REFLECTIONS ON A COMMUNITY OF INQUIRY APPROACH TO DESIGN STUDIO EDUCATION: A CASE STUDY

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ABSTRACT
Design studio pedagogy is the principal teaching method used in design education. The studio environment promotes learning through engagement with real-life projects that are typically ill-defined and supported by a design tutor. While learning is rooted in an experiential modality (learn-by-doing), the *why* of the designing (purpose, methods and tools) mostly remains implicit. The differing nature of design projects means that systematic approaches are seldom used, therefore students must understand the fundamentals of the discipline to succeed.
This research paper presents a pilot case-study on the integration of a Community of Inquiry (COI) approach into the design studio aimed at subverting the implicit nature of design education. The COI framework is taken from Lipman and Sharp's 1970s reimagining of philosophy for children, in which inquiry through communal dialogue is used to explore the philosophy of a discipline. In the adapted version presented here, the *discourse* revolves around the principles of design and emerging artefacts (sketches or prototypes), the design tutor becomes the *facilitator* who labels design moves and models design skills, and the *stimuli* are democratically selected design projects.
Survey results provide insights into students' experiences along with their challenges with this approach. Observations of students' design tendencies along with their design outcomes are also presented. In addition, the rationale for integrating COI, along with how it was adapted for use in a first-year product design module will be outlined, along with challenges, benefits, and learnings for future implementation.

Keywords: Community of inquiry, design studio education

1 INTRODUCTION

1.1 Design studio pedagogy
Design studio pedagogy is the principal teaching method used in design education [1]. The studio environment is rooted in an experiential learn-by-doing modality that promotes learning through engagement with real-life projects [2]. Here, product designers typically tackle ill-defined problems that go beyond mere form giving [3], requiring synthesis of specialist subjects as diverse as ergonomics, sustainability, and design for manufacture [4], and use of a multitude of possible design tools [5]. The differing nature of design projects means that systematic approaches are seldom used [6], adding to the challenge of design education. Furthermore, the why of the designing (purpose, methods and tools) mostly remains implicit in design education [3, 7-9], meaning process knowledge is only gained through experience. This research paper presents a pilot case-study on the integration of a Community of Inquiry (COI) approach into a design studio module, aimed at making the implicit explicit.
The design programme in which this case-study takes place, has had much success in graduate employment and at both national and international design awards. However, recurring observations across several years of final year students' capstone projects hinted at graduates that may not fully understand the rationale of designing, the methods, or tools. This pilot study was undertaken to investigate if this knowledge gap could be lessened.

1.2 On Community of Inquiry (COI)
Community of Inquiry (COI) was chosen for integration into this study as it is an educational approach that explores the philosophy of a discipline, with the goal of making the 'why' explicit. It was deemed a good fit for design studio environment as it facilitates active and collaborative participation in a student

led learning forum. The COI framework used in this pilot study is taken from Lipman and Sharp's 1970s reimagining of philosophy for children. This differs from Garrison's [10] version typified in online usage which espouses social, cognitive, and teaching presence.
In COI, deep learning and understanding is achieved through participants collaboratively exploring ideas while asking rich and meaningful questions of each other on topics of interest. Through COI participants learn to guide themselves, think independently, and make informed choices [11]. Important factors in achieving this include discourse, community, facilitation and stimulus. Discourse involves inquiry into the fundamentals of a discipline, collaborative experiences are increased through a community of participants, the teacher becomes a facilitator [12], and the stimulus is material, such as a video, that prompts discussion from which a democratically chosen subject emerges. The role of the facilitator (sometimes called a moderator) is to act from the Socratic ''position of ignorance'', working at the same level as the participants, labelling moves and challenging assumptions, uncertain where the inquiry will lead.

1.3 On design

Design projects typically start with a design brief given by either a design tutor or industry partner. Set out in this design brief is the contextual background, project aims, expected deliverables, design phases, deadlines, learning outcomes, and assessment criteria. Students then engage in a series of scheduled phases working towards a design solution that fits the predetermined design constraints of the brief. Design programmes typically take a scaffolded pedagogical approach starting with simple design projects and introduction to fundamental design tools in the formative (initial) years of education [13]. Each design phase typically spans one or two weeks, with each student attempting a variant of the same design brief. Projects can be individual or in teams and range in duration from several hours to several months. Design slams are short intensive projects which can start and finish in a matter of hours, while many cap-stone projects run over an entire year of study.
The design studio acts as a community of practice with students of all years working on projects in a shared space [14]. Discourse is central to this design studio community taking place in many forums such as tutor mentoring and teaching, informal peer discussions, and design reviews [15]. The design review, or crit, is a designated time during a project when students present their work and have experts and fellow students review and offer feedback [16]. However, the emphasis in these forums tends towards the designed object and advancement of solutions rather that of the why of the designing (purpose, methods, and tools).
The product design process model introduced in this module matches Kruger and Cross's [17] 7 stage expertise model. Due to the introductory nature of this first semester module, only phases 4-7 were engaged in to simplify the process. Phases 4-7 include: 4) define problems and possibilities; 5) generate partial solutions; 6) evaluate solutions; and 7) assemble a coherent solution. From a vast array of design tools such as sketching, CAD, prototyping, cultural probes, roleplaying, immersion, and mind-mapping, only sketching and prototyping were introduced.

2 METHOD

The following section outlines how Lipman and Sharpes COI framework was adapted for a first-year design studio module along with how data was gathered from the pilot study.

2.1 Context of study

The design studio module in which the case-study takes place is the first design module students will take in their four-year degree programme at the University of Limerick. The aim of this module is to introduce the fundamental skills and cognitive processes of product design and to lay the foundations for subsequent design studio modules. Participants comprised 43 Product Design and Technology students (20 female, 23 male) and ran over eight weeks, with one three-hour studio session per group each week. In this time students engaged in four projects, three of which were group projects (3-5 students per group), with the final project undertaken individually. The class was split into two groups of 21 and 22 students. The researcher was also the design tutor (facilitator). Each project ran for two weeks, a total of two three-hour sessions per project.

2.2 How COI was adapted

Elements of Lipman and Sharpe's COI framework that were deemed appropriate (workable?) in a design studio context were selected (see Table 1). In the adapted version presented here, the discourse revolves around the principles of design and emerging artefacts (sketches or prototypes), the design tutor becomes the facilitator who labels design moves and models design skills, and the stimuli are democratically selected design projects.

Table 1. Comparison of COI and design studio

COI elements	*COI focus*	*Adaption for design studio pedagogy*
Discourse	Inquiry and discussion to improve concept formation through equipping students with such tools as criteria, reasons, arguments and definitions [18].	Inquiry into the 'why' of design and designing (principles, methods, and tools). Shift in focus from discussions around the designed object, to discourse on the principles, methods or tools of design.
Community	Increase in collaborative experiences for learning where peer engagement is essential [19].	Increase in team projects: (from 25% – 75%).
Facilitation	The teacher as a facilitator or guide – acting as a bridge between concepts and arguments [12].	From tutor defined projects and schedules to student led. From role of tutor to moderator, facilitating critical discourse on the rationale of designing.
Stimulus	A democratically chosen subject from which discussion emerges [20].	From tutor defined project topics to democratically self-selected design projects.

2.3 Survey & Observations

A survey was used to gather participant feedback on their experiences of the integration of COI into design studio education. The aims of the survey were to find out:

1. how students found learning to design through the integration of COI and design studio.
2. if the group work prepared students enough for their individual project.
3. the main challenges for students.
4. the students' overall impression of the module.

Students were asked 15 questions, 13 of which were 5-point Likert scale questions and two open ended questions. Questions were structured to avoid social desirability bias and primacy bias. The data was collected using paper surveys distributed to 43 student participants, 38 students participated. Observations were noted in weekly diary entries about session organisation, student engagement, discussions topics, student assumptions, novice tendencies, and work produced. Ethics approval was granted by the University and all participants consented to involvement in surveys and observation studies.

3 FINDINGS

3.1 Survey

Survey results present an overall positive experience for participants. Overall student satisfaction rating for the module was high with 47% satisfied and 34% very satisfied on a 5-point Likert scale (not satisfied – very satisfied). Learning through group projects was also deemed positive with 58% rating as enjoyable, and 23% on the very enjoyable rating. Students were also asked how prepared they felt for taking on an individual project following three rounds of group projects. In response, 74% stated yes somewhat, and 18% yes, a lot. Free text answers offer some rationale for this positive feedback: "I felt that the previous stage gave a trial run on how to work on the project, also got insight into how others think"; and "Yes, because I could learn from my mistakes in the group project."

39% of participants found engagement in group projects easy, while 26% found it very easy. The majority of the class enjoyed having the autonomy of self-directed projects with 39% satisfied and 50% very satisfied on the Likert scale with only 8% stating they would prefer given projects. Motivation in group work was stated as high for 45% and very high for 21% of participants. Results were similar for the individual project with 47% stating motivation as high and 29% as very high. Free text answers support an increase in very high motivation for individual projects: "I think that working in the group

projects prepared me well for the individual project and it made me excited to explore some of my own ideas and skills".
The survey also captured students self-rating on six elements from the design projects including project selection, ideation, prototyping, sketching, understanding the process, and time management. Here, project selection, time management and ideation were rated most difficult of the six, with sketching and prototyping as the easiest. The following free text answer presents an example of why ideation can be difficult for novices: "I felt the initial stage of creating an idea hard as I was not thinking about a problem. I was trying to think of a product". Free text from a question on how you could have been better prepared for the individual project supports the ratings that project selection was the biggest challenge (10 references), followed by time management (7 references).

3.2 Observations

Excellent participant engagement in group work together with good quality discussions were observed and recorded in weekly diary entries. In addition, students seemed to enjoy the format. These behaviours are evident in photos of group whiteboard discussions and group prototyping.
Students' design outcomes were of high quality relative to time spent on projects with a remarkable diversity of self-directed projects undertaken. Group projects ranged from orthopaedic corsets to personal electric transportation devices, personal substance tracker, and a student backpack.
Student's difficulty with ideation, as found in the self-rated survey question, was also observed in weekly diary entries. In general, students tended to generate single or limited number of ideas, despite discussions around the divergent nature of this creative design phase. A second noteworthy novice tendency was also observed throughout the pilot study – the absence of iterative practice across ideation and prototyping activities.
Diary entries also highlight the two main challenges for facilitation of a COI approach in design studio education. The first was balancing discourse with the 'learn by doing' activities in projects. While energetic discourse was obvious at times, the 'doing' nature of design resulted often dominated the sessions. Secondly, the uncertainty of facilitating student-led rather than tutor-led sessions was daunting. Not knowing where the self-selected design projects will take different groups was challenging, as it takes much tutoring experience, an understanding of the rationale of design, and knowledge of novice tendencies.

4 DISCUSSIONS

4.1 Engagement, motivation, and self-directed work

Student survey results and researcher observations during this pilot study present an overall positive learning experience for students. Student engagement, an important factor in effective learning [21], was excellent. Dewey's [22] notion that academic achievement is positively influenced by the amount of active and collaborative participation in the learning process highlights the benefit of the collaborative learning experience central to Lipman and Sharpe's COI.
Research has also shown that the more educators give their students autonomy of choice and control, the more their motivation and engagement are likely to rise [23]. As this is the first study, it is unfortunately not possible to compare to past experiences. However, observations of design outputs were refreshingly diverse and demonstrated good thinking in bringing ideas through phases 4&5 of Kruger and Cross's [17] expertise model (4. define problems and possibilities & 5. generating partial solutions). This may be partially due to Pintrick and Schunk's [24] idea that students learn subjects that they are interested in and have autonomy in making choices, they tend to perform better. This also hints that to date we may also have been underestimating students by providing overly structured briefs and perhaps being too prescriptive. In addition, by making the implicit (the why of design) explicit through discourse, the autonomy afforded to students is more worthwhile.

4.2 Novice tendencies

Four novice tendencies were highlighted by the survey results and weekly diary entries. These included difficulties with, idea generation, project selection, time management, and iterative practice, each a tendency that would be expected from novice designers with little process experience. Limited idea generation is common in the work of novices due to tendencies such as design fixation [25] while good time management would rely on experience of design methods and tools. Despite being discussed in class; it was obvious that iterative practice is not a natural tendency and is something that will be

explored in future implementations. Interestingly, results from the survey and observations were at variance for project selection. Despite students' selection of appropriate and interesting design projects resulting in good outputs, these survey findings highlight students' desire for certainty & achievability in design projects [26].

4.3 Facilitation

Two major challenges with facilitation were highlighted in the Findings. Firstly, encouraging discourse on the 'why of design to develop a shared understanding of the rationale of process and tools was challenging. As Golding [11] notes, the moderator has to be skilled in facilitating group inquiry. The challenge in this forum is that design is an action, and maintaining the balance between dialogue and action was problematic as often students just wanted to "get on with it". Secondly, the experience of facilitation can be nerve racking, due to the radical uncertainty of this approach [12]. No longer is the teacher the 'sage on the stage', therefore setting one's ego aside and accepting you may not know the answer is crucial. Facilitation also requires patience and practice not to give 'the right answer', therefore competency as a tutor and an understanding of novice designer tendencies is critical. The loss of educational control can be uncomfortable for some [27] but the benefit of this is that the burden of learning is transferred to the student, freeing the facilitator to be fully immersed in facilitation.

4.4 Learnings for future implementation

The positive results from this pilot study are encouraging for future iterations. Managing and maintaining discourse should be a considered in future implementations, as the 'doing' can take over from the discourse. In addition, consideration of how this mode of delivery is extended across a variety of subjects and years should be made.

4.5 Limitations

There are several limitations to this pilot study worth considering for analysis of the study findings and for future research. As this was the first design studio module undertaken by participants and similar data had not been collected on previous cohorts, a comparison of approaches or learning experiences could not be undertaken. Due to the scope of the study, only surveys and research observations were used. In future studies, additional methods and independent observers may reveal deeper and less biased insights into the student learning experience. Furthermore, a follow up study would be required to establish whether or not there is a long-term positive effect on subverting the implicit nature of design education through COI.

5 CONCLUSIONS

This research paper presents a pilot case-study on the integration of a Community of Inquiry (COI) approach into a design studio module, aimed at subverting the implicit nature of design education.
Design education is complex due to the ill-defined nature of design problems, the requirement of specialist subject knowledge, and multitude of design methods and tools. This complexity often creates a dense curriculum that leaves little time for discourse on the why of designing (purpose, methods and tools). However, simply knowing the content will not suffice future graduates that face an uncertain and increasingly complex world. Future design challenges will require students' to be malleable, independent, and have an ability to be self-directed. The findings of this study go some way in establishing a starting point for creating such graduates.

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