CENTRE FOR TECHNOLOGY ENABLED CREATIVITY

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ABSTRACT

The Higher Education Funding Council for England (HEFCE), has recently awarded over £4 million (ca. 6 million Euro) to the University of Sussex and the University of Brighton to set up the Centre of Excellence in Teaching and Learning (CETL) in Creativity. The principal activities are the effective use of technology in the creative process with a particular focus, reflecting the collaboration between the two Universities involved, on engineering and design. This paper describes the pedagogic rationale behind this initiative and provides details of its implementation.

Keywords: Creativity, blended learning, technology, engineering, design

1   INTRODUCTION

Creativity can be viewed as the ability to imagine or invent something new of value. It is not the ability to create out of nothing, but the ability to generate new ideas by combining, changing, or reapplying existing ideas. Creativity is perhaps the most prized human attribute and an essential element of the design process. It is unsurprising therefore that we have attempted to enhance and mimic our creativity with technology. The CETL in Creativity includes within its remit the effective use of technology in the creative process. The remit is interdisciplinary with a particular focus though on engineering and design, reflecting the collaboration between the two Universities involved. Engineering and design are highly creative subjects and they involve synthesis and analysis requiring theoretical, innovative and practical skills. These skills are cultivated by promoting interest in technology and products, expanding perspectives on morphology and providing practical design examples and exposure to industrial practices. These are highlighted by the following examples.

- Creative Styling (Year 1, Product Design BSc). In this course the aim is for students to develop skills in creativity and conceptual development. Students undertake the design of a $1/5^{th}$ scale concept vehicle and then model it full size in the form of a tape drawing. This course draws on relationships with industry and the rationale and outcome are detailed in [1].
- Engineering Design (Year 1 Mechanical Engineering BEng, MEng; Product Design BSc). In this course the aims are for students to develop key skills in total design and machine elements. This is achieved by students undertaking the conceptual design for a cordless product such as a screwdriver, hair-braider or smoothie maker [2]. Work is submitted in two phases with the first acting as a design review allowing students to confirm or revise their approach before undertaking detailed design work where they apply new skills in machine

elements. The desired outcome is for students to realise their designs and improve the quality of their work and appreciation of form.

The CETL in Creativity involves a wide range of activities from specific projects and the use of and development of facilities for enabling creativity. The pedagogic rationale is described in Section 2, the technology enabled creativity zones in Section 3, specific projects in Section 4 and the dissemination of experience in Section 5.

2 PEDAGOGIC APPROACH

The broad pedagogic research question that underpins the CETL concerns 'what are the conditions that encourage a creative process?' The importance of 'space' in developing creativity is highlighted by [3], [4] and [5], the authors in this context referring to space within the process of learning and teaching. The CETL in Creativity is investigating these curricular spaces and also the way in which physical space can nurture the creative process. Critical questions that arise are:

- how can learning, teaching and assessment methods be integrated into the curriculum so that creativity inside or outside the classroom is encouraged?
- how does the creative process actually work and how should it be assessed?
- does emphasis on creativity as a process result in significantly deepened learning?

These questions are being investigated as a series of case studies, following individuals and groups working on a particular aspect of creativity.

Creativity is defined as 'shared imagination' in [6] whilst in [7] creativity is defined as 'the process of producing something that is both original and worthwhile.' It has been suggested that a number of factors need to be present for creativity to develop. These factors are both personal (nonconformity, risk taking, commitment) and intellectual (insight and divergent thinking, ability to identify problems) [8], [9]. For example, videoing groups while they work gives us new insight into the creative process and test, in practice, some of the theories set out by cognitive psychologists.

It is suggested by [6] that for creativity to be fostered among students, the curriculum should be 'problem-oriented' and that this approach goes beyond that of the problem-solving encountered in, for example, medical degrees, but encompasses a wider range of skills. Both universities involved in the CETL are facilitating the development of creative skills amongst students who have traditionally learnt a formulaic approach, incorporating a number of the elements highlighted by [6] and [10], in particular, the role of group and peer learning. A large number of smaller scale studies have been published which have mainly served to encourage lecturers to move from traditional lecture based teaching to more student centred problem based learning (PBL), arguing that the student learning experience is greatly improved and that students taught by PBL are more likely to engage in deep learning as opposed to surface learning. However, there are academics who assert that there is no evidence for this claim, since there have been no quantitative studies on a larger scale. As [11] claim: *What are needed... are mixed method studies that use validated measurement tools... A study that compared PBL with traditional programmes would need to be undertaken with large student numbers over at least a five year period to be able to demonstrate significant differences.* The observation, communication, display and playback capability in the Creativity Zones described in Section 3 provides the technology to enable such study.

The CETL in Creativity is supporting improved teaching and raised standards by enhancing the delivery of blended-learning through the following.

- Freeing teachers and learners from the constraints of the traditional classroom: New spaces allow new behaviours and dynamics and support the move away from

classic, didactic 'chalk'n'talk–style teaching to a more facilitative approach. Removing formal seating encourages mixing and self-directed, exploratory behaviour. Teachers can manipulate room dynamics to maximise peer learning through optimal mixing of students to suit activities.

- Providing teachers with effective tools to engage learners: The availability of a comprehensive range of cutting-edge technologies within a flexible space empowers teachers to construct compelling learning experiences and tailor these to changing needs. Delivering traditional and multimedia educational resources in 'wraparound' teaching displays creates immersive learning experiences, stimulates learner engagement and promotes intrinsic learner motivation.
- Enabling teachers to enrich learning opportunities: Teachers are able to extend the learning experience flexibly according to need through the effective use of layered learning resources where learning items are linked to deeper levels of information, further rich media resources and relevant individuals and communities.
- Supporting externalisation of learning: Multiple access, recording, group display, playback, presentation and feedback all increase the transparency of the activity and the learning process.

Student learning is improved by

- Increasing learner engagement through effective use of multimedia experiences: Current learners have grown up with computers and need innovative use of the latest techniques to surprise their assumptions and engage their attention.
- Grounding learning in experience: Abstract learning is reified by placing in real world contexts. Encouraging students to interact directly with the technologies, and manipulate them, allows them to learn from immediate experience.
- Personalising outcomes through self-directed learning: The exploratory nature of the CETL enables learners to take control of their learning journey.
- Creating a collaborative environment: Collaboration and multidisciplinary working stimulate engagement and facilitate knowledge transfer between students by active exposure to alternative mental models.
- Supporting reflective learning: Recording devices and the provision of spaces and tools to support playback enables individual and group reflection. Observing the dynamics of sessions can be used to stimulate meta-level analysis of both the learner's own and the group's learning process, helping to improve the learner's understanding of their own learning practice.

3   CREATIVITY ZONES

The centrepieces of the CETL in Creativity are two Creativity Zones, one at the University of Brighton and one at the University of Sussex. Although physically separate, these are networked to enable individuals to interact within a range of shared physical and virtual spaces, each embedded with appropriate technologies to support the communication of ideas and collaborative generation of designs. These activity zones draw inspiration from operating theatres. Multiple, flexible observation points and technologies enable other groups of students or guests, either physically present or in another location, nationally or internationally, to see and experience the activity underway. These broaden the potential scope of observational activity and, unlike viewing balconies, are not rigidly defined points but instead support continuous observation by peers, tutors and remote viewers through a variety of physical and audio-visual views. The confluence of state of the art communication technologies and design support software tools can be employed for thought-generation activities. Groups can

operate independently and then combine through use of information technology, sharing and developing ideas and then separate again for further, concentrated individual generative development. The general zone layout is illustrated in Figures 1 and 2.
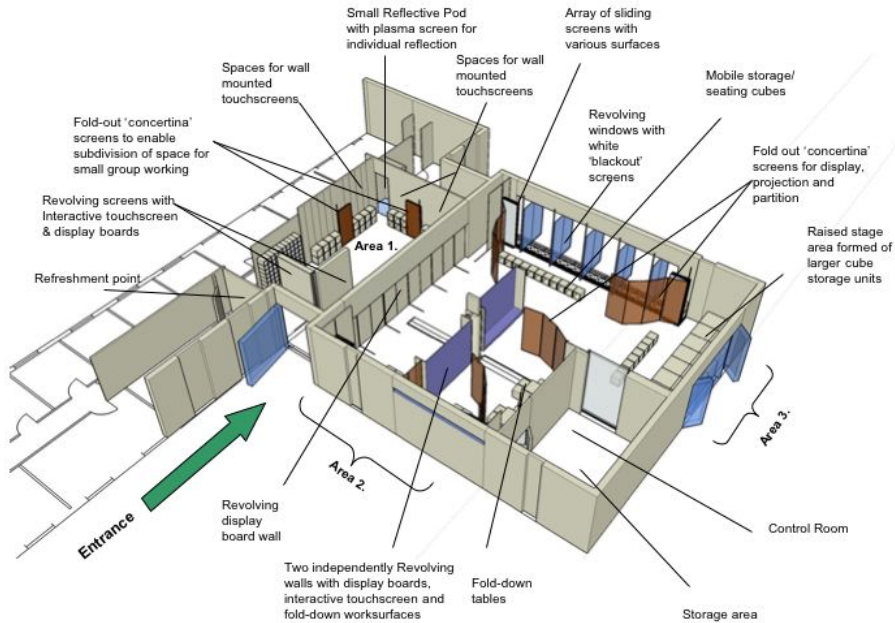

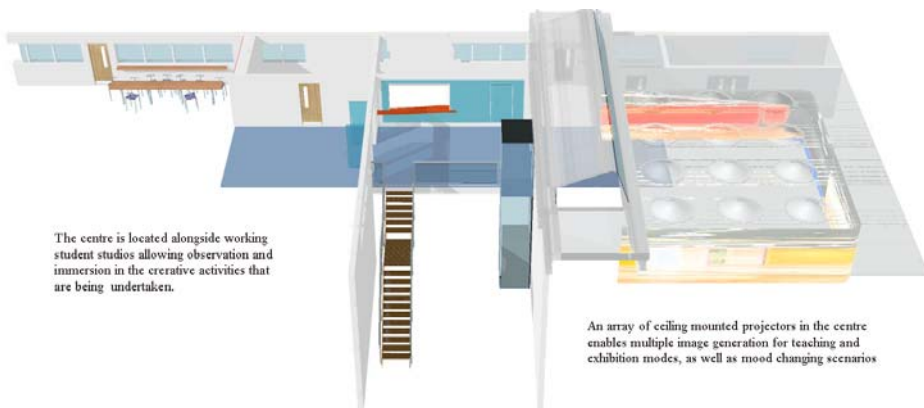*Figure 1. Creativity Zone layout, University of Sussex*

Figure 2. Creativity Zone layout, University of Brighton

The Creativity Zones are supporting an extension of the current teaching provision by:
- Extending the range of taught courses: The technical specification and the flexibility of the space enables the provision of new, innovative, previously undeliverable, course modules.
- Supporting the use of a studio system approach using facilitated team-based working around real-world problems with an emphasis on collaborative working in multidisciplinary teams, undertaking iterative cycles of rapid prototyping,

presentation and peer evaluation and feedback. The studio approach prioritises the elicitation of learning over the imposition of facts. The Creativity Zones make this possible by enabling rapid low-tech semi-functional prototyping and user-led design through the use of appropriately embedded multimedia within a multi-configurable space.

The technical specification for each of the Creativity Zones includes several pods, each with flexible space configuration, cameras, display screens, mood lighting, environmental control, re-configurable bespoke furniture, work display screens and able to operate independently or communicate with each other collectively or individually.

4   CREATIVITY DEVELOPMENT FUND

The Creativity Development Fund (CDF) plays a central role in the evaluation and dissemination strategy of the CETL. The fund is managed collaboratively and the criteria are aligned to those of the national Fund for the Development of Learning and Teaching in the UK. Those bidding to the CDF have to demonstrate how the project contributes to the CETL objectives and how it seeks to embed and evaluate innovation and change. Projects have to be underpinned by a pedagogic rationale and are required to provide case studies (based on the Higher Education Academy model) to feed into practice guides. The Creativity Development Fund projects from the first year are:

- The CREATE project: creativity, e-learning and teacher education.
- Shared insight: Understanding creativity.
- Creative responses to the Holocaust: interacting with artifacts.
- Learning to look: Teaching medical students observation skills through the learning of photography
- Fashion design development and pattern cutting using CAD software.
- Quantifying the teaching and learning value of Fablabs.
- Artemacy - The fusion of creative art and pharmacy education.
- Football 4 Peace - The development of multimedia modules and hypermedia research methods in a visual evaluation.
- Overalls evaluation - Pedagogic research into practice based forms of documentation and evaluation of art making and learning for undergraduate arts students and students with learning disabilities
- Reading into creativity - an investigation into the new relationship between technology and scholarship.
- Succour - Biannual journal of creative work.
- Developing models using social technologies for supporting personal development planning and building an environment to augment creativity within group projects.

As an example the 'Creative responses to the Holocaust: Interacting with artifacts' project aims to discover how students articulate non-academic responses in academic ways, and how teachers/tutors assess these student articulations, by exploring the hypothesis that interaction with artefacts deepens student learning.

5   DISSEMINATION

A key activity of the CETL is to evaluate both existing practice and the learning and teaching that the CETL supports. Matters for dissemination include: details of the project at both Universities involved; the CDF; impact on students and staff; what teaching and learning opportunities are being presented; updates on activities and events, new developments, reports and case studies; practice guides. The principal dissemination methods are outlined in the following list.

- Dissemination for awareness: leaflets, postcards, press releases, brochures, conference posters. A key element is the CETL website which is the main vehicle for non-targeted dissemination as well as the place to which target audiences are referred for continuously updated information.
- Dissemination for understanding: resources guide, selected annotated publications, invited papers, CETL case studies, Creativity cafes allowing the mixing of ideas within a quasi-social setting, conference presentations, Design masterclasses providing show-casing of practicioner skills.
- Dissemination for action: practice guides, conferences, workshops, visits, exchanges and secondments.

6   CONCLUSIONS

The principal activities of the CETL in Creativity are the effective use of technology in the creative process with a particular focus, reflecting the collaboration between the two Universities involved, on engineering and design. Technology-enabled, but not technology-driven, the two Creativity Zones provide teachers, students and industry with a versatile space that can be used in a variety of configurations to support more innovative and effective practice, teaching and learning. This paper has outlined the key developments, with particular emphasis on the potential offered by the two technology-enabled Creativity Zones and the integrated emphasis on creativity.

ACKNOWLEDGEMENTS

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