

Centre for Excellence in Enquiry-Based Learning

Project Case Study

Pedagogic Development – Enquiry-Based Learning for
Constructed Textiles

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Abstract

This project analysed the content of programme unit TX2009 Weaving for Designers, in order to identify topics which could be converted into Problem-Based Learning. This programme unit was traditionally taught through 'chalk and talk' methods and it had been identified that a more enquiry-led approach would aid student understanding. A trial day was held with second-year textile design students to test out a PBL task in which students had to design and create a woven table mat with a contrasting border, using the process of unit drafting. The results of this task were then evaluated and results used to create three further tasks, to be implemented into the curriculum in academic year 2006/07.

Background

The BSc (Hons) Textile Design and Design Management programme (TDDM) is unique in The University of Manchester, in that an art and design based programme is taught within the Faculty of Engineering and Physical Sciences. The programme has between 20 and 30 students per year group, who each have a Further Education background in art and design, with the majority of students also having a grounding in the sciences. The programme covers knitting, weaving and printing, with students designing and creating fabrics in these media as well as learning the technology behind these processes. Students also cover topics as diverse as textile materials, textile testing, Computer Aided Design (CAD), applied production processes, design enterprise and costing and economics, providing them with a well-rounded background to the textile industry.

For this project, the second year programme unit TX2009 Weaving for Designers was looked at, and topics identified which could be converted from traditional 'chalk and talk' lectures to Problem-Based Learning units. A blended learning approach was to be used, incorporating PBL into the curriculum whilst underpinning the programme through WebCT. This programme unit is assessed through 50% coursework and 50% unseen examination paper.

Rationale

Learning how to weave can be problematic for designers. The discipline demands the visualisation of 3D structures and manufacturing processes. Weave design at The University of Manchester has been traditionally taught through a technology-based route using lectures, laboratory classes and written exams. Observations by staff have shown that, after taking written examinations, TDDM students forget principles and practices of weaving and knitting, suggesting that they are adopting a 'surface' approach to learning (Marton and Säljö 1976). Biggs notes that university students should foster a 'deep' approach, which can be achieved through constructive alignment, in which clear curriculum objectives are married with suitable teaching and assessment methods (Biggs 2003, pp.25-36). Learning styles tests used

with the TDDM students determined that as a group they preferred active learning, and responded least to aural teaching (Sayer and Studd 2006).

Enquiry-Based Learning promotes a student-centred, 'deep' approach to learning, and provides a framework within which planned problem scenarios can be addressed in an active way, reflecting the way people learn in real life (Busfield and Peijs 2006). Problem-Based Learning (PBL) is a type of Enquiry-Based Learning and is a suitable method for teaching weaving as it allows students to learn actively (Sayer et al. 2006), fulfilling the criteria for the predominant bias of the group. It also encourages team-working skills, which are highly valued by employers (Bennett et al. 2000, pp. 3-8). PBL was chosen from the Enquiry-Based Learning umbrella for this project because the aim was to deliver understanding of technical theory in a practical way. The use of PBL allowed tasks to be set with certain technical parameters, which enabled students to learn in both a practical and enquiry-based manner.

Through this enquiry-based approach it was anticipated that students would build a stronger fundamental knowledge of weaving and weave structures, which would enable them to apply this knowledge to their creative fabric design projects more effectively. The project aimed to match teaching methods more closely with student learning styles and promote deeper and holistic learning for students through a more vibrant and stimulating learning environment. This project aimed to build upon a Teaching Quality Enhancement Fund (TQEF) funded project to convert knitted fabric structures lectures into PBL (Sayer et al. 2006).

Approach

The first task was to look through the syllabus for programme unit TX2009 Weaving for Designers, and identify any areas which were particularly problematic for students, which could be better understood if taught in a more hands-on, problem-based manner. A flow-chart was devised in order to identify the suitability of topics for conversion.

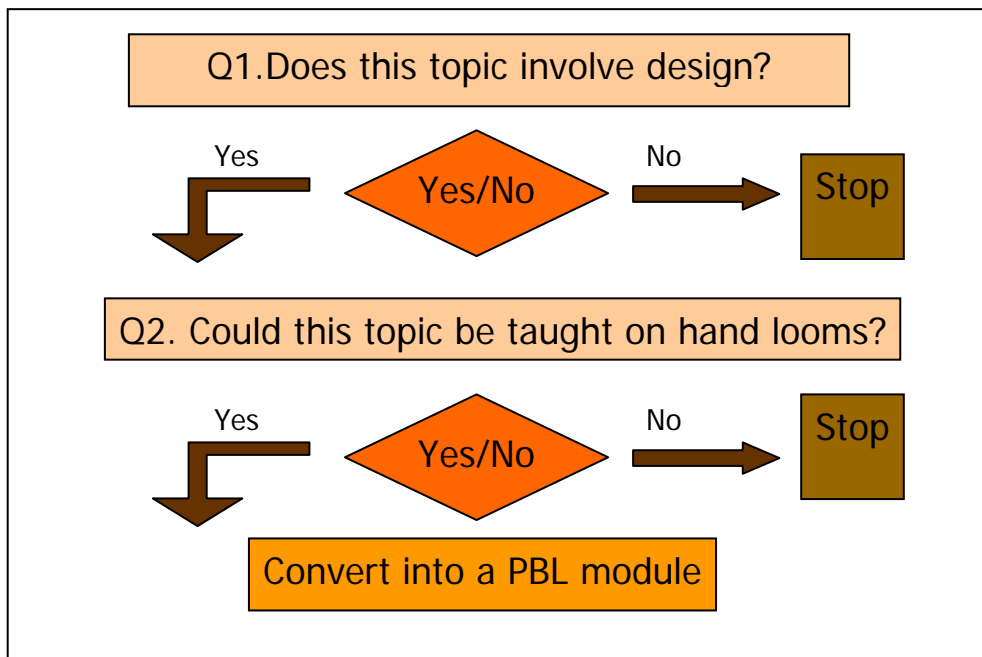


Figure 1 Flow chart used to identify topics for conversion into PBL.

Through this process, three key topics were identified which it was believed would be more effectively taught through an enquiry-based approach.

These were:

1. Double cloths – a process by which two cloths are created simultaneously, joined together in certain sections; the fabric is reversible.
2. Drafting/Unit Drafting/Lifting – drafting is the process of threading up the loom, so that warp yarns can be lifted up and down. Unit drafting is a process by which the yarns are threaded up in sections, allowing different patterns to be woven in different sections.
3. Extra Weft – a process by which extra weft yarn is inserted to create figurative patterns.

It was decided to use the topic of Unit Drafting as a trial task, in order to test the concept of teaching weaving and weave structures through this medium. A trial day was set within Consolidation Week to test the process and a PBL task was subsequently formulated and distributed to the 20 TDDM2 students one week in advance of the day. The students were split into groups of four by the staff team at this time, so that the groups were evenly balanced. This also encouraged students to work with peers with whom they would otherwise not necessarily interact.

Our company produces table linen using electronic dobby looms. Sampling is done using traditional 8 shaft hand looms. We have been approached by Ikea to develop a range of woven table place mats.

They will provide a warp with 284 ends of 2/5s cotton, and at 24 ends per inch will give a fabric width of approx. 12 inches. The client will also provide yarns for the weft and require that the place mats must have a structured centre panel with structurally contrasting borders.

They require you to work in groups of 4 and complete the following tasks:

1. Identify any terms, words or concepts which you are unclear about.
2. Define the problem and think of as many solutions as possible through 'thought showering'.
3. Use unit drafting to determine the contrasting areas within your fabric.
4. Identify the most suitable solution from your initial ideas.
5. Draw in the warp to an agreed drafting order and weave a sample table mat using the weft yarns available.

The processes you go through must be documented. These notes, plus a fabric specification sheet with sufficient information for your mats to be put straight into production, should be handed in along with your fabric at the end of the session.

6. A feedback sheet, which will be provided, must also be handed in. This will give you an opportunity to reflect on the task.

The project task will take place on Thursday 3rd November. The following is the schedule for the day:

9.30am - Start

12.00 noon - Lunch – buffet lunch will be provided.

4.00pm - Fabrics and documentation to be handed in and judged according to the following criteria:

- Technical ability; Colour; Suitability; Group dynamic; Process

4.30pm - There will be a presentation with prizes going to the group who has best fulfilled the above criteria and certificates being awarded to all who took part.

Figure 2 PBL task used on trial day.

As shown in Figure 2, the problem was set like an industrial brief, thereby encouraging the student teams to use the process of enquiry to research the market area for which their product was to be created. The students were to design and plan their placemat, thread up their loom and weave their placemat, taking notes of their process as they went along.

Alongside the PBL tasks, a preliminary WebCT unit was created in order to back up the Enquiry-Based Learning approach. It includes teaching information about constructed textiles, information about EBL and a self-test section for formative assessment. Reflective feedback sheets were

handed out at the end of the trial day to help evaluate the success and suitability of the trial task.

Assessment

All student teams completed the trial task in the time given, presenting a variety of different solutions. For this trial the staff team judged the outcomes in terms of technical ability, colour, suitability, group dynamic and process.

As this trial was not a compulsory part of the curriculum, a buffet lunch was provided to all participants and a prize of book vouchers was given to the winning team, as an incentive to take part. It had been decided not to ask students to write up a report about their process because of the voluntary nature of the day. However, in order to formalise this process for implementation into the curriculum, a reflective group report, documenting the team's decision making processes, would be expected. This report would be used for assessment alongside the actual products created and would become part of the 50% coursework mark allocated for this programme unit.

The WebCT unit was intended as a learning aid as part of a blended learning approach in this programme unit. Therefore the self test sections were designed to be used for formative assessment purposes. However, further work is to be done on this computer programme, and it is anticipated that the self-test section will in the future form part of the summative assessment process. Students will be allowed to re-take the WebCT self-tests ad infinitum in order to gain as high a score as possible. This score could be counted towards coursework marks, and thus would be an incentive to students to re-visit their work and subsequently learn the subject matter.

A written unseen examination paper would still be used to test the students' understanding of theoretical information. Although hard to determine, the students' practical weaving would also be looked at within practical

assessments, to see if the theoretical information taught through EBL has been incorporated more successfully.

Evaluation

As the actual creative task was to be completed on a set day, it was anticipated that the teams would use the preceding week to design and plan their placemats. However, in practice it was noted that, although some market research into the product had been done, actual product planning was not very comprehensive.

A variety of observations were made by project staff on the day. Firstly, it was noted that the task encouraged strong teamworking skills within the groups. One staff member suggested that groups could perhaps be made smaller so that all members were fully involved in the process, as some individuals were observed to be doing nothing at some stages of the task. If groups were too small however, this might have a negative effect on the group dynamics and practical implications for the availability of equipment. It was therefore decided that future PBL tasks would be given to groups of three students.

The length of the task was discussed and the conclusion was reached that a day-long task was too long. This was a comment also made by students on their feedback forms. On the one hand, students only just completed the task in the time given. On the other hand, a lack of momentum and engagement was noted at certain stages of the day, when students did not appear to feel a sense of urgency. With this in mind, the future tasks are planned to be undertaken in two-hour teaching slots with students allowed to use up to a further four hours of their own time. The actual products to be created will also be smaller and thus not need such a long time for completion. The planning and preparation time will remain the same, with the briefs being given out one week prior to the timetabled slot, to allow for groups to draft their ideas. Through the feedback sheets, eight out of the fourteen students commented that, if they could have done the task again, they would have spent more time on planning, underlining the importance of this stage.

For the trial task, the products were marked by their technical ability, colour and suitability and the teams were judged on their group dynamic and their design process. As mentioned, this assessment process would be formalised through the submission of written reports, documenting the above.

Within students' practical assessments, special attention was paid to the weave drafting plans used (the way students had threaded up their looms). It was noted that a number of students had used unit drafting, which was learnt during the trial task. It is hoped that, in future years, the techniques learnt through the further PBL tasks will be used to positive effect within practical work.

The students' reflective feedback sheets about the day demonstrated some interesting findings. Nine out of the fourteen students enjoyed the task and nine out of fourteen wished to see more PBL tasks within their curriculum. More importantly, twelve out of the fourteen students thought the task helped their understanding of unit drafting and thirteen out of fourteen thought the task helped their understanding of weave structures. As improving the understanding of weaving and weave structures was one of the primary aims of this project, this feedback is indeed very positive.

Further Development

Based on the findings and evaluation of the trial day, three tasks have been created and will be implemented into the *TX2009 Weaving for Designers* curriculum in academic year 2006/7. They are as follows:

- Unit drafting – based on the trial day task of creating a placemat, but on a smaller scale, teams of three students will be required to design and create a drinks coaster with contrasting border.
- Extra weft – students will be required to design and create a bookmark with a motif.
- Double cloths – a further drinks coaster will be designed and created. This must be colour reversible and demonstrate thermal insulation qualities.

Further funding has been received by the School of Materials to implement more eLearning through WebCT. The initial WebCT unit created for this

project will therefore be improved to incorporate more dynamic content, such as video clips and animations of processes and a more comprehensive self-test section, to be used for both formative and summative assessment.

The positive outcomes of using PBL for teaching weave design to the second-year students were noted by the research team, and this has had a knock-on effect on the first-year units. A previously lecture-based programme unit has been replaced by a workbook of practical exercises complemented by tutorials. This practical way of learning theoretical information prepares the students for the PBL group projects which the students will now receive as part of the curriculum in their second year of study.

References

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