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**STARTING A DESIGN COURSE WITH A BANG:
'WARMING UP' A NEW GROUP AND ENSURING KEY PRINCIPLES ARE
INTERNALISED AT THE START OF AN UNDERGRADUATE PROGRAMME**

Howard Denton
Department of Design and Technology
Loughborough University
Leicestershire
LE11 3TU
h.g.denton@lboro.ac.uk

BIOGRAPHICAL DETAILS

Howard Denton is a senior lecturer and programme leader for the Industrial Design and Technology with Education degree in Design and Technology at Loughborough University. He also teaches on various aspects of the Department's undergraduate, post-graduate and INSET courses. His main research interests lie in the areas of groupwork, simulation and ergonomics as they may be applied to design and technology teaching and learning both at school and undergraduate levels. He is also interested broadly in aspects of teaching and learning in design and technology.

ABSTRACT

The paper describes and analyses a learning activity conducted on the first day of an undergraduate programme in industrial design. The exercise is intended to induct students and to bring to the fore a number of key messages at a time when students tend to be overwhelmed with their new experience as undergraduates. The activity was evaluated via direct observation by staff, student feedback at the debrief, a questionnaire on individual student responses to a number of issues in relation to their perceived value and difficulty and peer evaluation of outcomes using criteria identified by the student group.

The activity is analysed to establish the principles used to overcome other distractions and ensure key messages are internalised by students. The principles centre on novelty effects and use simulation, group working, an outdoor context away from the university and a whole working day rather than more conventional time-table structures. Staff are able to base immediate post-activity group discussion on the shared experience and so focus on the key messages: the nature of design activity, group based design, modelling as a concept, decision making, giving presentations, self evaluation and assessment.

The paper, whilst descriptive of one event only, has relevance to colleagues involved with teaching on design based courses.

1.0 INTRODUCTION

The first few weeks of a student's undergraduate course are notorious for the number of distractions presented. Serious learning in this period is particularly difficult. It is this author's opinion, however, that this is a critical time in developing attitudes and, therefore, is too important to waste: it is important that key messages be got through to students.

For a number of years now students of Industrial Design and Technology at Loughborough University have been introduced to design practice via a one day exercise known as the Nomadic Brief. This paper offers a brief outline of the exercise and then analyses the structure for teaching and learning behind it.

2.0 EXERCISE OUTLINE

The year cohort is split into two groups of about 60, one operating on one day, the other the following day. This makes the group sizes manageable and enables the physical resources to be re-used. The groups are further divided into teams of 6 on a random basis and briefed on the exercise objectives and structure. Each exercise has three staff who will continue to teach design practice, but other staff join informally for part of the day in order to build relationships.

Essentially the briefing paints a picture of the teams being small family units of a larger tribe of nomads in a mythical period and country. They are moving to a tribal gathering and will travel for months building a shelter each night from materials which they carry (8 canes each 2.4metres long, a 4 by 3metre polythene sheet and an unlimited length of polypropylene string). The main task is to design and build a suitable nomadic shelter. In addition they have to design a "totem" to communicate their group identity and personality to others and to give a presentation to the other teams on the merits of their shelter design.

Working on a typical outcome

An important feature of the design work is that, following nomadic principles, the materials may be needed for other purposes from time to time, for example defence, fishing, building a coracle to cross

water, so the materials must be kept intact and not cut. This also means the materials can be used by the following group without waste, so keeping costs down.

The exercise is run off-campus at a site in the Charnwood forest with impressive views over the Soar valley and the university. The groups walk about two miles to the site, a useful opportunity to begin the process of getting to know each other and starting to discuss the task. The walk reduces costs, though a mini-bus and a car are used to ferry heavier equipment such as a water heater, coffee etc and act as emergency vehicles.

On arrival at the site the teams are given a strict deadline for completing the shelter, totem and preparing the presentation. An important feature is that pencils and paper are not allowed: like nomads they must arrive at their design by talking and working directly with the materials. One intention is to demonstrate the value of sketching as a modelling technique and emphasise how we tend to take it for granted.

The students take sandwiches and coffee as they wish. The teams give presentations on the merits of their designs to their peers; this is done in two sub-groups to make the time scale sensible. Five minutes are allowed for each team followed by discussion. During the design, construction and presentation phases staff are free to observe the design and team processes. Notes are made for subsequent de-briefing at the end of the day.

Following the presentations the sub-groups brainstorm the criteria they consider most appropriate for assessing each shelter (pencils and paper are issued). Assessment is by peers and formative but centres on criteria the students themselves derive in the brainstorm. At this point the question of ease of movement of the shelter is usually raised, or staff can raise it. Staff can then spring a test of this criterion by setting a timed move of the shelters to a different site a few meters away, but all shelters, when in travel mode should pass through a one meter square frame made of spare cane and held by staff. This part of the exercise, unexpected by students, is usually carried out in an enthusiastic and fairly excited manner, yet the message behind it is serious.

Once groups have agreed on the criteria pre-prepared sheets are issued which enable each team to enter the criteria and then allocate marks. The mark has to be agreed within the team; again making them operate as a team discussing their opinions and arriving at an agreed decision.

A final debrief allows discussion on: team working, design methods, design detail, giving presentations and assessment. Immediate feedback from students is very positive and the exercise is also frequently mentioned in end of semester student feedback proforma as being helpful, interesting and instructive.

3.0 PEER ASSESSMENT AND EVALUATION METHODS

Peer assessment by groups was based on three criteria selected by the students at the post-exercise debrief. The criteria were limited to three in order to keep the exercise simple. In this case students chose: function, practicality and aesthetics, each given a mark on a five point scale (5=high) plus qualitative comments. Each team was asked to evaluate only three other teams in order that this phase of the day did not overwhelm the previous phase. The marks awarded to each section were collated and it was possible to see the level of agreement across each triad of marks and the total averages gained and awarded by teams.

The average mark (out of a maximum of 15) was 10.18 with a range from 6 to 13.6. Looking at the marks awarded by each group the average range of marks covered was 5.15. In turn, the marks gained by each group covered a range of 3. This indicates that there was a reasonable level of agreement between groups marking any one outcome. In turn the wider range for marks awarded shows the groups were differentiating in their marking. These results (albeit limited in scale) indicate that the use of mark evaluation by peer group has some value and reliability as a method of offering feedback.

The qualitative comments were more variable in their value. Some groups used basic restricted and descriptive, phrases. Others were more analytical and offered feedback which would be of value. Most groups tended to offer feedback in a positive form eg *'good idea with the circle in front'*. There were few negative comments such as *'not enough imagination for structure'*. Whilst this was 'day one' of the programme the indications are that students require considerable training in offering useful

qualitative and analytical, feedback to peers if such methods of assessment were to become a regular feature of coursework assessment.

The self report questionnaire asked individuals to rate various elements of the exercise for their perceived value (10 = high) and perceived difficulty of (10 = very difficult). These were: the fantasy context, working co-operatively, reaching agreement in groups, having to design without being able to sketch, generating ideas in the group and developing ideas in the group. Means were calculated and also differentiated between gender.

6.4	4.3	8.7	3.5	7.8	4.2	6.9	6.0	7.9	4.1	7.6	4.9	<i>Whole</i>
5.8	4.1	7.8	3.4	7.2	4.2	6.9	5.6	7.3	4.1	6.9	4.8	<i>Female</i>
6.7	4.5	9.0	3.6	8.1	4.2	6.9	6.2	8.1	4.0	7.9	5.0	<i>Male</i>
V	D	V	D	V	D	V	D	V	D	V	D	
<i>Fantasy</i>		<i>Working</i>		<i>Reaching</i>		<i>Having to</i>		<i>Generating</i>		<i>Develop</i>		
<i>context</i>		<i>co-</i>		<i>agreement</i>		<i>design</i>		<i>ideas in</i>		<i>ideas in</i>		
V=Value		<i>operatively</i>		<i>in group</i>		<i>without</i>		<i>group</i>		<i>group</i>		
D=Difficulty						<i>sketches</i>						

Generally students responded to all elements positively. The fantasy context was the least valued aspect, though in the positive side of the scale. Males saw this as more valuable than females. Working co-operatively was seen as the most valuable aspect with, again, males seeing it more positively than females. A general pattern is that both males and females saw all elements as being of value but the difficulty scores were always lower, showing a self-confidence in relation to co-operative work, reaching agreement, generating ideas and developing ideas. Making the groups design without the facility to sketch was a deliberate teaching point to emphasise the importance and value of sketching as a modelling technique. Staff did observe some groups using sticks to sketch on the ground. This, in turn, was used in the de-briefing to ask these groups why they found this necessary, so reinforcing the point of the value of sketching. Some groups were seen to make small 3D models out of sticks which, again, provided a valuable point for subsequent discussion.

4.0 ANALYSIS OF THE TEACHING AND LEARNING STRUCTURE

The 'nomadic' exercise employs a number of factors which will be used to structure this analysis. It should be noted, however, that it is the interplay of these factors and the students and staff involved which generates the intensity of the activity and is able to punch through the distractions of that first few weeks in university. Analysis will be considered under:

the key messages
 use of novelty factors to increase involvement and memory
 use of simulation
 team working
 design aspects
 assessment

4.1 THE KEY MESSAGES

Colleagues will appreciate how busy a new undergraduate is in the first weeks of a course. Distractions are many, intense and varied, with the most "interesting" being non-academic. Some staff suggest not trying to do any serious academic work in this period but this author considers this to be misguided. Establishing key messages at this point emphasises their importance. They should then be built iteratively in future work. The general aim, therefore, is to bring the groups together, start the process of building an identity and, through the communication of a number of key messages, to start to put over a philosophy of working. The key messages and points for discussion involved in this exercise are that:

- designers need to be able to work effectively in teams (Austin et al 2001, Denton 1997b, Busseri and Palmer 2000)
- modelling is a key concept in design; it takes many forms but simple pencil and paper sketches are possibly one of the most useful (Garner 2001, Cross 1999)

- c. meeting deadlines is an important skill for the professional and the individual or team must learn to plan to use their time effectively (Garner and Duckworth 2000)
- d. designers need to be able to communicate, indeed "sell" their ideas to clients
- e. even the most basic design context offers opportunities for ingenuity (Baker et al 2000)
- f. the direct handling of materials provides learning opportunities
- g. students must discuss the nature of 'good design'
- h. designing should stretch intellectually, but can be fun (Baker et al 2000).

Supporting these key messages de-briefing allows students and staff to identify other factors such as "green" design, the use of imagination exercises in design thinking, the use of pressure constructively to build creativity. To formalise too many messages, however, would mean that the central ones may become lost.

Also embedded within the exercise is an important opportunity for the new student year group to bond via a shared and intense experience. Similarly students meet key staff away from the formality of the university and the basis for tutor relationships can be built quickly (Baker et al 2000).

4.2 USE OF NOVELTY FACTORS TO INCREASE INVOLVEMENT AND MEMORY

In order to get these points over it is necessary to employ teaching techniques other than the ordinary to break through the surrounding "noise". Novelty is potentially a very useful tool in this respect (Denton 1992). In the nomadic brief novelty is employed as follows:

- a. students are taken away from the university: this also reduces distractions
- b. the task is unusual in terms of its materials and physical scale of the outcomes. Most students will be used to practical projects in design and physics, but these are usually small scale and use more conventional materials
- c. the task extends one full day. This is not normal practice in schools
- d. the task is team based. There are indications [Denton 1997a] that this aspect is developed in a very limited way in schools, even considering National Curriculum requirements [The National Curriculum 1999].

Novelty effects have long been a problem for those engaged in research into teaching and learning. The Hawthorn effect [Cohen and Manion 1982] is a specific example and though the original Hawthorn work is flawed the central message stands: put people in a novel situation and observe them and they will work harder (for a time). This means that without prolonged and non-intrusive observation it is impossible to say whether it is the new context or the Hawthorn effect generating any improved performance. Any teaching context out of the ordinary may attract this effect: in this exercise the effect has been specifically employed in order to raise attention, work rate and retention of key points.

4.3 SIMULATION

There is evidence that simulations are not as effective as more conventional teaching for mastering facts [Percival 1978, Jones 1989]. However, Adams [1977] considered them more effective for modifying attitudes and developing confidence: this is closer to the aim of this exercise. Simulations are intended to be used iteratively. Each constitutes a cycle of briefing - activity - debriefing. Debriefing is, therefore, based on immediate and personal experience; experience shows that they can be very effective and there is a greater sense of relevance to students. Note also that the final de-brief occurs at the end of a learning session and Buzan [1982] pointed out that recall is best from the beginning and end points of sessions.

Simulation techniques can also boost motivation and sustain effort (as Evans and Sculli [1984] have shown). They also showed that the learning benefits from a simulation are not related to high levels of fidelity. The "nomadic" context for this exercise was clearly very basic and, indeed, fantasy, but experience has shown that if staff "paint the picture" with enthusiasm and interest, then students pick up the theme and become very involved. The exercise also contained a low level of competition in that each team could see the results of the other teams. Again, Evans and Sculli showed that competition can have a motivational effect within simulations; this diminishes if high levels of competition are allowed to develop.

Jones (1989) stated that participants in a simulation should operate with autonomy rather than having to play a particular role. In this exercise teams were formed but allowed to operate as they wished; in all cases a co-operative model developed, though there could be informal "leadership" if there is a strong member. The fact that the exercise is assessed formatively and that no mark carries forward does allow members to experiment more freely. Experience shows that the motivational effects of the exercise are strong enough to counter any wish to "freeload" by individuals.

The role of staff within a simulation is threefold: establishing the `environment`, monitoring the simulation in action, assisting at de-briefing to maximise learning [Glandon 1978, Shirts 1975, Perry and Euler 1988, Dawson 1990]. Experience shows that students quickly get fully involved which leaves staff free to observe carefully. These observations can then be used to support the de-brief in addition to students' own points. The debriefing is intended to pull together experience, to help individuals to stand back and reflect so that experience is transformed into learning [Pearson and Smith 1986]. If the experience is complex or long it may be better to simplify it and use a series of iterative cycles rather than one.

4.4 TEAM WORKING

Industrial designers frequently work as members of teams (Garner 2001). These teams are often interdisciplinary due to the nature of typical products. Industrial employers are certainly now very clear on their requirement for team working experience in recent graduates [Price 1995]. A recent small-scale study by the author [Denton 1997b] indicated that of the student cohort in the department very few had experienced team-based activity at a sixth form level. All had experienced some form of group work, for example group science experiments, but this is little more than the sharing of resources. The National Curriculum requirements for team working in Design and Technology do not yet appear to have had any profound effect, and there is no real evidence yet on how it is being interpreted in schools. It becomes important, therefore, to consider the development of team working capability within undergraduate designers.

Price [1995] defined a team as: "A group of people with a mix of skills who are organised to work together towards an objective that they share". Price is an industrialist, but his point on "different skills" does translate to the different backgrounds, knowledge and experience found in pupils or students. Team work sometimes involves competition between teams while there is intra-team co-operation. Barak and Maymon [1998] emphasise that a team has a goal, usually the design of a specific product, and that members are mutually accountable. In industry the success of a team is measured primarily in terms of the quality of the product designed: education is concerned with the learning processes in relation to both designing and team working capability.

Staff observation of teams can raise many interesting points at de-brief. The main ones would be on the idea generation methods used, particularly whether all members are encouraged to contribute or whether certain members dominate. Similarly decision making methods can be discussed and shared at de-brief. General points on methods of getting a new team to work together quickly and efficiently are also discussed.

4.5 DESIGN ASPECTS

Typically all students on this course will have a good grade at A level in a design subject; they have, therefore, some experience as designers. The design process often taught in schools, however, can be rather "ritualistic" [Denton and Williams 1996] and it is important to quickly "shake up" students' ideas in this field. By introducing novelty: the use of larger scale "product", materials students would not normally design with, removing the ability to sketch ideas, and operating a sharp one-day project, students are forced away from their conventional design approaches.

Modelling is an important concept for students to understand. By removing the most frequently used method, pencil and paper sketches, students are made to confront the utility of such sketches. De-briefing can reinforce this message and make links to other methods of modelling which designers use and which are brought out in subsequent design practice on the course. Cross (1999) quotes Howe *'I draw something, even if it is "potty", the act of drawing seems to clarify my thoughts'* (p32). Cross then goes on to emphasise the role of sketching in communication, criticism and discourse, assisting

problem structuring through solution attempts and promoting the recognition of emergent feature and properties.

The exercise acts as an example of a project time line in that it takes students through a complete design process in a day. De-brief can re-visit the need for meeting deadlines, setting internal deadlines and establishing effective idea generation and decision making methods (Garner 2000). Staff observations of the teams support student self-report at de-brief to give examples of good practice during the exercise.

By using materials not normally used by students in A level project work students can be made to consider the question of ingenuity in their use. Bamboo is an interesting material in that while it can be used as a straight member, its elasticity is visually apparent, unlike, for example, a steel member. String, within a shelter structure is, again, very visual; tension can be actually seen and felt so redundancy or loading can be considered easily. The joining of canes, especially as the structure should be capable of being quickly taken down and re-erected, becomes an interesting design feature. Students are not warned of the sudden move required after the assessment criteria are discussed; poor solutions involved string being untied and the move is very slow. Good solutions allow umbrella-like folding so the whole shelter can be moved quickly and conveniently. Joints of the cane and string allowing this can be very interesting. Another example of challenges to ingenuity is the tensioning of the polythene sheet. Lightweight sheets are used to save on cost. These are not strong and polythene is a fairly slippery material to fasten to. The sheet cannot be punctured and so teams have to consider how strings could be joined. Typically an acorn put in a corner and then string wrapped around the sheet and acorn works well. This is, again, an interesting concept to develop and to transfer to conventional materials at de-brief.

Other design-related issues that can be raised at the de-briefing include: brainstorming, ecological issues such as re-cycling materials, aesthetics in terms of the sculptural form of the shelter and communications via the totem (including product semantics) and the verbal presentation.

The verbal presentation had to involve all members having some responsibility to raise issues and so involved careful planning, delegation and overall responsibility to the team.

4.6 ASSESSMENT

As a project in the first week of the year it is considered that assessment should not carry forward to the year mark. Nevertheless the exercise is valuable in de-mystifying the assessment process. Peer assessment is used in other aspects of design practice and has been well reported elsewhere (for example Hodkinson and Patel 1995).

5.0 CONCLUSION

The modularisation of degree courses has, perhaps, highlighted a possibility that has always existed: that students may not appreciate their course as a whole (Norman 1994). Can the student bring components of their course together and see their relationships? Exercises such as that reported above have the potential to show a holistic approach to design and the principles could be used several times within a course to help maintain that holistic view. This exercise has a particular aim to bring a new student body together and start to inculcate the department's philosophy of design. In this respect it has been shown to have value, though this clearly needs more detailed evaluation. The principles described above, in terms of novelty effects, can be used to drive a particular message or set of messages across and can be used in different contexts at different stages within a course. An example could be a "design week", a technique frequently used in design courses, when the timetable is frozen and students tackle a specific brief, to be completed by the end of the week. Such exercises are generally successful in generating high levels of student activity and students, in turn, regard them as having great relevance to professional practice.

"Warming up" a new student group is a factor which is underestimated. The usual round of social events do have their value, but this author contends that it is also essential to start to build that philosophy of design immediately if it is to have impact. The methods described above do this by breaking through the "noise" of student life and could be transferred to other courses with some value.

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