

SAND CASTING ON THE BEACH—INTRODUCING TRADITIONAL MAKING SKILLS, MATERIALS AND PROCESS THROUGH PLAY AND EXPERIMENTATION

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Within the higher education (HE) product design field, many researchers stress the importance for students to recognise and value the relationship between practical 3D object-making experience, and experimenting with process and materials. Given the increasing pressures for design departments to sustain and keep large workshops, we face the perhaps inevitable consequence that product design students will lose fundamental physical 3D-object making skills. A case study from a sand casting workshop was used to investigate how new learning spaces could develop a teaching methodology to teach material and production knowledge, using low budget, low-tech, and practical object-making methods. The study showed that this learning space engaged the participants with the project and developed insights into teaching and learning that would not have been achieved through purely theoretical, studio-based teaching. Furthermore the workshop created an arena for social and professional interactions, and was found to be a possible tool for a discourse on sustainable design and production. The study led to developments in the design curricula of the participating institutions and resulted in learning outcomes of relevance for product design education.

Keywords: Crafts, learning spaces, international collaboration, ecology, material experimentation

1 INTRODUCTION

There is increasing concern within the HE product design community that teaching traditional object-making skills and material experimentation is decreasing [1]. One example is Bucks New University in London, which is closing its renowned undergraduate programmes in furniture design. Neil Austin, head of the furniture design course, said, ‘*Creative courses are a little bit messy and a little bit big—they need workshops, they need facilities and they need space to play*’ [2]. This issue was echoed by Apple’s chief designer, Jonathan Ive, who spoke recently at the Design Museum in London: ‘*So many of the designers that we interview don’t know how to make stuff, because workshops in design schools are expensive and computers are cheaper ... that’s just tragic, that you can spend four years of your life studying the design of three dimensional objects and not make one*’ [3]. In addition, there is a lack of skilled teachers in lower education [4]. In Norway, 70 percent of the educators teaching arts and crafts under the age of 30 have no formal education in an art or design discipline. This has alarming consequences for staff recruitment into design at HE institutions, and impacts on the lack of practical object-making skills that students acquire while attending HE institutions.

Traditional object-making processes serve to develop principles and disciplines from which students are empowered to explore and engage with new object-making technologies. At a time when our digital tools allow for more work to be processed virtually, the traditional workshop can complement the development of the digital learning environment. This competence is important for new product design graduates who will face the challenges of working in industry once they graduate. Students should not need to rely on having access to large, well-equipped workshops in order to gain experience with hands-on object-making and experimenting with materials.

2 BACKGROUND

Several researchers have emphasised the importance of hands-on experience and the connection between crafts and process [1, 5, 6]. This is not a new opinion, and is in fact something Aristotle thought about: *'Lack of experience diminishes our power of taking a comprehensive view of the admitted facts. Hence those who dwell in intimate association with nature and its phenomena are more able to lay down principles such as to admit of a wide and coherent development; while those whom devotion to abstract discussions has rendered unobservant of facts are too ready to dogmatize on the basis of a few observations'* [1].

A more recent commentator is Deputy Head of Research and Head of Graduate Studies at the Victoria and Albert Museum, Glenn Adamson [5], who, in his book *Thinking through Craft*, views object-making and experience with materials as a craft and process that should be regarded as a habit of action rather than a fixed set of things. *'Craft is not only a way of making things, but a way of making people: a means of social improvement.'* This approach corresponds with the writings of John Dewey and the theories of the progressive educational movement from the late nineteenth century [7, 8]. Dewey defined *experience* as a moment of interaction with objects and processes. Through engaging with these processes, students are offered opportunities to develop, and to grow their pride and self-esteem; these processes also promote mental and physical wellbeing. These building blocks could inspire students and empower education to not only build strong economies but also sound societies [5]. This view proposes that the interaction with objects and processes become more than just making objects, which aligns with the work of the American sociologist Richard Sennett [6], who views craft in this broader sense. He argues that the physical making of objects is part of being human, whether it involves making objects, food, or music. He suggests that physically making objects is needed to provide a balance from an increasing culture of screen-based mental processing tasks, both at work and at home. This could indicate that the increasing pace of learning, the easy access to information offered in the digital realm, and deadline-driven processes are having an effect on opportunities for students to reflect on their learning during projects.

The demise of physical workshop facilities within design education is a growing concern for many. Mathew B. Crawford [1], an American writer and researcher in cultural studies, champions the need and recognition for intuitive and tacit knowledge, stressing the negative effects that the decreasing workshop facilities within US design education has had on this knowledge. Without the opportunity to gain experience in physical object-making, Crawford argues that most forms of real knowledge, including self-knowledge, come from the effort to struggle with and master the reality of material objects. This corresponds to a large extent with the theories of Adamson and Sennett [5, 6]. Crawford further argues that the ideologists of the knowledge economy have posited a false dichotomy between 'knowing' and 'doing'. The importance of doing is emphasised by the arts and design writer and critic, Peter Dormer, who stated, *'the constructive rules of craft are only learned by actually doing the activity'* [9]. In 2006, the designer Max Lamb made his 'Pewter Stool' [10], manufactured from a sand-casting process produced on a beach. This was a low-tech manufacturing approach with a minimum need for tools. The project showed that experience with some crafts and processes can be achieved without the need to have access to well-equipped workshops. From a design education perspective, Lamb's work is interesting to us because it addresses different learning spaces. Setola et al. [11] use the metaphors the wild, the pub, the attic, and the workplace to visualise and emphasise the importance of different learning spaces through the learning journey. This view suggests that different learning spaces will support and encourage different learning experiences.

2.1 Research Question

From a design pedagogy perspective, it is interesting to use learning spaces creatively and to observe the impact that this might have on teaching and learning. Learning spaces are frequently discussed in design research, but there seems to be little focus on how the use of an outdoor environment might influence the learning outcomes within the context of teaching material and process. This led to the following research question: How to develop new learning spaces to teach material and production knowledge and skills, using a low budget, low-tech, physical object-making process?

3 METHOD

The main research method is a case study [12] of a two-day 'design and make' jewelry workshop conducted in Edinburgh, Scotland. Participatory observation [13] was used to study how students were

responding to this playful and simple project structure, which emphasised practical experience with materials and process. An eco-philosophical perspective [14] was used to discuss the impact on environmental sustainability this method can have on the learning process.

3.1 The sand casting workshop

The workshop was developed through an established Norwegian/Scottish research and teaching collaboration. Thirty product design students and five teaching staff, representing both Scotland and Norway, participated in the workshop; we were also joined by a local professional sand casting company. We structured the workshop around a 'lost Styrofoam' casting process. Day one of the workshop was conducted indoors, in the university's studio space. Students were asked to make jewelry models out of Styrofoam, which they sourced from discarded packaging materials. On day two, the project workshop relocated to a local beach (Figure 2). The Styrofoam models were dug into the sand, leaving one part of the model emerging above the surface of the sand (Figure 3). The attendees built a fire from driftwood found on the beach to melt pewter. The melted metal was poured onto the Styrofoam, melting and replacing it to create a perfectly matched cast. The cast artefact was then dug out of the sand and cooled in the sea. We also experimented with aluminum casting, which required using propane as a heat source rather than the fire due to the higher melting point of the material. Part of the finishing work on the casts was done on-site, but the unpredictability of the outdoor environment meant a trip back to the university to complete the rest of the projects.

4 FINDINGS

The workshop produced a wide range of findings, ranging from observations on individual skills acquisition, to impacts on the larger group dynamic. Students were noticeably more engaged in the process compared to similar workshop themes that were conducted in the studio. Using an outdoor teaching environment not only excited the students, but also led some to experiment in ways that may not have happened in a school workshop. For example, some students started to cast into patterns that they carved into the sand, while others cast directly into shells and similar objects that they found on the beach, which created some unexpected outcomes. Students clearly gained new insights into working with materials and a craft process. Many had difficulty understanding the transformation from Styrofoam to metal, and how that affects issues such as dimension and weight in a jewelry piece. Also, most students became obsessed with 'finishing' their jewelry, grinding away any perceived imperfections in the casts and leaving few traces of the making process.

The workshop also created an environment that encouraged social and professional interactions, which probably developed more easily and quickly because we were away from the more formal structures of studio- and office-based locations. The beach acted as a hub, bringing together representatives from two nations and participants from both industry and academia, as well as inviting the interest of inquisitive passers-by. Ideas generated as a result of the workshop were noted as opportunities to discuss and make changes to both university's respective product design curricula. In addition, the findings also indicated that similar workshops could be used as a platform to develop a discourse about environmental sustainability.

5 DISCUSSION

The aforementioned sand casted Pewter Stool [10] by Max Lamb, which he produced at Caerhays Beach in Cornwall, UK, provided a source of inspiration for developing this workshop. Lamb's technique, however, differs from the main method used in this workshop. He dug directly into the sand to create the casting mold and used propane as a heat source, while this project primarily used 'lost Styrofoam' casting and an ordinary outdoor fire for melting the metal. Despite these process differences, both methods are similar regarding the use of the beach as a studio and production space. Lamb's video post [15] of his manufacturing process provided both a source of inspiration for our students and a context for the workshop. In particular, Lamb's work helped to demystify the casting process and manufacturing techniques for students who were engaged in design processes with the workshop for the first time.

5.1 Student engagement and learning spaces

Students were noticeably more engaged in the process compared to students' participation in similar workshop themes delivered in-studio. Of particular note was student attendance. All students arrived

on time at a cold, rainy, and windy beach on an October morning, 4km outside of the city center. This is a strong indication of student engagement if we compare this to the late arrivals or absences that generally occur during studio-based modules. Students actively took ownership of their own learning; they did not want to stop the workshop, even given the challenging weather conditions. They wanted to organise future workshops through independent study, if it were not possible through the university. Dewey emphasised that through engaging with processes we are offered opportunities to develop, and to grow our pride and self-esteem; these processes also promote mental and physical wellbeing [7, 8]. To what extent this workshop achieved this is hard to measure, but the engagement from the participants was obvious. We could clearly spot both pride in their work and healthy self-esteem amongst the students upon completion of the various tasks.



Fig. 1. Experimentation



Fig. 2. Sand casting



Fig. 3. Lost Styrofoam

The natural restrictions imposed on the workshop (by time, weather, and light) focussed the project towards process-driven experiences rather than final project outcomes. Removing the expectation of a 'finished' project outcome likely freed the students to experiment and to make mistakes without the perceived risk of failure. Whilst care was taken to decrease risk from the workshop, the nature of the materials and process required an element of working with risk. In this context, risk was regarded as the control the students had over the processes and the impact on the outcome as a direct result of their object-making skills. The casting process was quite unforgiving, as there was no option to press undo or to reach for a rubber. The students were encouraged to work with their 'happy accidents' and unexpected outcomes.

Furthermore, we observed an interesting mind-set in most of the students. Nearly all were concerned with creating a smooth, blemish-free finish to their objects. On reflection, this should not have been such a surprise, given the desire some students have to create attractive CAD visuals, aided by sophisticated rendering packages. This gave the teaching staff an opportunity to discuss with the students the possibilities of working with some of the random outcomes this casting process can offer, and not to erase the provenance of the object.

In addition, several of the students had difficulty predicting the outcomes of the different stages of the project process. For example, Styrofoam is an extremely lightweight material, and what is perceived as a logical size and scale for jewelry (when modeled in Styrofoam) might not be appropriate after it is cast in pewter. Students were told about these issues prior to modelling their designs, thereby gaining theoretical knowledge; at that stage, however, they did not yet have practical experience. This indicates that the change in appearance from one material to another is something one has to physically experience in order to successfully develop and control successive processes and production of objects. This example shows how skills acquired through hands-on experience is important for gaining material understanding. Furthermore it corresponds with the work of Sennett [6], who emphasises the importance of the close connection between the hand and the head, and views this as a dialog between a concrete practice and a way of thinking, which can evolve into discovering and solving problems. The practical, hands-on nature of the workshop required the students to continually wait and reflect on their tasks before moving on to the next step of the object-making process. This allowed students and staff time to discuss the progress of each project, and contributed to developing a holistic approach to the teaching and learning environment.

Looking at Setola's [11] thoughts on different learning spaces for different activities, it seems that the beach learning space affected the learning outcome differently than if the workshop had occurred in a

school workshop. For example, students experimented with casting into found objects on the beach (Figure 1). A more unexpected example was the experience students had when they discovered a washed-up beam in a container near the beach. Students wanted to use this for their fire, but were surprised to discover the beam's high density. It was so heavy that it required four people to carry it, while two people could easily carry a similarly sized beam of Norwegian spruce. In addition, they discovered the difficulties of cutting this hard wood and getting it to burn. These experiences would not have occurred through teaching from a purely theoretical and studio-based perspective. According to Dormer [9] and Crawford [1], these types of skills and knowledge are best learned through experience.

5.2 Social and professional interactions

The location and preparation of the workshop site needed careful planning from the staff, which required a number of visits to the site, working around tide times, Scotland's unpredictable weather forecasts, and access to the site for transporting materials. This extra-curricular activity proved to be a positive experience for the dynamics between the academic staff and the industry participants prior to the workshop, most of whom had not met each other previously. During the course of the day the site needed to be prepared, maintained, and dismantled, which were tasks that required collaboration between all participants; this promoted inclusive and equitable interactions between staff and students. To encourage a good interaction with curious onlookers, it was important that we did not damage the beach; we needed to demonstrate that we were working safely and responsibly.

An additional goal for the workshop was to further develop our existing international relationship by including industrial collaboration. An Edinburgh-based 'green' sand casting foundry was invited to collaborate with us on the beach casting day. We were pleasantly surprised to hear that they gained new knowledge from the process, as well, and remarked throughout the day about some of the processes and techniques that *'they had not realised you could do this'*. In addition, the company contributed skills and knowledge, becoming both learner and teacher. Some staff members were also new to this particular object-making process, so they became learners alongside the students; this forged a sense of camaraderie among all participants. This was a particularly rewarding example of developing a holistic learning experience.

One outcome from the workshop is that it has led to a discourse on workshop activity at the Norwegian University College. This discourse may lead to the implementation of several one- or two-day, material-based elective courses. Similarly, the experience of the workshop has led to proposals to restructure some module content on the product design programme at Edinburgh Napier University.

5.3 Contributions to a sustainability discourse

The workshop can contribute to a sustainability discourse. One way of discussing this is through Arne Næss' theory on 'deep ecology' [14]. Through his ideas on complexity, Næss claimed that mature and stable ecosystems are characterised by great inventiveness and the multiple uses of resources, and that every society has alternative ways to satisfy its needs: if one factor reduces the possibilities, there are alternatives within the local community. The process of casting in the sand of the beach is an example of seizing other possibilities within the community when workshops aren't available. The concept of deep ecology is interesting from a design perspective, because it emphasises the importance of relational thinking, holistic thinking and system thinking. These are all factors of importance within a holistic design perception. In deep ecology, everything is connected with everything else through a mutual, dependent relationship in a long-term perspective. It is a symbiosis, where all parties extract mutual benefits from each other through true companionship. In this workshop we used natural resources like sand, water, and wood found on the beach. The materials used for making models were discarded Styrofoam retrieved from the garbage. It was important to leave the beach unspoiled after use. This can be an important contribution to relational and sustainable thinking in design education. It is a way of experiencing a holistic, ecological praxis first-hand.

6 CONCLUSION

One of the aims of this study was to develop a learning environment through hands-on experience with a physical object-making process. Sand casting on the beach proved to be a low-budget and low resource approach to hands-on learning and teaching experience, with a focus on working with materials and process. This working methodology encouraged collaboration between students,

academics, and practitioners, and inspired future, student-led learning events. Furthermore, it will likely lead to curricular changes in both of the participating institutions. The study indicates that traditional object-making skills still have a value and place alongside digital, 3D prototyping technologies and theoretical teaching. In addition, the method aims towards viewing the diversity of learning spaces, and how these spaces can lead to different learning outcomes. This outdoor learning space created an opportunity for experimentation, insight, and learning which would not have been possible in a school workshop. Using natural resources like driftwood, sand, and water, and the opportunity to leave the working space unspoiled once the project was complete, made it possible to view the workshop through the perspective of environmental sustainability. The extent to which the students experienced insight into the relative sustainability or unsustainability of our workshop is unclear. It is plausible, however, that this approach could be used in a sustainable design discourse.

The learning outcomes identified [16] in this study are relevant issues in product design education concerning knowledge, skills, and general competence. Having knowledge is to understand the importance of material knowledge in product development. Skills are related to process understanding and the skillful manipulation of materials. From a sustainability perspective, general competence is to see nature and design as mutually corresponding elements. This case study is based on a single workshop, but the phenomena identified has the potential to stimulate and foster similar outdoor object-making workshops. For future workshops it would be interesting to think about how to integrate the planning and logistics of organising the outdoor workspace itself, as a specific learning outcome for the students. For other design educations who wish to explore these possibilities, it does not have to be casting. Through trying out different learning environments, using crafts, delivering short workshops and engaging with materials and play with a range of physical 3D making skills, we presume you will reach similar results.

The workshop offered learning methodologies in addition to the chance to observe, listen, and physically engage with a process. It also provided opportunities to experience tacit knowledge, and required collaboration between all of its participants, each having a responsibility for one another and for the environment. In addition, lecturers, industry practitioners, and students had the opportunity to become both learner and teacher. This was a challenging and rewarding workshop and, in the words of Glenn Adamson, '*Craft, because it is hard won, is always a revelation*' [5].

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