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A Case Study of Game-Based Learning in Interior Design Studios

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Abstract

The purpose of this paper is to understand perceptions of interior design students after using game-based learning (GBL) as an approach to address workload distribution, lack of clear assessment criteria, and deficiencies of the master-apprentice model during the process of solving several small-scale design problems along the course of a semester. A literature review of the instructional issues in design studios is presented along with an overview of the activity systems theory as an underpinning theoretical perspective. This research paper explains the research design behind the case study methodology used to perform data collection, analysis measures and organize coding schemes. Findings from the study conclude that GBL fits into the iterative and experimental nature of the design process, helps students focus on the design process through trial and error without a significant risk, changes the studio's feedback structure, and allows students to track their progress while having creative freedom. This paper provides empirical evidence supporting the existence of instructional issues in traditional design studios, provides considerations for using GBL to address these issues, and suggests directions for future research studies in fields of instructional technology, design pedagogy and higher education policy.

Keywords

game-based learning, design education, studio pedagogy, studio issues, technology, case study

Introduction

Interior design educational studios are environments for active learning and experimentation. However, they have been generally criticized for shortcomings in basic pedagogy. This qualitative case study attempts to understand the perceptions of six undergraduate interior design students about using game-based learning (GBL) in a 16-week long design media and presentation studio. This paper focuses on explaining the research design, data collection, analysis methods and coding procedures, and limitations. It finally delves into findings and GBL implementation considerations through referring to participant quotes. This case study attempts to answer the following research questions:

- How do interior design students perceive GBL as an approach to address workload distribution, lack of clear assessment criteria, and deficiencies of the master-apprentice model?
- How do the perceptions of these students confirm general affordances of GBL within interior design studios?

Literature Review

Issues in Traditional Studios

The design process within the design studio dictates the sequence traditionally practiced by design educators (Broadfoot & Bennett, 2003; Kuhn, 2001). Students tackle open-ended, ill-structured problems usually presented as project descriptions. The number of projects students complete within each studio differs greatly depending on their academic year and studio topic. Entry level and drawing media studios usually include 2-4 short projects, 2-4 weeks long each. Advanced level studios usually include 1-2 large projects, 6-10 weeks long each (Al-Qawasmi, 2005; Chui, 2010; Ham & Schnabel, 2011). However, this traditional format has been criticized for issues with student workload distribution, deficiencies with the master-apprentice model, and the unclarity of assessment measures used to evaluate student work. Student workload distribution has been questioned in design studios due to amount of time allocated for the studio sessions within the curriculum (Smith, 2015). Confining students to perform their design thinking and acts of creativity within the studio's space and time proved ineffective (Kuhn, 2001). The misalignment between time allotted for studio sessions and the workload distribution expected from students is obvious according to recent studies (Belluigi, 2016; Dorta, Kinayoglu, & Boudhraâ, 2016; Ku, 2016; Smith, 2015).

Using the master-apprentice model places pressure on instructors to attend to all students individually (Collins & Kapur, 2014). This may encourage a sense of *following* of the instructor, and misinform the educational process when instructors try to conceal the design procedure to arrive at final solutions or products (Glasser, 2000; Yurtkuran & Taneli, 2013).

Creativity in design studios is important for it nurtures innovation and individuality among students. However, traditional design studios view creativity as the only important skills to cultivate and gains exaggerated emphasis compared to other aspects of the learning experience in design studios (Gross & Do, 1997). This increases subjectivity in evaluating student work, and makes grades an incomprehensive measure of work quality (Smith, 2013, 2015).

Theoretical Perspective: Activity System Theory

The design studio, as a learning environment, can adapt to several theoretical perspectives. For this study, I used the activity systems theory developed by Engestrom to analyze the studio environment into identified yet integrated entities; participants, a sense of community, and a set of engaging activities (Engestrom, 2000). The design of the GBL studio was also based on the activity system theory. The activity system comes to life within the studio when participants are involved in tasks that facilitate prior knowledge and experiences. Participants in the design studio are active contributors to and creators of knowledge, content, context, and perceptions.

The activities can be categorized into those requiring physical skills such as construction and artistic expression, and those requiring cognitive skills such as communication and inquiry (Dewey, 1915). Figure 1 illustrates GBL as a pedagogical approach that can provide a structuring framework for these activities while increasing students' engagement, extending lines of communication, and enhancing decision-making processes.

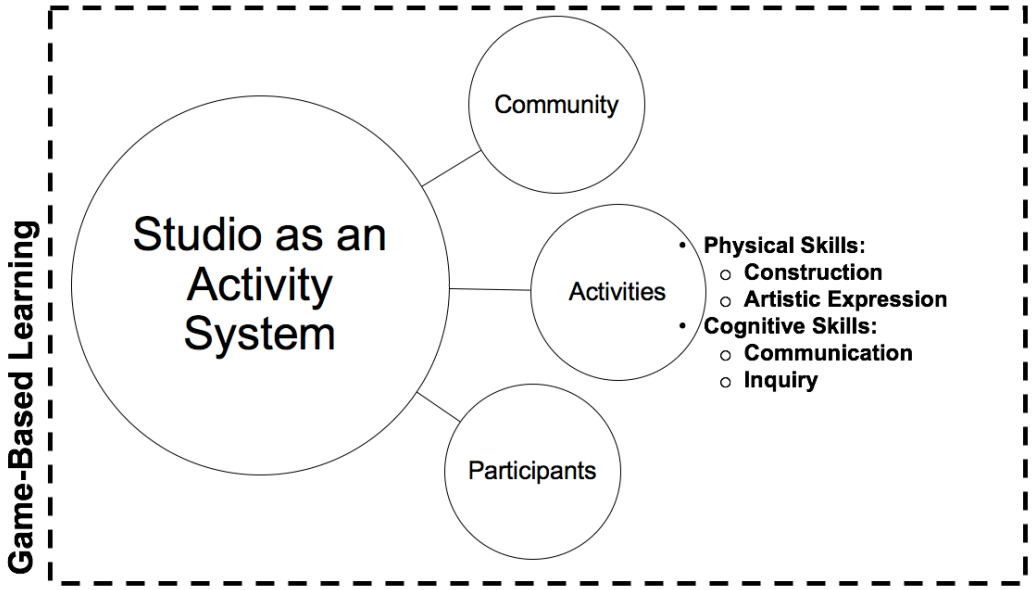

Figure 1: Game-based learning approaches as a framework for the studio's activity system.

Affordances of GBL

This case study adopted Karl Kapp's definition of GBL where game-like elements and attributes are used in a meaningful manner to design a course in game-like structure to promote learning and engagement (Kapp, 2012). GBL has been found to; cultivate better learning attitudes, increase student motivation, nurture higher-order thinking and decision-making processes, situate and authenticate the learning experience, and help achieve better learning outcomes (Kapp, 2012; Nelson & Annetta, 2016; Perrotta,

Featherstone, Aston, & Houghton, 2013). This study used GBL approaches to establish a structure for the activity system within the design studio. Elements and attributes of GBL increase student engagement and nurture skills acquisition through structuring the studios tasks and actions.

Gee (2004) suggested that GBL is built upon several learning principles; some of which can address instructional issues pertaining to traditional design studios. In both GBL and traditional studio settings, learning is situated in practicing knowledge. The experiential nature of learning in these environments reduces stress associated with fear of failure when trying new approaches. The iterative learning process in GBL environments is like the learning cycle in design studios. The nonlinearity of the design process is like the multiple problem-solving routes available in GBL. Finally, the learning experience in both environments is based within the learner, the learning environment, and the community of learners.

Current research and applications on GBL are very well developed in the K-12 sector (Denham, Mayben, & Boman, 2016). The higher education sector has witnessed successful and insightful applications and research studies as well (Brown, Comunale, Wigdahl, & Urdaneta-Hartmann, 2018). However, most of these applications have been in disciplines other than design, in general, and none of these applications were in relation to studio environments or the field of interior design specifically. This study aims to investigate the application of GBL in a discipline that is more connected to design studios as they manifest specifically in interior design and generally in fields such as architecture, landscape architecture, urban planning, or graphic design.

Overview of Research Design

A case study methodology was adopted to study how six undergraduate interior design students use and perceive GBL as a supplemental approach to solve design problems in a studio. The design of this case study was based on the activity systems theory in that the techniques used to collect and analyze data were considered the tools of the study. The Instructor/ PI, the learners and the GBL system were playing the role of the subjects or actors, while the themes and assertions were considered the objects/ motives of the study. The participants/ learners and their belonging to an interior design program formed the community component. The rules of engaging in the study were voluntary participation, along with individual 3-hour commitment from each learner/ participant. Finally, the divisions of labor were the hierarchy of the studio environment, and the responsibilities held by the study's subjects. Figure 2 illustrates how Engstrom's representation of a collective activity system informed the research design of this case study.

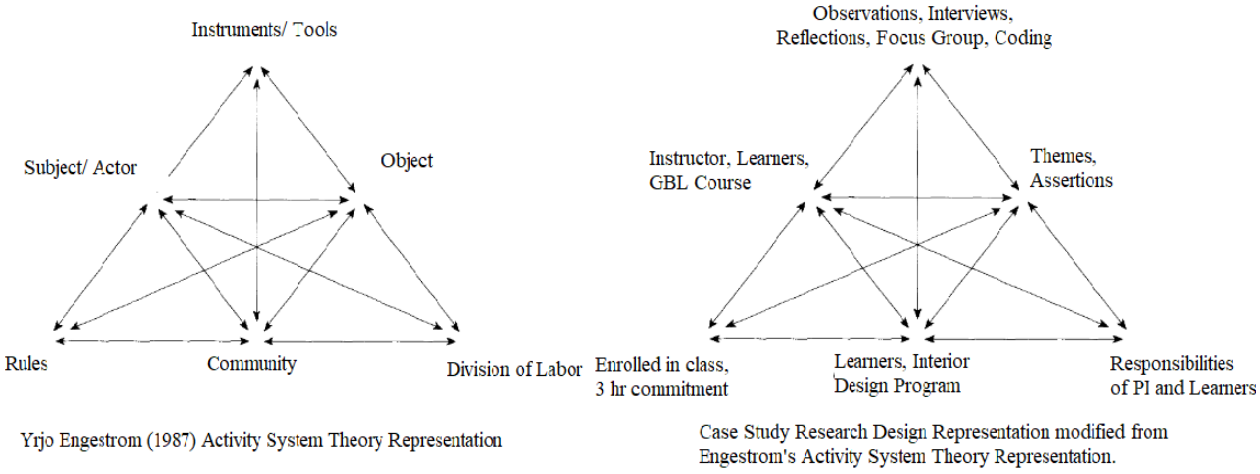

Figure 2: Representation of both the original Activity theory figure developed by Engestrom (1987) and a modified version depicting the research design of the GBL case study.

The students used a GBL approach the instructor (Principal Investigator) designed to navigate the design process in several small projects. The course I designed for this study was based on the experiential learning theory model (Kolb, 2014) to align instructional design practices with game-based learning elements and attributes, while keeping with the spirit of the design studio structure.

The course was a 3-credit hour studio addressing the application of various media techniques for the presentation of interior design projects. The course met twice a week for 3 hours. The course used a GBL pedagogy and was designed as a game structure. Students were introduced to four challenges; each challenge had an assigned list of in-class quests and Homequests. In-class quests were timed activities and needed to be completed during the studio, while Homequests were activities that should be completed outside of the studio. In-class quests were designed to help students progress through the course without leaving too much work to do outside of class time.

The instructor observed and took notes of participants while working through design problems. Each participant was interviewed individually to reflect upon and clarify his or her experiences using the GBL approach. Interview questions focused on understanding perceptions of GBL as an approach to address workload distribution, assessment ambiguity, and master-apprentice model deficiencies. The focus group session debriefed participants to provide insights on improvements needed to enhance the proposed GBL studio and how their perceptions confirm general affordances of GBL within interior design studios.

It is worthy to note that the researcher is also the instructor of the course used in the case study. As a researcher, I have my biases in terms of the findings I expect from the study and I need to be clear in differentiating what I would like the data to convey versus what it

truly does convey. As an interior designer, I have biases in terms of my design style and approach. I tend to use inductive logic when thinking about design solutions, where I start from the specifics of the problem statement and progress systematically to the general and overall solution. And as an interior design educator, I have biases in terms of what I view as appropriate or correct design processes.

Unit of Study

Bridging the case study methodology with the Activity System's theory is manifested through using the participants "Activity" as the unit of analysis for this study. The activities that the participants engaged in can be categorized into:

- Developing design solutions for the projects on hand using the tools provided as individuals and as a community of learners.
- Employing the reward system of the game-based learning studio to encourage task completion in and outside of class
- Enabling their flexibility to take on a variety of learning roles

Sample and Demographics

The study used criterion and convenience sampling (Bloomberg & Volpe, 2015) to recruit six undergraduate interior design students at a public University enrolled in an interior design studio. The instructor introduced the study using brief explanatory leaflets. Students' questions about participation were answered prior to joining the study. The main criteria used for recruiting the participants were their willingness to participate in the study, their enrollment in a junior level studio, and their time commitment of 3 hours for individual interviewing and focus group session. Proper Institutional Review Board (IRB) consent forms were ndistributed to all students in the class; those willing and interested in participation signed and returned the forms. The study lasted for the duration of the fall semester where students and the instructor met 3 hours twice a week at a dedicated studio space within the university campus. The demographics of the participants can be summarized in Table 1.

Table 1

Sample demographics data

Demographic	Category and Percentage			
Age	20	21	22	23
	16.66%	16.66%	50%	16.66%
Race	White		African American	
	67%		33%	
Program Year	Junior		Senior	
	83%		17%	
Gender	Female		Male	
	83%		17%	

Data collection

Data was collected using observations, interviews, written artefacts, and a focus group session. Observations were used to document participants' progress through the design activity. During the working sessions, the instructor collected observation notes in a digital format and reflected on each session as soon as it ended. Notes were also taken of student's comments, feedback and nuances that occurred during the weekly studio sessions. Weekly reflections were collected from students and used to inform interview questions. During the semester, semi-structured 30-minute individual in-depth interviews were conducted with the participants to illuminate the notes made during the observations. Interviews were recorded using two electronic devices to ensure having multiple recordings. Minimal notes were taken while conducting the interview to ensure maintaining rapport with the participants. In the focus group session, participants discussed their perceptions during various design stages. The focus group helped participants brainstorm about ways to improve the GBL pedagogy in interior design studios.

Data Analysis

The analysis took a progressive focusing approach (Parlett & Hamilton, 1972). Observation notes and weekly student reflections were continuously analyzed to inform interview questions. In-depth interviews were then transcribed and analyzed to inform focus group

questions. The analysis structure was open to change and enhancement as the study continued. The progressive focusing approach allowed principal investigator to interact with the data as it was collected, and helped re-focus and refine data collection continuously.

Attribute coding was used to help organize the data. Codes were organized and connected to data formats. Data was coded per participant and identified with their corresponding interview session number and date, focus group comments, and weekly reflective writing document. Structural coding was later used to organize participant responses for each interview question, and then relate them to answering the main research questions. This coding method allowed for quick access to data that was relevant to a particular analysis from the larger data set (Namey, Guest, Thairu, & Johnson, 2008). In-vivo coding was also used for interview and focus group transcriptions (Saldana, 2015).

Finally, the data was comprehensively reviewed using pattern and focused coding to produce themes and assertions that inform and address research questions. Making sense and meaning of data took place during the theming stage, where codes were synthesized to formulate categories, then themes that were later used to create assertions. These assertions eventually addressed the main research questions of the study. The results of data analysis lead to a broad interpretation to illuminate the unique case of GBL in interior design studios. Also, the findings discussed lessons learned to inform the development and enhancement of the proposed GBL pedagogical approach.

Findings and Discussion

After analyzing the data, codes were organized using thematic analysis. The thematic analysis approach was found suitable for this study because it helped align the data with the two main research questions. The flexibility and independence of this approach helped uncover patterns among the study's units of analysis, and allowed the development of latent themes beyond what the data merely showed at the semantic level. Braun & Clarke's (2006) 6-step framework was followed to arrive at five major themes. The first three inform the study's first research question. The last two themes address the second research question, provide supporting evidence of GBL affordances in interior design studios, and reiterate student reported issues in traditional design studios.

Theme 1: GBL Addressing Workload Distribution

This theme condensed information from five code categories addressing the students' design thinking process, progress and motivation, and how GBL impacted their time management.

During the interviews and the focus group session, students noted how they see the design process during the game-based studio as an iterative process. In their reflection papers,

they described their design thinking in a continuum between trying and struggling, to rearranging their solutions and drawing from external inspirational resources:

> "I have been struggling trying to figure out what all to put on my board. I have literally rearranged my board layout at least ten times and I am still not happy with it."

> "I started with sketches related to that and draw on some inspiration …. change my direction and go with a theme that suited my project better."

Students also noted that within the game-based studio, they had the chance to think deeper and earlier about their projects. One student focused on how the GBL approach allowed her to focus on the design process and take risks with her creativity because she was "not trying to do it to get it correct, like I'm just doing it to like experiment, see what works".

Students noted that using GBL reduced their tendency to procrastinate. The in-class and home quests kept students flowing through the projects. Staying on task became easier given they had activities due every class. The continuous, consistent, weekly checkpoints obligated students to complete their activities on time and not get behind:

> "I found myself doing, staying on task a lot more and not like just waiting to the weekend to do it."

> "I liked how you had different aspects due one at a time, that way we could stay on track and work on one and that way it's not cramming it all at the end trying to finish. We had to stay on top of it."

The GBL approach also influenced the structure of the design process. Students commented on how they found the defined structure of each project useful along with the corresponding due dates to individual activities. They also enjoyed having creative freedom, despite the structured nature of the course:

> "My favorite part about this course compared to other classes is that you did not force us to do anything we didn't like. I liked having creative freedom to do what I wanted for a change."

> "I did like that our projects had structures and due dates, and I felt they were more open ended…. with this course I was able to see my own design develop"

Students found that the timeline used for the course aligned well with the design process. All the course activities and elements worked together to guide students throughout the different projects in a gradual manner. Using tutorial demonstrations or a short lecture before working on activities in each class introduced students to what was expected. The Homequests connected the class meetings between different weeks and gave students the chance to apply knowledge on their own time.

> "we go like step by step instead of just saying like design is a whole-time thing"

> "I think like the way you had the time, I'd say what we had to do our research first and we had that week to get that in. Then do our selections next and that first week was focused on the research it wasn't focused on doing selections"

When students were asked if GBL impacted their time management during the studio, two did not see it as impactful. One viewed the checkpoints as regular due dates, the quests as traditional assignments, and the rewards as their traditional grades.

> "because when you are in college you are just like, you are like okay that's a due date got to do it then. I didn't necessarily look at it like any other way if that makes. I just did it, that didn't affect it I don't think. I don't think it affected my time management. Because versus a normal thing, it would have just been like basically the same thing just not worded that way"

The second student focused on how GBL was not efficient for him as a full-time employee, where his busy work and school schedule kept him from keeping up with the required checkpoints, quests, and achieving the rewards:

> "The approach maybe didn't work so much for me personally. If I was more a traditional college student who didn't really have to work because I had help from my parents to pay for all my bills and everything, then yeah, I'd be. As a less traditional college student, it was a little more challenging to keep up with."

The other four students thought that GBL made the studio easy going and not as stressful. It allowed them to stay ahead of schedule by becoming more conscious of how they spend their time in studio. They became more patient with their design thinking, managed their effort and time, and could gradually perfect the design process and product.

> "I have been ahead of schedule. I worked almost every day on my Moroccan board and it allowed to me to be pretty stress free."

> "I became more conscious of my time and what I needed to spend my time doing to finish the project."

> "I think this project will come out neat. I don't want it to look rushed so I want to perfect it and do my best in the given time."

> "I don't feel as rushed, and that has to do with check points, and incentives for meeting those check points. It's helping me be more disciplined, and not push it off to the weekend."

Theme 2: Achievements and Rewards

Students used a variety of mechanisms to track their performance and achievement throughout the studio. They also used these tools to receive feedback about their performance without needing to meet face-to-face with the instructor or waiting till midterms to know how well they are doing. Students used a combination of tools related

to GBL, and others inherent within the learning management system to facilitate the course.

Leaderboard.

Students used the Leaderboard tool to view their ranking among the rest of the class (Figure 3). They found the leaderboard useful because it provided anonymous and indirect feedback on their performance in the class relevant to other students. They also found it motivating for them to try and improve their performance within individual areas of the course. Each category was in a separate column. Therefore, it provided another view of the performance in addition to the overall course score available via the learning management system.

> "I definitely look at [Leaderboard]. I think it's very helpful. So, if I'm in 5th place, I need to put a little fire and get it together. I look at that before I actually look at like the grades."

> "my favorite is the [Leaderboard], I can see where I am in relation to other people."

ID	Total Points	Total Percentage	Rank/ Place	Attendance	In Class Quests	HomeQuests	Challenge 1	Challenge 2
14400	613.5	61.35%	1	0	58.8	51.8	190.5	132
48364	412.7	41.27%	8	-10	41.8	27.5	91	141
50426	519.2	51.92%	7	-15	50.45	51.7	156.25	103
95932	602.4	60.24%	4	-10	57.6	47.8	180	134
04072	588.65	58.87%	5	-5	60.85	27.8	173	141
08110	611.75	61.18%	3	0	57.75	34.5	195.5	126
14720	612.3	61.23%	2	-15	58.7	59	191	136
32317	571.1	57.11%	6	-10	58.3	56	141	139

Figure 3: Leaderboard tool developed using Microsoft Excel and imbedded within the learning management system

Badges.

The course used digital badges to reward and incentivize students (Figure 4). Students had mixed feedback about badges in the course. Although they thought the badges added an enjoyable element to the course, they could not see the necessity or value behind them in terms of evaluating performance in the course. Using the badges as merely virtual rewards was not a strong enough reason for employing them as an achievement tracking mechanism:

"I like them though! I am a very competitive person and I want to win at everything. But I really like the leaderboard. I made a point to check it all the time."

"I think the badges they are fun. They don't necessarily make me work more. But, they are fun to see."

Figure 4: Digital badges used in the course to reward students work.

Rubrics.

Students were provided with rubrics to have a clear idea of the criteria used to evaluate their work. They mentioned using rubrics to identify how many points each activity was worth, what areas to focus in the project, to understand project expectations, and to provide self-review on their work.

> "The rubric [was]useful, because if something is worth 20 points, and then something is worth 5 point, you know what to focus on more."
>
> "I love rubrics because I can know before I start what you're looking for. Where my points are coming from, you know, within their there is a lot of points and you know I really focus on that."

My Grades.

This is a tool is inherent within the learning management system used for the course (Figure 5). Students used "My Grades" to know how many points they achieved or missed for each individual activity. It also allows them to view all their graded activities in one page and displays the status of grading for each item (in progress, graded). It finally allows them to view comments and feedback the instructor documented on their work.

> "I just always check my grades, because I'll be like why do I have a zero in this grade? What did I not do? Or, just kind of keeps you updated."
>
> "I check my grades on blackboard because you've just seen exactly what you made."

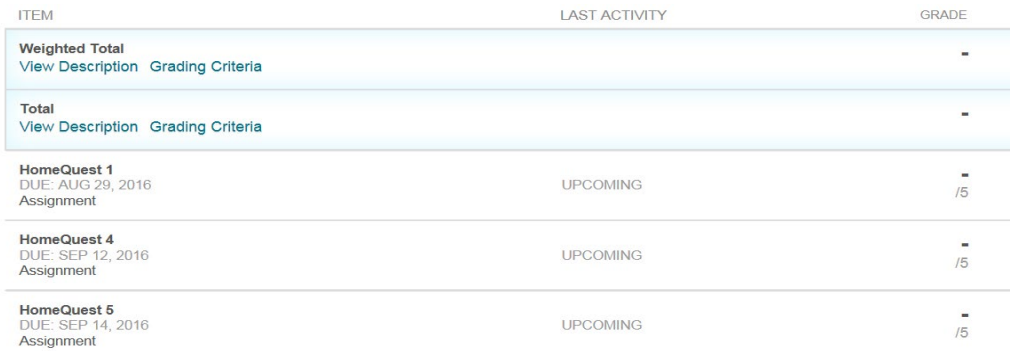

Figure 5: My Grades tool in Blackboard Learn displaying quests and respective points.

Calendar and timeline.

Although this is not a tool that was intentionally designed or used to track students' achievement in the course, some students mentioned using the calendar to track weekly

studio activities and their corresponding due dates. One student explained how using both the calendar and the timeline helped her:

> "The tool that I use to keep up with stuff in class is "Calendar" in Blackboard. I go to calendar and it shows what's due that day. I have my planner and I'll write on each day what's due that day and then at the bottom write what I should work on that day to be where I am supposed to be. So every day I'll get done what I have on there and look at it. I'll plan it for like the whole week and if I stick to that like I'll be done with everything on time and that way I don't stress myself."

Theme 3: Learning Roles

Within the game-based studio environment, the roles adopted by students and instructors change to better suit the learning experience on hand. The learners' role developed and adapted through several phases during the 16-week period of the semester. At the beginning of the semester, students discussed how they felt skeptical about the GBL approach and towards trying to immerse themselves into the experience.

> "At first my role was like a deer in headlights. I felt lost and like I don't know where I am going with this."

> "a lot of us at first were hesitant on how we felt about it because it was just kind of a new structure."

Towards the end of the semester, students found themselves more encouraged to take initiative in their learning. They felt that they can be responsible for searching for answers to their questions, encouraged to leave the comfort zone to try new ways of learning, and be less critical of their unfamiliarity with the new knowledge they are gaining:

> "when we got to Sketch Up towards the end of the semester I think I have progressed in that way in taking it upon myself more."

> "once we actually started putting our foot in I felt I need to change my role and be responsible for figuring out how things work. I felt my role was to take initiative and search for answers to my questions. I am not going to always have someone beside me to answer my questions."

When reflecting on how their roles changes as students during the focus group session and the individual interviews, students shared some ways that they could have done things differently during the course to improve their learning experience. One student mentioned that she should have taken more notes or recorded the lectures and demonstrations in class. Another student discussed how she would have liked to increase her effort and improve her work quality. Finally, one other student wished she was more open and embracing of the different way of learning introduced in the class.

> "I actually wish I would have taken more notes than I did to utilize it. I felt like I should have recorded the lectures and stuff, especially for Photoshop."

> "I wish I would have paid attention from the beginning of what the overall project was going to be."

> "Be a little more open minded to it because even though it was new and I was trying to learn it …. I didn't like push myself at the beginning"

Students also shared how they viewed the instructor's role during the game-based studio, and how it changed depending on the nature of the project on hand. The role of the instructor was within a continuum between being hands-on and hand-off. Students explained that when they needed step-by-step and detailed guidance through their projects, they found the instructor involved within their learning experience. They focused on how the instructor goes around the studio space, shows them techniques through in class demonstration, checks on their work, and keeps students on track by reminding of important due dates, checkpoints, and explaining intricacies of the GBL approach:

> "in the beginning I felt like it was more, more hands-on"

> "I feel the instructors really involved … like whenever we're doing rending like showing those techniques and working around and making sure we understand what we're doing."

> "when we watched instructor on the computer and just followed along. That is probably just the best way for us when we are going through the learning process. It's just doing there, hands on where we can ask questions and be able to work things out while we are there in class."

On the other end of the continuum, students found the instructor to be more hands off. They explained that they appreciated having time and space to think through problems in class while the instructor is there for them when needed. One student discussed how she found the instructor to be "not the traditional teacher… not just talking at us all the time." She referred to the instructor as a "tool" that students can employ to facilitate their learning.

> "[the instructor] was hands off for the most part so we can have work days in class which I really do appreciate because if I am working on something at home and I get stuck, I put it away and procrastinate and then I am behind. But in class I liked having her there to help us along the way."

> "I guess it's a more hands-off approach for me, I like that instructor's around to definitely give us instructions. I don't feel like I'm doing this blindly, but at the same time, I don't feel like instructor's hovering over me. Just there like as a tool but not necessarily."

Theme 4: Affordances of GBL in Design Studios

This theme summarizes categories of codes that represent the affordances of using GBL within interior design studios. Per the data collected from students, GBL helped provide opportunities for authentic learning, prior knowledge facilitation, and social interactions. Students found that GBL immerses them in an environment of experiential learning; where they learn through experimenting with a variety of design strategies and communication methods.

> "it's actually refreshing that we actually learn something this semester that we can actually apply in our field"
>
> "even though this is a game. I feel I could apply it more to a different world of experience because it's more there's deadlines and checkpoints to get through them. So I think that gets more applicable to the real world."
>
> "structured on how it's going to be in real life when you have couple of days to put materials together when you have a client walk in. I think it helped to give it a better structure that is more realistic and how to get it out in the field. Based on my experience while working at furniture marketing."

Within their weekly reflections, students discussed how the challenges within the studio facilitated prior knowledge from previous semesters. In-class quests and Homequests helped familiarize students with several skills they had forgotten. The quests within each challenge also helped them overcome their fear of previous failing attempts, and guided them to complete the activities of the studio:

> "Doing this project has helped me a lot with remembering how to do things in that we did last year in another class"
>
> "I learned a little bit last year when we were doing it for our residential class but it has been so long that I already forgot so much. I'm glad we worked through some of the exercises in class together because I would have been so lost."

Students in this cohort have described themselves as being called the "quiet group" among other students in the program. Their social interactions were minimal at the beginning of the semester, and almost no interactions took place that are related to their work in the studio. During the interviews and the within their weekly reflections, students discussed how they see their social group dynamics changing in the class. Their attendance at the senior's cohort presentation was built into the GBL studio as an opportunity for authentic learning. Observations of the class showed that the participants started talking more amongst themselves and discussed as a group their thoughts for their project's final presentation. The students' in class collaboration helped address their questions faster than waiting in turn for a one-to-one consultation with the instructor:

> "I'm also glad that we got take a break from all the classwork one day and see what the seniors were up to. Seeing their projects also got me to thinking about my wedding project and how I wanted it to turn out."

During the focus group session, students also discussed how they have started to feel like a family within the class. They mentioned feeling responsible towards keeping each other updated about classes and becoming more comfortable about asking each other for help outside and inside the class.

> "I think this semester we got more comfortable with each other and our social interaction increased significantly compared to prior semesters."

Interestingly, one student explained that the social bond that has been developed among her cohort is of more importance to her than the quality of the education she receives at the program. She further discussed that the social collaboration and interaction among students in her cohort makes up for what is missed in class:

> "the social aspect of the program is more important than the gaps that have been in some of the courses, because of newer instructors. Yeah, because I feel like even if you don't get it from the teachers, whereas this classmate might understand it better, and can teach you like helped you."

Students also focused during their interviews on how GBL has been part of student conversations outside and inside of class. GBL became another way for students to update each other on important due dates, and collaborate to help one another compete in a friendly manner without compromising their relationship as individuals or their quality of work:

> "I mean we were all intrigued about it. their badges and stuff they get like whenever somebody goes on and checks a badge it's like, "Oh! I got a little badge." We get to be silly over this little badge we've gotten and it's a little fun."

> "even though the projects are individual like we're all doing the same thing and so, it like kind of promotes collaboration to an extent or like a discussion of our ideas, and I think that that has something to do with GBL. Because we're all directly competing against one another but like in a friendly manner."

Theme 5: Traditional Studios

This theme discusses two categories of codes related to traditional design studios including affordances and issues. The affordances of design studios in general are concerned with the Uniqueness of the educational setting when compared to traditional lecture format classes. Students explained how they prefer the studio format over traditional lecture format classes for a variety of reasons; the nature of hands-on work that is usually required in a studio setting, the small size of classes, the lack of formality in the program, and the strong relationship between students and instructors.

> "I like design studios better than the courses because it's hands on"

> "a positive is how laid back it is here. you can come and go as you need it's like a little, your own little house. You are close to the teachers because you have such a small group too, I love it so much."

> "you don't feel uneasy about anything. You don't feel weird about asking the questions, or calling or texting you, emailing you at any time trying to figure stuff out. I feel like other majors that's not the case"

Students also discussed their experiences with previous studios and the type of issues they usually face. The first issue that seemed to receive consensus among the participants was lack of creative freedom. Students shared that in design studios, they do not usually have the freedom to change thinking direction or design theme as the project progresses. They

are also obliged to include very specific and standardizing details within the project to a degree where they feel detached from their own designs:

> "I feel in other classes we are obliged to include very specific things which makes me feel the design is not really mine."

A second issue that students face in design studios is the lack of clear instructions on how to move through projects. Students mentioned that they usually get told what to do, without any guidance on how to arrive at suitable solutions, and without consistent feedback for them to know if the solutions they arrived at are correct or acceptable.

> "other times we had projects… So, it was like, "Okay this what our project is, start thinking about your materials and then we'll work on a project as we go along."

> "In other courses I feel like design is a whole-time thing, and not really a process"

> "some of our courses they just, they [say] do this and don't necessarily help you or check on your progress."

Another issue that students discussed, and is more specific to their program, is the frequency of changing instructors. Due to the small size of the program, students are not provided with several full-time faculty. Instead, the program depends on part-time or adjunct faculty that deliver courses based on availability and need. This has impacted the participants view and experience of their design education journey. The lack of permanent faculty members made students feel less of a priority, shook their confidence in the education they receive, and caused them to question their ability to learn.

The last issue students discussed with regards to design studios is time management and workload distribution. Students shared that although the studio sessions are long, they see it as a chance for instructors to ask and expect more work, and therefore increase the expected homework hours. Students tend to feel rushed in studios with majority of the work to be done outside studios hours. Hence, the learning process remains not very detailed and causes students to focus on just completing the assignment regardless of the quality or thinking processes behind the activities:

> "our program's homework hours are exponentially greater than college of business, journalism any of those."

> "at the studio, the time period is long, it's almost like a 3-hour class, I still feel like there's so much to learn in that time."

Conclusions

The experiential aspect of GBL matches the iterative and experimental nature of the design process. GBL helps student focus on the design process by allowing them time and room to think, explore, fail, and succeed without a significant risk of penalty. This impacts the feedback nature adopted within the studio environment. Clear expectations for the multiple formative feedback sessions throughout the semester allow students to remain

on track with the projects, while having creative freedom to explore ideas without fear of failure.

The GBL approach did not only impact how students thought about their projects, but also how they progressed throughout the design process. Providing students with tools to succeed is only one part of the equation. Students should also invest time and effort into using these tools to achieve the expected learning outcomes by the specified checkpoints and be immersed in the learning experience.

With learning styles and preferences, it is important to use multiple ways for students to track their performance and to be able to review feedback when they need it. This is particularly important when implementing GBL in higher level studios, where students work on one large project during the semester. GBL can be used to establish continuous performance feedback loops. Students can have a chance to improve their performance instead of waiting for major project critiques where risk and fear of failure is higher.

Changing roles in GBL studios is another important consideration. While this may put both the instructor and the students outside of their comfort zone, it encourages them to adapt to rapidly changing situations which is a skill highly recognized in professional careers.

GBL in interior design studios can be implemented to enhance several aspects of the studio community and instruction. This study showed that GBL helped students see realistic application of interior design knowledge and theory. GBL mimicked schedules and deadlines expected in the field, activated knowledge gained in previous courses, and increased student interaction during and outside of the class time.

Finally, students confirmed the instructional problems in design studios that are the focus of the study, including the imbalance between workload distribution and time management the high dependency on the master apprentice model, and the lack of clear guidance on expectations and progress of the design process.

With the shift in design studio pedagogy towards using digital technological advancements in the process and product of design, the application of innovative learning technologies within educational settings cannot be overlooked. The 2019 Innovating Pedagogy Report from the Open University places “Playful Learning” as the top pedagogical trend that is in substantial formation and will continue to be for the foreseeable future (Ferguson et al., 2019). In addition, the report specifically identifies a need for more evidence on approaches that can guide learners through their playful exploration. The findings of this case study can be used as a starting point to build up the complexity of learning support system for learners and educators. This case study used a digital learning management system, whereas there is a plethora of opportunities for designing and developing game-based learning environments for a variety of disciplines and creative interests.

Limitations and Future Directions

The restricted sample size and sampling method contributed to narrowing the study's focus and reducing its transferability. As for methods of data collection, observations may hinder participants from acting naturally. The instructor took notes at the instructor's podium periodically during class time instead of at students' desks. The focus group brought on several limitations. Some participants' opinions were overpowering others or altering the discussion's path. All participants were addressed for each question, and responses were prompted when changes in body language happened (i.e. Nodding). Participants were required to identify themselves with a number and to say the number out loud before answering any questions. When a participant forgot to mention their number, a note was made next to the question with that participant's number and time. This smoothed the transcription process.

Several future research studies could be developed based on this case study. The limitations that the learning management system used in the study caused can be addressed in several ways. Future studies might delve into exploring GBL in design studios using different management systems or independent game structures.

This case study shed light on a small number of participants without comparing between traditional and game-based studios. It would be interesting to collect evidence on both learning environments by conducting a comparative case study, where student perceptions about GBL in one design studio can be compared to their perceptions in a traditional design studio.

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