OVERCOMING THE BARRIERS IN CLIENT-BASED LEARNING: A CASE STUDY

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Abstract

Client-based learning in Higher Education presents the opportunity for students to work with a real client on a real project. Students studying Creative Industries subjects such as digital design benefit immensely from client-based learning; as it provides them with meaningful projects, real-world problems, interaction and feedback from clients who may not be design-literate. As a result, students learn how to digest feedback and translate it into design decisions, whilst strengthening their skills in time management, motivation, and resilience. However, when it comes to the practicality of integrating industrial clients into the curriculum, several challenges are faced. First, it's not always feasible to find clients who are interested and willing to spend time engaging with undergraduate students. Second, client-based projects are often sparse and, therefore, assigned to high-achieving students; as such, it can be challenging to cater to and facilitate client-based projects for an entire cohort of students, including students who vary in their abilities and academic performance. Finally, it can be challenging to map the client's own deadlines against academic terms and assessment deadlines.

This paper presents a case study of a client-based undergraduate digital design project where the client is a PhD student at the same university. Specifically, we discuss the appeal of utilising research-based projects as real-world problems for undergraduate students to tackle as an alternative when it is not feasible to source and engage with industry-based clients. We discuss the process we adopted to facilitate this project as well as the potential benefits, drawbacks and challenges of such an approach.

Keywords: Client-Based Learning, Higher Education, Design Pedagogy, Authentic Assessment.

1 INTRODUCTION

As of 2019, the Creative Industries in the United Kingdom (UK) achieved a Gross Value Added (GVA) of £115.9 billion, marking a substantial 43% increase since 2010. This growth rate is more than double that of the UK's average (2010-2019) in other sectors, which stood at 17.7% [1]. This substantial expansion has led to an increased demand for talented and skilled professionals within the industry, consequently leading to a surge in enrolment figures in designed-related Higher Education (HE) programmes. For instance, the 2021/22 academic year witnessed 189,890 students opting for design-related studies—a 13.75% increase compared to 2014/15 [2, 3]. In correspondence to the needs of the Creative Industries, the importance of ensuring that HE programmes produce capable graduates who can make valuable contributions to this sector cannot be overstated.

Research within design pedagogy underscores the importance of balancing methodological design theory with the appropriate level of practical technical skills. This equilibrium ensures that students produce inspired outcomes meeting accepted standards and participate effectively in creative design processes [4]. Furthermore, research highlights the importance of incorporating pedagogical practices that enhance students' soft and interpersonal skills, thereby boosting their employability. Such skills include creative problem-solving, critical thinking, the ability to assimilate and respond to feedback, effective time management, and proficient written and verbal communication within and outside the circle of designers [5, 6].

Existing research reports several approaches to achieve these pedagogical objectives. Whilst such approaches vary, most well-recognised approaches in the body of literature undertake the principle "learn by doing", recognising it is the best way to incorporate active learning, design thinking and theory, technical know-how, and personal and interpersonal skills into one cohesive learning package [7-12]. For example, Problem-Based Learning is a pedagogical approach that cultivates problem-solving strategies and deepens students' knowledge base by engaging them as active problem-solvers in scenarios that closely resemble real-world situations [7]. Whilst Problem-Based Learning can be conceptualised in various ways, such as through case studies, role-playing scenarios, or debate panels, Project-Based Learning is a subset approach within Problem-Based Learning. In Project-Based Learning, students engage in extended, multi-step real-world problem-solving activities that result in

tangible and authentic outcomes [8, 9]. Lastly, Client-Based Learning represents another facet of the Problem-Based Learning approach. In this subset, industry-based clients introduce projects, themes, or problems and actively collaborate with students throughout the project's duration, offering feedback and guidance [10-12]. Client-Based Learning, in particular, provides students with a multitude of learning advantages, particularly in the context of design pedagogy. The literature highlights that client interactions allow students to work on meaningful real-world projects, shape their interpersonal skills such as time management and resilience, boost their self-esteem, increase their motivation to maintain the engagement continuum in university projects, cultivate professionalism in their written and verbal communication, enhance their receptivity and response to feedback, and establish potentially beneficial industrial connections for post-graduation [10-12].

Despite the myriad of benefits Client-Based Learning can offer, its practical implementation presents several challenges. Whilst involving industry-based clients can immensely enrich students' learning experience, they may not see the same appeal or find the time to engage with students due to their competing priorities and deadlines [11]. On the academic side, sourcing suitable industrial clients aligned with the module's learning outcomes and ensuring the reliability of clients, as Client-Based Learning's success hinges on sustained client engagement, can be challenging [13]. Secondly, clients, owing to their extensive field experience, may sometimes present overly broad projects or provide ambiguous feedback. In contrast, students at this stage may require more focused, well-defined projects and clear and direct feedback [10]. Thirdly, where clients engage with student projects for their own business purposes (i.e., utilise some or all the students' project work for their business), coordinating their deadlines with academic terms and assessment schedules can pose a logistical challenge. Lastly, the number of client-based projects tends to be limited and is often assigned to high-achieving students, making it challenging to accommodate and facilitate such projects for an entire cohort of students with varying abilities and academic performances.

Herein, we present a novel approach to address the challenges encountered in Client-Based Learning. By sourcing a PhD student as a "client" for an undergraduate digital design student, we first introduce the case study, the scope of the undergraduate module in which this approach was introduced, as well as the PhD project brief, which served as the client brief. Subsequently, we detail the execution of the undergraduate Client-Based Project and its evaluation. Lastly, we offer a discussion on the potential benefits and drawbacks associated with this approach.

2 CASE STUDY

2.1 The Final Year Project Module

The Final Year Project (FYP) is a 60-credit, level 6 module that is undertaken by digital design students studying under the Division of Computing, Engineering and Mathematical Sciences at the University of Kent, UK. The FYP is a substantial piece of work based on students' own personal interests. Students may develop an interactive visual experience, create a 3D animation or visual effects piece, produce a motion graphic, or develop a VR application. Whilst students can choose to work individually or in teams, the FYP is a largely independent piece of work, with guidance from an academic supervisor. Intended learning outcomes of this module include integrating students' technical and design observations in a major development project, demonstrating proficient use of industry-standard tools and techniques, demonstrating a thorough understanding of the production process in their chosen area of study, producing professional-quality documents and digital media artefact, and develop and improve idea-generation techniques commensurate with the development of a substantial creative brief.

In the term prior to the module being undertaken, students receive an introductory lecture that introduces them to the module, expectations, timeline, and examples. Following this, students are asked to submit their project area (e.g., 2D, 3D, games, web, interactive installations, etc.), as well as a proposal describing their overarching project theme (i.e., tell a story, present a topic, offer an interactive experience, etc.). Students are then distributed to academic supervisors based on their area of speciality. When the module commences at the beginning of the term, students receive an introductory lecture that introduces students to the FYP module, expectations, timeline, and examples. Topics related to project management, ethical considerations, and communication skills, are covered through shared resources on Moodle[1], lectures, or during student-supervisor tutorial sessions. Tutorial sessions happen fortnightly with academic supervisors in a group setting, where students share their ongoing work, gain feedback, and have the opportunity to

[1] https://moodle.org/

ask questions and share their experiences. In addition, students can set up 1-1 meetings with their academic supervisors to discuss matters in a private setting or gain further guidance in the interim between tutorials. Finally, if required, students can contact other academics on the course to gain area-specific guidance depending on the academics' expertise.

2.2 The PhD "Client" Brief

A PhD student in Biomedical Engineering, enrolled within the Division of Computing, Engineering & Mathematical Sciences at the University of Kent, UK, is investigating the use of technologies to enhance the accessibility of wheelchair driving training for new wheelchair users. Learning how to operate a wheelchair effectively and safely is a crucial step for newly disabled individuals, as it promotes their independence, facilitates their return to work, aids in their social integration, supports them in resuming their societal and familial roles, and ultimately enhances their overall quality of life [14, 15]. Such training typically involves the repeated practice of set exercises designed to improve maneuvering and propulsion techniques [16]. However, conventional (i.e., real-life) training methods can be cost-prohibitive, time-consuming, and may necessitate resources that are often unavailable [17].

In the existing body of literature, several studies have explored the utilisation and effectiveness of various technologies, including Virtual Reality (VR) applications [17-19], as methods for providing wheelchair driving training to individuals who are new to using wheelchairs. VR has been reported to be effective in enhancing users' wheelchair-driving skills safely [17-19]. However, many aspects still require further investigation to enhance the deployment of VR in this context. Specifically, the PhD student aimed to explore the following:

- Examine the effect of the environment and interaction design in VR on users' outcomes (i.e., driving skills), engagement, and motivation. This was to be explored through a comparison of the same training terrain with a change in the environment appeal (i.e., realistic vs. stylised) and interaction design (i.e., minimal vs. gamified).
- Examine how the hardware of the training system can be adjusted to enhance the training's accessibility. To achieve this, the student designed a set of sensors (i.e., Inertial Measurement Unit) that can be fitted on any wheelchair and connected to the VR training system via WiFi. The premise is that this may enable users to train on their own wheelchair rather than a training wheelchair that might not have the same sensitivity levels as theirs. It may also allow users to fit the sensors as and when they want to do some training, thus increasing the accessibility of the training beyond the laboratory settings.

Considering the scope of the research project, the PhD student required a 3D artist who could design the VR environments and gamified elements. Such a 3D artist would need a good understanding of designing stable and renderable environments that do not lag, flicker, or produce technical issues. These requirements are not only needed from an aesthetic point of view but also to ensure that the VR training does not cause adverse effects such as eye strain, nausea, or motion sickness [20]. To this end, the PhD student extracted the design requirements for the environment terrains from the well-established Wheelchair Skills Training Program [16] and produced a floorplan specifying the dimensional requirements, ensuring that the VR version of the training meets the standardised requirements for effective and accurate measure of wheelchair driving skills (see Fig.1).

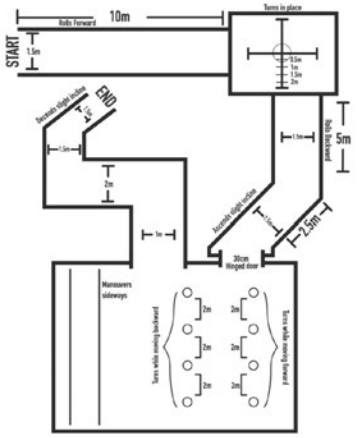

Figure 1: Blueprint of the wheelchair training terrain provided by the PhD student (client)

3 PROJECT DELIVERY

One of the PhD student supervisors is also on the supervision team for the FYP module. During the introductory lecture, the supervisor presented an overview of the PhD student's research, scope, and elaborated on the design requirements. The supervisor then welcomed any enquiries about the project, and students were told how to contact the supervisor if they were interested in undertaking the client brief. Students were informed that undertaking this project was entirely voluntary. However, considering that the research is planned to be published in a scientific journal, the student's contributions to the project would be duly acknowledged. Only one student approached the supervisor, expressing a keen interest in adopting this proposal as their final-year project.

The undergraduate student explained that while they had a clear vision of their desired focus (namely, 3D art), they struggled to formulate a concrete project proposal. They highlighted that the expansive freedom of choice offered by the FYP module's specifications was overwhelming. Consequently, when the opportunity presented itself, the student expressed that having a more defined scope with room for freedom to execute the designs as they saw best (while adhering to the client brief) was advantageous. Furthermore, the student commented that it was the first time they would need to consider the restrictions on developing 3D environments for VR, including the requisite graphics optimisation to ensure a safe and enjoyable experience. To which, the student highlighted that such an exciting challenge could add a valuable addition to their portfolio.

Aiming to kick off the project, the academic supervisor convened an initial meeting that included both the undergraduate and PhD students. During this meeting, the project objectives were reemphasised, and expectations were recapped. The students also discussed their respective deadlines and devised a collaborative plan that accommodated both sides. From that point onwards, each of the students continued to engage with the supervisor in their scheduled sessions (i.e., FYP tutorials for the undergraduate student and project supervision meetings for the PhD student). Whilst the students were encouraged to meet regularly on their own, they were also able to request a group meeting with the project supervisor whenever needed.

As a result, the undergraduate student successfully created two 3D environments; realistic (i.e., University building) and stylised (Sci-Fi) with gamified elements. The two environments were built using Autodesk Maya[2] and integrated into VR using Unity3D[3] game engine. Both environments adhered by the design specifications provided by the PhD student. Fig. 2 showcases the different angles of the training environments.

Figure 2: Stylised 3D environment with gamified elements (on the left) and their replica in the realistic 3D environment (on the right).

[2] https://www.autodesk.com/products/maya
[3] https://unity.com/

4 EVALUATION & CONCLUSIONS

The benefits of Client-Based Learning are well-recognised in the literature and in pedagogic practice. In Client-Based Learning, students benefit from improving their design thinking skills whilst interacting with industry professionals working on meaningful projects mirroring real-world problems. Students also learn how to interact with professionals who may not be design-literate, and therefore, students learn how to digest feedback and translate it into design decisions whilst strengthening their interpersonal and professional skills such as time management, resilience, and communication [10-12]. However, the practicality of delivering such a learning approach has proved challenging, specifically when it comes to management and coordination between clients and students [13], and the ability to source appropriate clients who are willing to spend time engaging with students [11]. Finally, client-based projects are not always easy to source, and due to the high expectations of clients, these projects are typically assigned to high-achieving students. As a result, facilitating client-based projects for an entire cohort of students, including those with varying academic abilities, can be quite challenging.

In this paper, we presented our alternative approach to addressing the challenges encountered when delivering Client-Based Learning pedagogy. We achieved this by engaging a PhD student to pose as a client for an undergraduate student under a project-based undergraduate module. This case study focused on a single project, serving as a pilot to assess the effectiveness and feasibility of this approach. Consequently, we draw on our experience to outline the benefits and drawbacks observed in our version of Client-Based Learning.

Right Amount of Scope & Freedom: When the undergraduate approached the supervisor, they commented on their feelings towards the FYP module specifications being somewhat overwhelming. The added pressure was due to the FYP being the largest piece of their student work and would account for a substantial piece of their portfolio for future job applications. As such, the student made several remarks on how the project brief provided them with the scope while also allowing for a great degree of creative freedom. Such freedom within the scope of the project may have also given the students a sense of shared ownership over the project, which may have a positive impact on students' engagement and sense of investment in the project.

Shared Motivation: Whilst the motives driving undergraduate engagement in the project, such as achieving high marks, enhancing their portfolio, and improving technical and professional skills, are understandable, industry-based clients may not always perceive direct benefits from such interactions. Consequently, they may lack the motivation to initiate or sustain engagement with students throughout the term. Interestingly, we observed that the PhD student had a mutual need for the outcomes of this collaboration (i.e., VR environments) for their research study, and as a result, they were equally committed to this collaboration. As such, both students maintained active communication through emails and face-to-face meetings. The fact that both students were studying on the same campus facilitated the arrangement of meetings as needed.

Understanding & Flexibility: having a “client” who was a student on a higher education level, yet still a student, came with its advantages. The PhD student, in contrast to some industry-based clients, had grounded expectations and a comprehensive understanding of the capabilities of the undergraduate student. Additionally, we noted that both students demonstrated a high degree of mutual understanding regarding their respective commitments and schedules. As such, collaboratively adjusted their timelines to accommodate each other's obligations, ensuring that deadlines were met efficiently.

Interaction & Communication Outside The Designer Circle: learning how to listen to feedback from those who are not necessarily design-literate and knowing how to digest such feedback and make design decisions accordingly is an important skill for designers. As such, we observed that even though the PhD students’ project was centred around VR, their understanding of the interaction and environment design was limited. Therefore, there were many instances during testing where the PhD student commented on technical issues using non-technical terms, to which, the undergraduate student had to understand what the PhD student meant, and react to their feedback by fixing these issues. Another example is in regards to interaction design; the PhD student had a limited understanding of how to communicate instructions within VR in an engaging manner. To which, the undergraduate student took full liberty to investigate the best approaches and produced suitable designs for this purpose.

Realistic & Close-to-Industry Experience: Beyond the project brief, scope, and timeline closely mirroring those typically provided by industry-based clients, this approach replicated various aspects of a realistic and industry-like project experience. Notably, the undergraduate student underwent multiple iterations of certain 3D assets before they met the standards set by the PhD student acting as the client, mirroring the iterative workflow often seen in the industry. While the undergraduate student may have

created appealing 3D assets, a number of them ultimately did not find a place in the final VR training system, a situation that closely parallels industry scenarios where work may not always be utilisd as initially intended. This process may help students acclimate to such occurrences without becoming disheartened by their diligent efforts. Furthermore, unlike students working on personal passion projects who enjoy complete creative freedom, this undergraduate student had to align their priorities with the client's objectives, a crucial mindset to cultivate when preparing for a career in the industry.

Drawbacks & Considerations: There are several drawbacks and limitations to the proposed approach that must be considered. First, opting for a PhD student as a client instead of a real industry-based client may result in students missing out on valuable opportunities to network and establish connections within their chosen field, which could be essential for future career prospects. Additionally, the limited interest expressed by only one undergraduate student in joining this client-based learning project suggests that some students may not have perceived the value of this collaboration, especially when considering that the project did not offer any financial incentives. It is also crucial to acknowledge the limitations in the availability and suitability of PhD students' projects as well. In this context, the timing and the scale of the PhD project must align effectively with the requirements of a final-year project. These considerations are vital in assessing the overall viability of this approach.

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