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GAME DESIGN STUDIES: THROUGH THE EDUCATIONAL PRISM

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Abstract: *One of the most challenging and maybe most important tasks of working as a professor and instructor is creating a purposeful and engaging curriculum program. To convey the right theoretical information and practical knowledge, professors go through an iterative process of learning through self-education, teaching, correcting, and adjusting their teaching approach. One must embark on the journey of self-discovery, proper communication, and willingness to change and adapt the curriculum to meet the requirements of industry standards, students, and technology. This paper aims to give insight into the iterative process of creating a curriculum program and practical tasks for students in the third year of Graphic Engineering and Design studies on the subject of Computer Games. Also, the process of transferring skills, acquired by working as an instructor for Unreal Engine and Unreal Editor for Fortnite and collaborating with the game designers, in the classroom will be discussed. As a result of this paper, some guidelines for designing curriculum programs for teaching game design and game development are proposed.*

Key words: video games, education, curriculum program

1. INTRODUCTION

To most, games are often observed as activities meant to enrich leisure time; something that is done to relax by themselves or in the company of others. By playing games players are provided with a sense of advancement and fulfilment by following specific rules and overcoming obstacles. If the educational system is observed in a similar way to games, one can find oneself in the gamified world of education, either as a student or as a professor. Students follow a specific set of rules and overcome different obstacles to acquire the skills and knowledge necessary to cope with the future challenges of the real world. On the other hand, educators are in the role of "game designers" who tailor their "mini-systems" to be similar to games or even include different types of games for a better understanding of the curriculum and at the same time provide better engagement.

When it comes to game design and game development for education there are different approaches in the research community. The report from MIT's Education Arcade (Klopfer, Osterweil & Salen, 2009) stated that researchers who advocate for game-based learning tend to adopt one of two very different approaches to designing games for formal education. The first approach is to use commercial games (e.g., World of Warcraft and Civilization) in education. The second one generally avoids commercial games and focuses on educational games that help supplement traditional academic subjects. The two approaches mentioned above tend to be more instructional in the way that teachers want to have a finished, downloadable teaching product as the party responsible for teaching the child.

Kafai and Burke (2015) adopted and wrote about the constructivist approach to using games in education. Contrary to instructional approaches, the constructionist approach is learning by making games. In Piaget's (1951) work, games of construction are considered the highest form of gameplay, as games require children to build representations of the world according to their understanding. Kafai and Burke (2015) emphasize the idea that knowledge about rules, worlds, and interactions is, in this way, represented in a public entity (which is the game) and that playing and making games highlights the personal, social, and cultural dimensions of constructionist learning. They stated that making video games could help understand the social, economic, and civil power of making and sharing.

This paper describes how these two approaches were applied, tested, discussed, and modified for different purposes with the goal of creating a better learning environment and for students to build better creative projects for their portfolios. Alongside, the authors implemented the approach where the presence of the teacher and their advice and mentorship are at students' disposal.

1.1 Teaching with CoI in mind

While digital learning finds its roots in the broader use of computers, there was both an explosion of new research and a revisiting of the old ones. One such important research that has increased in popularity recently is surrounding the Community of Inquiry (CoI). Coined by Garrison, Anderson, and Archer (1999), CoI embodies an educational experience. CoI consists of three core elements: social presence, cognitive presence, and teaching presence. All these three elements, interlacing, further support discourse, set climate, and select content, are represented in Figure 1.

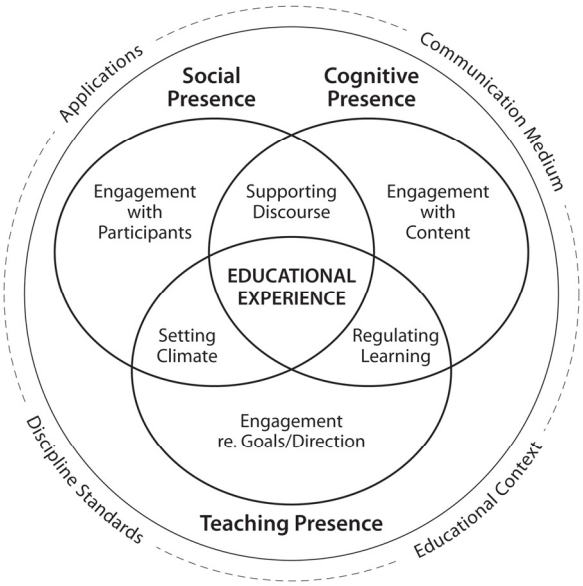

Figure 1: CoI framework

The CoI survey was developed and first tested by researchers in 2008 to aid understanding and implementation of CoI (Arbaugh et al., 2008). The survey consists of 34 questions distributed among the three key elements. Like the general CoI framework, it is actively researched today while maintaining its reliability and validity (Stenbom, 2018).

2. METHODS

In this section, the author will present the use and examples of one of the key elements: Teaching Presence. However, in this case, the implementation of teaching presence is done for real-life lessons, with the hope that if there is ever a need to transfer lessons to the online environment, the transition will go smoothly.

2.1 Teaching Presence in the practical part of the university course in Computer Games subject

The practical part of this university course is acted out in the computer classroom. Students are divided into six work groups, and each workgroup meets once a week in the computer classroom for 3 hours and 15 minutes (short break). Furthermore, each student workgroup consists of 16 students, allowing the teaching assistant (TA) or the professor to give individual attention to each student in need. This subsection is written from the experience gained from 2 semesters where the authors held six student workgroups per week, spanning two school years.

At the start of each semester, students get introduced to the topics and goals for the semester, allowing students to have realistic expectations of the course. This is important because most of the students never worked with the software (Unreal Engine) that is taught in the class, and the end goal of the class is to provide students with a good enough set of skills that they can employ, with the guidance of the TA or Professor, to complete their projects by the end of the semester.

What was noticed is that very often, a student or a small group of students was already familiar with the advanced concepts of computer games and even the game engine used in the computer lab. While that

can be challenging for lecturers, especially since students felt comfortable enough to ask questions about our approach, it was a great opportunity to discuss the class topic more engagingly. One of the most noticeable advantages of motivating students' engagement was that it lead to organic transfer of knowledge, both in student-student and lecturer-student relationships. Allowing students to express their agreements and disagreements in a safe environment was also a great way to build community.
The first year, students weren't given time during the computer class to work on their projects, so they were only following along with what the teacher did. In this approach, the transfer of knowledge was mainly one-directional, and examples done in the classroom were not specifically related to their projects. Only the main principles and skills are acquired.
During the second year, for the same course, a new method was employed (derived from transferring knowledge from other courses and conversations from industry specialists). This method was more in accordance with the CoI framework (described above). Since the computer class is project-oriented, each session had some amount of time reserved for working on the student projects in the classroom environment. The project work usually happened after the necessary part of the lecture was done, and students were encouraged for 15 minutes to simulate a meeting within their project groups to organize what every individual was working on during the previous week and what were the plans for this class. When the 15 minutes were up, each group presented what they were working on, what they planned to work on in the next week, and the issues they were facing. Other teams were motivated to ask questions and offer solutions without negatively impacting the grade for any of the teams.

2.2 Educational work at different courses and game jams outside of university

In the second part of this study, examples of curriculum are examined. Two different programs are described in this paper and one game jam each one organized by Epic Games Novi Sad (Epic Games Novi Sad, 2024a), 3Lateral (3Lateral, 2024), and Materriya Talent and Community Development team (Materriya, 2024) in collaboration with university professors.
The first one is the World Building Fellowship: Unreal Editor for Fortnite (UEFN) program (Epic Games Novi Sad, 2024c). Thirteen participants have passed through the program which lasts eight hours a day, five days a week for three weeks in total. The program consisted of lectures and practical work in Unreal Editor for Fortnite and the task was to create a game environment utilizing given game genres and mechanics. This course was tailored for professionals who have at least three to five years of experience in the game industry, 3D/CG art, concept art, and architecture, or for anyone who would benefit from learning how to integrate real-time world building into their projects.
The second course is called UEFN: Game Crafting program (Epic Games Novi Sad, 2023). Three iterations of the course are done from October 2023 till October 2024. One was held in October 2023, the second one in February 2024, and the third one in September 2024. The first iteration of the program had a total number of sixteen participants, and the second and third iteration had fourteen participants each. Each iteration of the program lasts three working weeks. Every week participants had three lecture days (Monday, Wednesday, Friday) and working days on Saturdays and Sundays (first iteration both days for three hours and second and third only one day for four hours). Participants had the task of creating assigned game environments using UEFN and Fortnite Creative by utilizing given game genres and mechanics. This course was tailored for students in the final years of their studies at the university.
The third program was the UEFN Game Jam (Epic Games Novi Sad, 2024b) where participants had the task to make a video game (island) for Fortnite by utilizing UEFN and Fortnite Creative tools during the span of two days (Saturday and Sunday) in the form of competition. Each day participants work for eight hours for a total of 16 hours after which they need to present playable games in Fortnite. There were a total number of seven teams consisting of three members (a total of 21 participants). Every team had two working stations at their disposal. Unlike the first two programs described in this chapter, this program concentrated on mentor work rather than giving lectures about specific subjects.

3. RESULTS AND DISCUSSION

Results presented here are based on working hours and the distribution of the activities throughout the whole program. These activities are separated into three main categories: (1) follow along type of class, where students learn some new lecture by watching and replicating what the lecturer does; (2) working independently on their projects (with the help of a mentor) and (3) presentation of their projects in front of the group. Seven different methodologies are presented for seven different teaching activities:

university classes for Computer Games subject for two distinct semesters (Methodology 1 and 2); world building in Unreal Engine program for professionals (Methodology 3); three game crafting programs in UEFN (Methodologies 4, 5, and 6), and game jam in UEFN (Methodology 7).

3.1 Approach for teaching Unreal Engine at the university course in Computer Games subject

Working hours for Methodology 1 and 2 are presented in Table 1.

Table 1: Distribution of working hours in Computer Games subject at the university

	Number of hours in one class	Total number of hours in semester	Teaching hours per class (follow along)	Number of hours working in a team	Mentor consultation hours
Methodology 1	3	42	3	-	-
Methodology 2	3	42	1.5	1.5	1.5

In the case of Methodology 1 students had 42 hours of follow-along type of class where they did not have time to work on their semester projects. Their individual work was done out of the classroom and without mentorship. Mentorship was provided only during the private sessions and only for two hours a week (28 hours per semester for the whole generation of students). Because this was the first time they were working in an Unreal Engine environment, and they were not familiar with C++ coding or visual scripting (Blueprints) their task was only to make an environment and to make a story through world building and animating cameras. No game mechanics were required to be implemented.
Methodology 2 was different in a way that students had 21 hours throughout the course (50%) of follow-along type of class instead of 42, and 21 hours (50%) of working on team projects where the teacher was at their disposal for questions and mentorship. Besides that, students had the opportunity to come to the private sessions for two hours a week, which gave them a total of 49 hours (21+28) of consultations throughout a semester with their teachers. The result of this approach was not only the 3D environment of the game but one functional mini game with employed game mechanics.
It can be seen from Table 1, that Methodology 2 gave more "room" for working on assignments (projects) during the class with the multifaceted benefits. One benefit of such a learning-by-doing approach utilizing the Teaching Presence of CoI framework is that students had each week more hours with the teachers discussing their assignments. The second one is that they implemented freshly acquired knowledge from that day on their projects. The third one is that not only Teaching and Cognitive but also Social Presence were employed since students worked, discussed, and interacted during the class and they were solving problems in a similar way they would in a real working environment. Also, this approach freed up time after class for some other activities. And finally, the projects were done on time due to the time management advantages of this approach.

3.2 Approach for teaching Unreal Editor for Fortnite for world building aimed at professionals

Working hours for Methodology 3 are presented in Table 2.

Table 2: Distribution of working hours in World Building in Unreal Editor for Fortnite for professionals

	No. of hours in one day/class	Total no. of hours during course	Teaching hours per class (follow along)	No. of hours on individual projects	Mentor consultation working hours	Project presentation of milestones
Methodology 3	6	75	40.5	28.5	28.5	6

Methodology 3 had almost double the number of course hours (75h) with the distribution of 40.5 hours (54%) for the follow-along type of lectures, 28.5 hours (38%) for working on their projects/mentor hours and estimated 6 hours (8%) for the presentation of their projects in front of the group. Presentation in front of the group with specific milestones every week gave participants of the project a sense of responsibility and orientation for their project.
The goal of this program was to familiarize professionals, who already worked for 3-5 years in the industry, with the possibility of UEFN and the final product was a 3D game environment with implementation of basic game mechanics. This is why most of the time (54%) was spent in a follow-along type of class. This program took place after the course where Methodology 2 was implemented, hence

some knowledge was transferred from university classes to the education of industry professionals regarding the percentage of follow-along compared to practical work on the projects, which gave good results.

3.3 Approach for teaching Unreal Editor for Fortnite for undergraduates

Working hours for Methodologies 4, 5, and 6 are presented in Table 3.

Table 3: Distribution of working hours in Unreal Editor for Fortnite: Game Crafting program for undergraduates

	No. of hours in one day/class	Total no. of hours during course	Teaching hours per class (follow along)	No. of hours on individual projects	Mentor consultation working hours	Project presentation of milestones
Methodology 4	3	51	24	24	24	3
Methodology 5	3	45	24	18	18	3
Methodology 6	3	48	10.5	34.5	34.5	3

In the case of Methodology 4, participants attended a total number of 51 hours of which 24 hours (47.06%) were the follow-along type of lecture, 24 hours (47.06%) were reserved for working on their own projects, and 3 hours (5.88%) for the presentation of the milestones in front of the group. Methodology 5 had a different distribution of follow-along type of class (53.33%), working on projects (40%) and presenting milestones in front of the group (6.67%). In the case of Methodology 6, follow-along type of class occupied 21.88%, working on projects 71.88%, and presentations in front of the group 6.25%.

This program evolved through three different Methodologies. The first one was focused on 50%-50% distribution between follow-along type of class and working on their projects which led to satisfying results, but the game worlds were majority done with predefined game assets from Fortnite which didn't make a distinct look in the great sense. The second iteration of the program (Methodology 2) had more accent on follow along type of class (53.33% compared to 40% for individual work) to teach students how to use non-Fortnite assets to get a more distinct look that is different from Fortnite's native. The result of this approach was more unique game environments but with scarce game mechanics. The third iteration hits the middle spot between the first two regarding final games. The focus of this iteration was on game mechanics and some basics of creating an environment with non-Fortnite assets which gave more time for working on the individual projects. The result of this approach was more interesting games, mechanics wise, and a more "Fortnitey", yet unique look.

3.4 Approach for mentoring Game jam done in Unreal Editor for Fortnite

Working hours for Methodology 7 are presented in Table 4.

Table 4: Distribution of working hours in Game Jam in Unreal Editor for Fortnite

	No. of hours in one day/class	Total no. of hours during course	Teaching hours per class (follow along)	No. of hours on individual projects	Mentor consultation working hours	Project presentation of games
Methodology 7	8	16	1.5	13.5	13.5	1

In the case of Methodology 7, the nature of the program (game jam) was such that participants had to finish a game in 2 days, so the focus was on their projects (84.38%) with the short introductory/orientation lecture at the beginning of the program (9.37%) and final presentation of the finished games (6.25%).

This Methodology is not comparable to the previous one but is here just to solidify the premise that more work was handed to the students to work on their projects with only the necessary instructions (follow-along type) and that a more time left for mentoring can lead to finished projects in less time.

4. CONCLUSIONS

Observing Table 1-4 as well as their explanations one obvious trend can be noticed. By increasing the number of hours reserved for working on individual projects a lot of benefits can be derived not only for

students but also for teachers (mentors). One such benefit is that by leaving more time to help students achieve their goals, teachers have the opportunity to work on a variety of projects and hear a lot of new and interesting ideas which broadens their knowledge and also gives them experience on how to approach similar projects and problems in the future. If the participants have prior knowledge in the matter and/or are professionals from the industry, teachers can acquire new skills and points of view which then can be transferred to the university classroom and other programs.

Following the CoI framework and survey and shaping the lessons to support the teaching presence element, lecturers and students were able to build open and enjoyable learning environments. Removing the stress of grading (although in the case of the university students they were still graded at the end of the course) students felt free to exchange ideas while allowing the lecturer to provide feedback and guide each team towards realistic solutions. However, sometimes, the in-classroom discussions are not enough for some, usually more ambitious teams. This leads to either office hours or e-mails from the students. Regarding office hours, students are offered multiple online options, such as Google Meet, Zoom, Discord, and traditional ones. Some students prefer writing emails, and that poses a different set of challenges. Students tend to send more emails the closer the deadline; therefore, it is imperative to motivate them to ask questions early on. Another interesting fact is that some students prefer to work at later hours of the day, and therefore send e-mails at that time. While it is important to set a boundary around working hours, in some special cases, when students must work while studying, it ends up being more productive to exchange emails with them at the most suitable time.

This research showed also that mentoring knowledge acquired from courses outside of university and from interacting with industry professionals can be and, in the authors' opinion, should be transferable to the university and vice versa. This transfer is done not only by means of providing useful tips and tricks to the students but also by means of crafting a better curriculum program through experimenting with different teaching methodologies.

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