understandings of the examination by display.

An obvious response to this shift of intentions would be that the ILP is not

assessed or not assessed through the display. My concern with both responses is that they could too easily perpetrate and reinforce the belief that the highly finished type of artefact is the proper and sole outcome of design and technology education. Jackson (1995, p 164) applies the term 'hero culture' to the assessors in art and design education. Is there a similar hero culture associated with the highly finished made world artefact in design and technology education?

This paper has recorded the main findings from two studies that have looked at a design and technology project undertaken by higher education students. The project brief is unusual in that the intention of learning is made explicit and overt, rather than the implicit, even covert, status of learning in the more usual design and technology project brief. This shift in intentions from 'designing' to 'learning' is not without problems. Once a learning audit is commenced some students can feel overwhelmed by the apparent magnitude of their resultant list, and once identified this must still be operationalised through a project.

The studies show that this more overt status to learning prompts students to consider issues outside the confines of their present course, and specifically their future professional practice, whether in education or industry. The specific learning intentions for professional practice were identified from a range of sources; for education pathway students their previous teaching practice was the most vigorous prompt. It is believed that increasingly these external, professional prompts will be more defined. For those seeking Qualified Teacher Status publications such as Design and Technology Association (DATA) minimum competences (DATA, 1995, 1996) will be one such prompt – or imperative.

The main discussion has centred on the influence of assessment, and in particular the *authentic culture* of a specific form of assessment on the BA course. I believe that the ILP does raise important questions as to wider social practices of design and technology education as perceived by learners. What for learners is the role, status and purpose of an artefact? In their lives

outside school or college these may be relatively clear, but in a learning setting artefacts have other purposes. If these different purposes are not clear then at best the result is hybrid activity, at worst it is deeply confused.

References

Broadfoot, P (1966) 'Educational Assessment: The Myth of Measurement' in P Woods (ed.) *Contemporary Issues in Teaching and Learning* London: Routledge, 203-230.

Brown, J S , Collins, A and Duguid, P (1989). 'Situated Cognition and the Culture of Learning' *Educational Researcher*, 18, 1, 32-42.

Davis, A (1996) 'Assessment and Transferable Skills in Art and Design' NSEAD, 15, 3, 327- 331.

Design and Technology Association (DATA) (1995) *Minimum competences for students to teach Design and Technology in Secondary Schools: Research Paper 4*, Wellesbourne: DATA.

Design and Technology Association (DATA) (1996) *Guidance for Primary Phase Initial Teacher Training and Continuing Professional Development in Design and Technology: Research Paper 7*, Wellesbourne: DATA.

Elmer, R (1995) 'Mapping Intentions' in J Smith (ed.), *IDATER 95, International Conference on Design and Technology Education and Curriculum Development*, Loughborough: University of Loughborough, 74-79.

Elmer, R (1996) *Whose need?: a study of reflective practice of eight students on a BA (Hons) Design And Technology course*, unpublished PhD thesis, University of Reading.

Fosnot, C T (ed.) (1996) *Constructivism: Theory , Perspectives and Practice* New York: Teachers College.

Jackson, B (1995) 'Assessment Practices in Art and Design: a Contribution to Student Learning?' in G Gibbs (ed) *Improving Student Learning* Oxford: Oxford Centre for Staff Development, 154-167.

Kelly, A V, Kimbell, R A , Patterson, V J and Stables, K (1987) *Design And Technological Activity: A Framework For Assessment* London: Assessment of Performance Unit/HMSO.

Kimbell, R A (1997) *Assessing Technology* Milton Keynes: Open University.

Kimbell, R A, Stables, K and Green, R (1996) *Understanding Practice in Design and Technology* Milton Keynes: Open University.

Murphy, P (1966) 'Integrating learning and assessment – the role of learning theories?' in P Woods (ed.) *Contemporary Issues in Teaching and Learning* London: Routledge, 173 – 193.

Schon, D (1987) *Educating the Reflective Practitioner* San Francisco: Jossey-Bass.

Stables, K (1993) 'Who are the real clients in school based design and technology projects?' in J Smith (ed.), *IDATER 93, International Conference on Design and Technology Education and Curriculum Development*, Loughborough: University of Loughborough.

Wertsch, J V (1991). *Voices of the Mind: a sociocultural approach to mediated action* Cambridge, Mass.: Harvard University.

Appendix 1

This appendix gives the ILP brief as given to the students in 1996. Sections not germane to the purposes of this paper have been omitted and are shown by square brackets. There were minor differences with the 1994 brief, mostly concerning staffing. The brief does not give descriptors for how the tutor will assess the quality of the students' evaluations. This may be a criticism of the project as presented to the students.

Individual Learning Project

Where you are coming from
During Lent term you were engaged on projects that required you to work in groups. During this term you will be commencing another project that will require you to work, for some of the time, in groups. In addition to the act of designing, an intervention in the made world, I would suggest that these projects have carried with them some very important but potentially difficult agendas. [...] However one result of this group work may have been that you have felt that you have had less control over some aspects of your work.

Where you are going to
The fourth year of the course is very much focused on the individual. [List of year four course elements.]

Individual Learning Project: Purposes
The purposes of this Individual Learning Project in Trinity Term are:

* to re-acquaint and re-orientate you to working essentially as an individual rather than as a member of a group

* to prompt an 'audit' of personal skills, knowledge and values.

Over the last three years it will be expected that you will have experienced the major areas within design and technology as envisaged by the course. However, as with many fields of human endeavour, theory and practice may not completely coincide. In other words there may be gaps in your portfolio of knowledge and skills. This project allows you to address those perceived gaps, both in anticipation of Year 4 and for their intrinsic importance.

In some students' group project work, there has been an emphasis on the disaggregation of purposes for different audiences. I propose that this is continued and strengthened for this particular project. You need to write up a project proposal in a manner that is familiar to you: Project Brief; Initial Specification; Evaluation; Resources. However there should be two sets of objectives, those addressing the design brief, designing needs, and those addressing your learning needs. Additionally, I suggest that if you wish to give a higher priority to your learning needs on this particular project, rather than designing needs, then this is acceptable *within the framework on this project.*

Staff associated with the project
[List of staff.]

Evaluation
To be consonant with the approaches adopted in this project, I propose that evaluation of the ILP is organised as follows.

An evaluation is carried out on the designing that you have conducted – your intervention in the made world. Although you may normally consider this to be integrated into your folio, at whatever format A1, A2, A3, in this instance I would like it done on A4 (or reduced to A4). Additionally to these qualitative comments I would like you to give yourself a quantitative mark out of 40.

Additionally, I would like to see, again on A4, an evaluation of how well you feel that you have achieved your learning objectives – intervention in yourself. From your experiences on other aspects of the course, and in particular your experiences on placements both in school and industry where there has been a requirement to write a reflective commentary, I would expect to see this to be more analytical than descriptive. As with the designing evaluation, I would like you to give yourself a quantitative mark out of 40.

The emphasis of tutors' feedback will be on the quality of these evaluations. A written commentary and a mark out of 20 will be given for these two evaluations.

As with all project work on the BA, this is a formative feed-back only; you may make changes to any aspect of the project prior to its summative assessment at the end of your fourth year.