Studio-based teaching in Information Technology

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Abstract
An innovative computer science degree at The University of Queensland's flexible learning campus represents a radical shift in course design and pedagogy in the field of computer science education. At the core of the Bachelor of Information Environments is a Studio-based approach to teaching and learning, modelled on the architectural studio, which encourages a community of learners to interact to solve problems. It is an immersive approach to learning where open problems are visited iteratively.

In contrast to the lecture/tutorial style of delivery, this approach is learner-centred with an emphasis on educational design that values learner interaction, problem solving and small group work with a focus on real contexts. The Studio subjects offer students an opportunity to solve real design problems in ways that mirror the work of professionals in the world of information technology: through team work, collaborative learning and the application of related knowledge to new contexts.

This paper details the Studio approach to flexible learning in The University of Queensland's Bachelor of Information Environments program and reports on student learning experiences and outcomes after the first year of delivery.

A New Approach to Teaching Computer Science
The Bachelor of Information Environments degree, offered at the new flexible learning campus of The University of Queensland, is a new and exciting degree in the field of computer science.

When the idea for a new campus at Ipswich was first mooted, a decision was made to take this opportunity to bring about innovation in course content and pedagogy. A new degree in information technology that focused on emergent issues such as human computer interaction and also was to be taught through a Studio-based teaching model was proposed.

Traditional computer science degrees predominantly focus on the engineering aspect of the technology. It was felt at the time that the interesting issues in the field are not the engineering ones, but issues to do with the use of information technology, particularly in the workplace.

The name “Information Environments” was chosen because we wanted to avoid any preconceptions. Any other name, such as ‘Interaction Design’ or ‘Human Computer
Interaction’, not only limited ourselves but also constrained external perceptions of what we were doing. The entire course is seen as one, integrated whole. The individual subjects and their learning outcomes are predicated on the model illustrated in Figure 5.1.

![Figure 1. Curriculum plan; three years strongly sequenced](image)

**Information Environments**

"Information Environment’ is a term used to describe the concept of a networked, pervasive and information rich environment in which we work and play. The degree focuses on the emergent areas of Interaction Design, Multimedia, the Web, Computer Supported Collaborative Work and Information Appliances, all within the framework of a sound background in traditional Computer Science expertise. One teacher described the distinctive nature of the degree in this way:

"Well in a word, it's the focus. We focus on interaction design. We are focussing on how people deal with the technology, not the things behind it, even though the students do learn to program, and they become reasonably sophisticated, our emphasis is on how you use the equipment to work better and on how people interact with it."

**The Role of the Studio**

Not only is the content of this degree innovative, it also represents a radical shift in course design and pedagogy in the field of computer science education. At the core of the degree is a studio-based approach to teaching and learning, modelled on the architectural studio, which encourages a community of learners to interact to solve problems. It is an immersive approach to learning where open problems are visited iteratively. Studio-based teaching has long been the norm in disciplines where the nature of practice is the development of abstract artefacts that are used by others. Studios, and the attendant teaching mode of mentor and coach, can be found wherever art, interior design, architecture, graphic design, etc, is taught. The Studio subjects in this degree in each semester are designed to provide opportunities for the practical application of the knowledge and skills derived from the other Information Environments subjects.

Students have reacted favourably to this approach and this comment is indicative:

"The thing that I like about the projects is the ability to pull together a lot of different technical skills. If you're just working on Java like they do in other courses, then you only look at Java in that course. When you have a subject like Studio which actually draws on all subjects, you can use the Java aspect
with some of your design skills and you get to team together a whole lot of things and not only work on one course skill. This is where you get to really pull everything together and say 'oh I have to think about that,' where if you're doing just one subject, you don't have to think about how it reacts or interacts with anything else, and I find that really excellent."

Skills Modules Figure 2. Integration of content streams into the Studio course.

The structure of the entire programs bears on the course structure as indicated in Figure 2. The program has four streams, and unlike other programs in IT at The University of Queensland, the intention is for an integrated approach to course content, learning activities and outcomes.

Practical integration of other subject content occurs in the Studio stream. The subject Studio is taught across all six semesters of the Bachelor of Information Environments program.

The structure and content of the Studio course is based on the concept that design must be taught as a hands-on project-based subject. Within the general structure and aims, staff devise suitable projects for each new semester which provide the learning vehicle for the pursuit of those aims, and which require the development of the skills which are seen within the course structure as appropriate to that level of the course. The overall planning of the subject stream is co-ordinated by the Studio Teaching Group on behalf of the full staff of the Information Environments Program.

The aims, content and structure of the course are continually reviewed by the Studio Teaching Group in the light of changing educational needs, and in response to changing circumstances within the University and external professional needs.

A project is a block of teaching/learning. It might be made up of a seminar series, one or more projects, a set of lectures, or any form of learning activity. A project will generally last 4 or 8 weeks. There are two projects in a semester. The projects explore: issues, context, theory, practical skills, design skills, personal communication skills, industry, technology, research and literature. Projects may also include students from other courses.
There are various ‘interim’ presentations during the semester, followed by feedback sessions in smaller groups. Projects end with a public presentation, attended by all students, all staff and researchers, and visitors affiliated with the particular Project. This presentation will generally happen during the examination period and will be followed by individual feedback sessions.

Students are expected to develop skills in the resolution of design ideas, through various media available to them. They are also expected to demonstrate a breadth of knowledge regarding existing exemplars in Information Environments and present a rationale for their approach to the design of Information Environments.

Many of the software tools that are needed by the students require intensive instruction before they are able to be applied. Two workshop weeks each semester are scheduled, where the focus is on skills acquisition in tools for graphic design and image manipulation, web editing, animation, video, audio, etc. Workshops are also used for the acquisition of physical skills such as prototyping in Foamcore.

The Design Stream includes the subjects Visual Thinking, Interactive Media, Interaction Design, and Human Computer Interaction. It is evident that these subjects are not to be found in a traditional computer science degree. For example, the Visual Thinking subject aims to develop the essential design skills of seeing, sketching and visualising. These skills are exercised through solving design problems, where the emphasis is placed on quickly executed sketches, diagrams, storyboards and construction of physical prototypes. The intention is to develop fluent and flexible idea production.

The Pedagogical Approach

The pedagogy underlying the Studio approach has its theoretical origins in social constructivism and is influenced by the work of Lebow (1993), and of Jonassen et al (1993 & 1996). It is an approach that places the learner at the core of the teaching and learning experience, and, like Sims (1999), emphasises the importance of learner activity and interaction as viable mechanisms to support learning. It believes that “what the student does is actually more important in determining what is learned than what the teacher does” (Shuell 1986).

In a break from the transmissive mode of delivery, characteristic of many lecturing situations and increasingly evident in the design of many content-driven online courses (Brown, 1997), the Studio approach creates a learning environment in which students are actively engaged in the learning process. It also creates a more fluid and responsive learning environment as remarked by one Information Environments teacher:

"Because we have a lot of interaction with the students, we can develop up things, every program goes it's own way. It's not like we set a program and we expect certain things to happen and so on. We do set a program but then it evolves and this is as a result of interaction with the students. We have lots of stages where we may change the projects slightly, the outcomes are never certain...I enjoy that...and we are always very pleased with what happens, we are always impressed."

In the Studio, students work together on projects that present them with real-life design problems. The project-based approach of the Studio provides an environment for learners to:

• plan and develop their own learning projects
• apply the skills and knowledge learned in concurrent subjects to the specific real life scenarios provided by the projects
• work collaboratively with other learners to develop knowledge and understanding
• work with mentors and coaches
• work as mentors and coaches

This approach is valued by students:

"I highly value a mentor/apprentice style of learning and if you're going to sit there on the internet you're just not going to get that input. Especially with our studios and projects, you know, they are incremental, and if you don't get input every week on how you're doing form somebody who knows, then you're going to end up at the end of the project with something that's not worth the effort you've put in."

The projects provide realistic and relevant contexts which encourage ownership and voice in the learning process. They also provide opportunity for authentic assessment by assessing not a number of facts or concepts that are memorised and reproduced under examination conditions, but the learner’s ability to use and apply the knowledge acquired in the learning process in the types of settings and situations where it is ultimately destined to be used. Transfer and application are important outcomes of learning in the Studio approach. Students have commented favourably on their learning experiences in Studios:

"With this new style of learning out here we’re a lot more proactive, feeling 'I'm here to learn', not 'I'm here to be taught'."

"With the emphasis on project activity you're actually doing stuff, instead of just lectures then cramming at the end, and saying 'yes I've passed' and then in three weeks time you forget what you’ve just learnt anyway. The progressive project type thing helps you revisit stuff that you've learnt from other semesters."

The Role of Technology in the Pedagogy

Technology is used in the Studio, not to deliver content, but to move the classroom focus from the teacher to the learner, and to create a more active and engaging climate for the learners. Oliver (1998) argues that such a shift will encourage learners to develop their understandings and their capacity to think and act critically. Students are encouraged to use hardware and software to create new information environments and the WWW is used to support communicative, collaborative and cooperative activities among students and teachers. One teacher describes it in this way:

"In the area of computer science, you learn best by doing. It's not enough to go to a lecture and sit there and listen to someone talk about a subject, you actually have to do it....you have to use the machines. So in the studio subject, the students spend most of their time in front of the computer actually doing the task....it's a process of discovery. It's also very much focussed on group work and interaction with your peers, so you're not sitting there alone, there's a lot of group work and that interaction is very important for motivation, for the students try harder to invent and to discover what's possible with the new media... so it's a learning environment which promotes innovation I think."
The Studio aims to foster creativity, reflection, articulation and reasoning, all of which are important lifelong learning skills and valuable graduate attributes and the purposeful use of technology and of group work is central to these aims. One teacher observed:

"I think it's always exciting to see the creativity that the students will come up with if given the chance. But, if you place the students in a more traditional environment, where they know there's a right answer, then, what are you going to get but that answer? So ours is much more focussed on creative outcomes, innovative outcomes, and that's fun to teach."

Students commented on the usefulness of group work for preparing them for the workplace:

"With group learning, it sort of prepares you for the workplace because you're not an individual in the workplace, you always have a team that you have to work with....Other people just don't get the group learning until they get into the workplace and then they have to try and deal with it in a real-world situation, where we have the time to deal with that now and be able to reflect on it, how we are working in a group."

Building reflective skills in students is a key element of the Studio-based approach and is influenced by the work of Schön (1995) which illustrates why rational design processes don’t work in reality. Schön explains how designers (architects, musicians, engineers, etc.) really work, when they solve real problems and how to teach expert knowledge to others and these skills will be valuable skills for students when transferred to the workplace.

The Role of Space in the Pedagogy

Supporting this pedagogical approach is the program's commitment to the use of physical space as a resource to solve problems. Trevitt and Chalmers (2000) investigate the use of learning space by students and teachers and the impact of the physical settings on teaching practice and learning activities, and their investigations include a focus on the Information Environments program. The Studio subjects are held in purpose-built spaces designed to encourage collaboration and team approaches to problem solving. While there is naturally a strong emphasis on access to technology in this degree, the design of the physical space varies significantly from the rigid line-up of traditional computer labs. The Studio spaces are more fluid, allowing the formation and re-formation of different teams and different spaces according to the problems driving the student interactions.

Conclusion

Evaluation studies indicated that students in the Bachelor of Information Environments overwhelming endorse the Studio-based approach to teaching with is at the heart of the pedagogical design of this degree. Students welcome the opportunities the Studio projects provide them to contextualise the skills they've learnt in other subjects and to apply them to real-life design problems. They also value the group work associated with the projects, and comment on the importance of reflection and feedback to skill development and the growth of their conceptual knowledge.

This approach has required teaching staff in the Bachelor of Information Environments to take on new roles and teach in ways that are much less teacher-directed and much more focussed on the centrality of the learners and their learning. It has also resulted in greater collaboration across the degree structure and greater willingness on the part of teaching staff
to be more responsive to capturing teaching and learning opportunities as they arise as opposed to rigidly delivering a pre-planned program of work.

References


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