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THE IMPORTANCE OF PLAY AND CREATIVITY IN THE DESIGN CURRICULUM

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ABSTRACT
It is more important than ever that our product design graduates have a better understanding of how to enhance their creative skills in order to design and develop new innovative products. This paper describes some of the research undertaken in the area of creativity and play; how it is being integrated into the design curriculum within the school; and how it is helping to inform the design of a new building for the school. The first part of the paper provides a summary of recent studies that have explored the relationship between play, the 'state of being' of a person, the environment and creativity. The second part of the paper discusses how the results of these studies have significant implications for the design curriculum and the student-learning environment.

Key words: Play, creativity, state of being, learning environments, product design process, learning, curriculum, education

1 INTRODUCTION

It has been generally accepted that play and creativity are extremely important elements of early years education [1]. This paper is looking at why and how creativity and play are also important to tertiary education, especially in the field of design. In some ways it is accepted that creativity is a very important element of good product design [2]. But it still seems an enigma as to how to formally build this skill into the design curriculum. Play seems to be only allowed into the curriculum if it is in direct relation to prototyping.

2 SCHOOL OF ART AND DESIGN - RESEARCH

One of the main aims of this particular art and design school is to create an environment of "creativity and innovation, inspiring new ideas and applying knowledge in new ways to create value." These aspirations have needed to be grounded in a deep understanding of the creative and innovative process. Creativity theories are diverse, complex and many[3]. This is mainly due to the many different perspectives and contexts in which this phenomenon occurs. Under this multitude of theories, it is often difficult to know where to start when trying to apply them to the curriculum and create an environment that fosters creativity and innovation. At this school of art and design we started by asking the question: "what fosters creativity?"

2.1 Research undertaken

A series of studies have been carried out over the past four years looking at this exact question and explored how play, the 'state of being' of a person and the contextual environment might foster creativity.

2.1.1 Play

Brown and Vaughan [4] and Schrage [5] contend that play is an important aspect of the creative process. Play has often been defined as being a spontaneous activity that is joyful, having the absence of consequences and the removal of constraint [6][7]. Brown and Vaughan [4] also talk about play as being an altered state, exploring the possible in which joyful emergence occurs. The first study we conducted looked at play and its relation to prototyping [8]. From that study we highlighted some areas that required further investigation. These were whether play really does support creative problem solving; whether the type of play undertaken needs to be related to the task at hand (e.g. the creative problem to solve); and does the form of play (e.g. imaginary, physical, social) affect the level

of creativity in problem solving? This led us to our next study that directly followed on from the previous one.

In this following study we explored play a little further to understand more about the type of play and its effect upon the creative process. We looked at physical, imaginary, social and non-related play in relation to solving a creative problem. The creative problem solving challenge we chose was Duncker's candle problem [9]. Participants were randomly assigned to five different conditions (no play, imaginary play, social play, physical play and non-related play). Ten participants were in each condition. In the 'Social Play' condition participants were allowed to communicate with each other via a Facebook application on their mobile phones. In the 'Imaginary Play' condition participants were given the task in the form of an imaginary story. In the 'Non-Related Play' condition participants were asked to take part in a game that was not related to the challenge before being told of the task. In the 'Physical Play' condition the participants were given the actual materials to manipulate in order to help them solve the problem. In the final 'No Play' control condition, participants were just given the written instructions and asked to solve the problem. All participants were given a maximum of five minutes to complete the task. All participants attempted the task and recorded their solution independently. Figure 1 below shows the results the number of correct solutions for each condition.

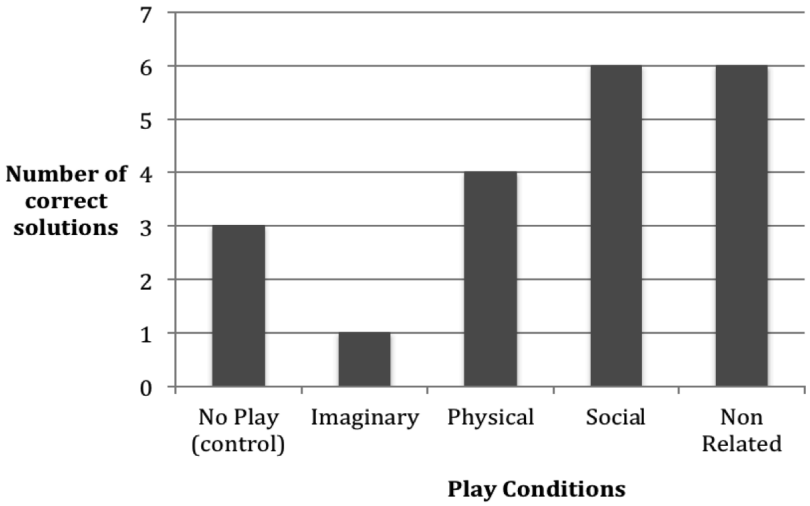

Figure 1. The number of correct solutions for each condition

The 'Non-Related Play' condition and the 'Social Play' condition had the highest number of correct solutions. In addition, participants in the 'Non-Related Play' condition completed the tasks in a significantly faster time, on average, compared to the other conditions. This would suggest that there is more going on than just iterative feedback when a person is playing in the creative design process.

Relatively new research has started to show that play may also be important because of the intrinsic motivation that is inherently part of the nature of play [10]. This intrinsic motivation and elements of autonomy have also been shown to have an affect upon a person's feelings of well being. This study supported the idea that play may be even more important to the creative process because of the affect it has upon a person's 'state of being'.

2.1.2 State of Being

This was a more difficult quality to measure, particularly in relation to creativity. The first question that came to mind was how do we measure 'state of being'?

Mental states have been found to have physiological signatures. Several physiological measures have been used as an index of user mental effort and mental workload. Heart rate variability (HRV) has been shown to be one of the most promising methods for measuring Autonomic Nervous System activity [11]. HRV is the variation in the time interval between heartbeats, specifically the variation in RR intervals of the Electrocardiogram (ECG). There is evidence to suggest that there is a close relationship between HRV and emotional states [12].

The study that we conducted aimed to see if there was a correlation between mental states and creativity by using the level of coherence in the HRV signal for measuring mental states of participants in the incubation stage of the creative process [13]. In this particular context the term

coherence is used to describe the periodic oscillation of the HRV. We tested this by replicating a study by Dijksterhuis and Meurs [14] that looked at the level of divergent thinking [15] by participants in a creative task. The task was to come up with new names for pasta. As in the study by Dijksterhuis and Meurs, five examples were given of existing pasta names and all examples ended with the letter "i". The idea being that new names for pasta (generated by participants) that did not end in the letter "i" can be classed as words stemming from divergent thinking.

The participants were hooked up to a monitoring device that recorded their HRV. After participants read the instructions, they were randomly allocated to one of the three conditions. The first condition was where the participants did the creativity task immediately, the second condition was where they had three minutes to think about the same task before completing it, and the third condition was where the participants were told about the task but then helped to relax for three minutes before completing the task. The creative process was measured quantitatively by the degree of divergent thinking combined with the Consensual Assessment Technique (CAT) developed by Amabile [16]. Table 1 shows the mean number of pasta names created by the participants for each condition that ended in the letter "i" (converging items) and those that did not (diverging items). Table 2 shows the percentage of diverging items created compared to the total number of items created.

Table 1. Mean number of convergent and divergent words

	Immediate	Conscious Thought	Mental Relaxation
Converging items	4.7	3.5	2.2
Diverging items	2.3	1.8	2.6

Table 2. Percentage of divergent Items created

Immediate	Conscious Thought	Mental Relaxation
35%	31%	50%

All the pasta names generated by the participants were also scored on their level of creativity by three independent professional designers who were blind to the purpose of the experiment and blind to each other's scores. They used a 5-point scale ranging from 1 (not at all creative) to 5 (very creative). The scores for each pasta name (from the three independent designers) were averaged. The overall mean creativity scores for each condition are shown in Table 3 below.

Table 3. Mean creativity scores

Immediate	Conscious Thought	Mental Relaxation
2.24	2.25	2.36

After further ANOVA tests results showed that there was a significant difference in creativity between the relaxation condition and the other two conditions. The findings were not completely conclusive but what they did show is that there was a connection between the coherence levels (we defined as their 'state of being') and the change in the coherence levels and creativity. From this study we suggested that it is perhaps not only the absolute coherence value that is significant i.e. the mental state per se, but the change from one state to another.

2.1.3. Learning Environments

There is plenty of recent research highlighting how different environments affect creativity. Groves et al. [17] looked at how "creativity is fostered by the built and cultural environment" by studying twenty of the most innovative companies around the world. As a result they highlighted four important elements that creative spaces should have: spaces that stimulate; spaces for reflection; spaces for collaboration; and spaces for play.

In a previous study [18] we ran for postgraduate product design students, we looked at how different immersive environments can also affect learning. The study was part of a module called *Sustainability Issues in Design for Production* (SIDP). The module was designed to raise awareness of issues such as resource depletion, pollution and climate change and the consequences of design choices. To help support the students' learning we took them to the *Centre for Alternative Technology (CAT)*in Machynlleth. While at CAT the students were not only given lectures on sustainability and information on alternative materials, but were also housed in specially designed accommodation where they directly experienced the consequence of their use of resources. For example, every time they used too much power they would experience a short power cut; when they needed heat they had to collect wood; and throughout their stay they were required to monitor their energy use. Figures 2 and 3 show images of the accommodation at CAT.

Figure 2. The eco-cabins at the Centre for Alternative Technology

Figure 3. Working on the Design Challenge in an eco-cabin

The outcome of the immersive experience for the students was very positive and proved to be more effective in achieving the aims and learning outcomes of the module compared with previous years when the students learnt in a traditional studio-style format. Some of the comments from the students are below:

- *"It's made me think more about materials in my professional design work."*
- *"It was different. Not like anything I've done before."*
- *"Being there encouraged me to take a more holistic approach to sustainability in my design work, instead of just changing materials."*
- *"It was more realistic. It showed the impact sustainability will have on my life."*

The students engaged in a level of thinking about sustainability that simply could not have been achieved without the immersive experience evidenced by the detail design in the project work that they produced.

2.2 Summary of Research Studies

The results of our play studies have shown that play is a very important element of creativity - not only in relation to prototyping and feedback but also in relation to the 'state of being' of a person and its relation to 'autonomous exploration' and intrinsic motivation. Our study that focused on the relation between mental states and creativity supported the notion that the 'state of being' of a person was important to foster creativity. In addition, it suggested that the change in mental states during a creative process also enhanced creativity. Research into creative spaces and our study on immersive environments emphasised how important the environment is to support creativity.

3 IMPLICATIONS FOR THE DESIGN CURRICULUM

The results of these studies have significant implications for the design curriculum and the student-learning environment. To foster creativity in a design curriculum we believe that the curriculum should support: play including related and unrelated play to the task at hand; choice and autonomous exploration (intrinsic motivation); and a diversity of experiences (including social, cultural, environmental and subject related). In addition, the physical environment should support creativity through providing spaces for play, spaces for quiet reflection and spaces for sharing ideas.

A new delivery structure for all our design courses is currently in development within the school. Concurrent with the curriculum redesign is the design of a new building to house the courses within the school. Some of the key aims of the new curriculum are to: create a culture, which "generates and enables autonomy, responsibility and ambition" in our students; that fosters and enables "a culture of creative scholarship"; and that fosters and enables "creative interaction, debate and collaboration".

To try and achieve these aims, the new undergraduate curriculum has three main modules per year called 'Subject', 'Field' and 'Constellation'. The Subject module focuses on the student's chosen subject in depth (e.g. Product Design, Graphic Communication, Textile Design, Illustration, Ceramics, Fine Art) so that the student gains expertise in one specialised area. The Field module provides a range of options for students to choose from that go across subjects allowing students to work in inter-disciplinary and trans-disciplinary research groups. Students will be encouraged to collaborate, but also to identify their own particular focus and contribution. Students will also have the opportunity for international exchange or work experience during this module. The Constellation module again provides a range of options for students to choose from that go across subjects, but focus more on a particular intellectual or philosophical area. This module allows students to explore and challenge theories; understand and contextualise art and design history; and help develop their own views and critical position.

The new course curriculum is very much in line with the findings from our research, in that students are given more choice and autonomy in where to specialise and given opportunities to have a range of diverse experiences through interaction with students from different disciplines and through experiences in different environments and cultures. Supporting these curriculum developments are the design discussions for the new building to make sure the student learning environment supports creativity and innovation. Key aspects of the new building design will be areas for play, both related to prototyping and autonomous exploration and also related to well being ('state of being'). The new design will incorporate common workshops and prototyping areas to encourage physical play and exploration as well as interaction and collaboration with students from different disciplines. Areas will also be set aside for social play and interaction, quiet reflection and imaginary play to support well-being. In addition, the link between the building and its environment is important so that students can seamlessly switch between working inside and outside the building as the change of environment can often help creativity and innovation.

4 CONCLUSIONS

To help our students enhance their creative skills and to help them design and develop new innovative products we have tried to create an environment of "creativity and innovation, inspiring new ideas and applying knowledge in new ways to create value." We have done this through linking our research work in creativity and innovation to the design of a new curriculum and building. Our new design curriculum and building will encourage autonomous exploration, collaboration and a diversity of experience as supported by Lepper and Henderlong [10], Kelley and Littman [2], Brown and Vaughan [4], and Schrage [5]. Our belief is that the new curriculum and building design will enhance the creativity and innovative output of our students, it will support the students' own feeling of well being, and hopefully result in new innovative products that support the well being of others.

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