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"Jeff: the hungry fish" – a case study in educational game design with unity 3D and C#

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ABSTRACT

'Marine Fantasy' comes in the form of a game entitled "Jeff: The Hungry Fish", created to encourage people in understanding marine biology - the fun way!. The gaming experience named 'Jeff: The Hungry Fish' presents a concept known as 'Marine Fantasy' with the intention of promoting comprehension of marine biology among individuals, albeit in an entertaining way. Concurrently, developing this new project meant being outside our comfort zone. That will lead to a break-through of stunning visuals, fresh musical pieces and far more efficient coding scripts. Along with this report, it proposes a simple yet educational game, developed in Unity 3D, scripted in C# language. The game immerses the player in the role of Jeff, a fish aspiring to progress into a larger and more powerful aquatic creature. Given its low position in the food chain, participants are required to adhere to the regulations of underwater existence while engaging in the gameplay. "Jeff: The Hungry Fish" is an educational game, but not in the traditional sense of a structured academic curriculum. Instead, it embraces a broader definition of education, one that encompasses learning through diverse modalities and across various domains. The game utilizes a playful and engaging approach to impart knowledge and information, recognizing that learning can occur through experiences that are both entertaining and enriching. The educational aspect of "Jeff: The Hungry Fish" lies in its potential to foster curiosity, promote critical thinking, and provide opportunities for exploration and discovery. It aims to make learning a more enjoyable and accessible experience, regardless of the specific subject matter or the learner's background.

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Introduction

In recent years, technology has grown very fast. New technology was yielded to create a new method for fun learning. Edu games has become a new revolution in the world for fun learning. Is also one of the major inventions which is changing the way to experience for learn. Jeff: The Hungry Fish" is to simply make learning fun again. It is an objective that everyone aims to achieve, but it's lacking in the current reality. We are still utilizing only textbooks and traditional classrooms. Even if technology is in question, nothing changes as students are told to find a carbon copy of the textbooks' contents anyway in the same format. To add salt to the wound, students are told their material is 'too advanced' when they achieve a goal outside of the box. This diminishes the thirst of knowledge needed to be quenched, demotivating the drive of an individual to be inspired, and discourages natural curiosity to be satisfied.

The current system is punishing individuals that genuinely want to pursue a subject matter on a deeper level. It's not fun to be told you can't be graded because your work is nonexistent in someone's eyes. It's not fun to be told because your work is nonexistent, you'll be forced to do the same work as everyone else. This is the environment of the education industry; instead of encouraging a variety of skill sets, it's forcing uniform ideas and ideals. Different people have their own desires to pursue- no one will ever form exact ideals.

The objective of this project is to develop a fun and interactive educational game centered around marine life, aiming to make learning about the ocean and its ecosystems an engaging experience. By integrating educational content into gameplay, the project seeks to foster curiosity and awareness about marine biodiversity in an enjoyable way. Additionally, the game will incorporate simulation elements that challenge players to think critically and develop strategic skills, enhancing both their cognitive abilities and environmental understanding through immersive play.

With the emergence of our project, we conclude to make fun learning popular again. Living to do what we hate, to enjoy what we love shouldn't become the standard saying anymore. Subsequently, we also aim for the early embracement of marine biology, which aligns with the theme of our game. The game has a simple, colourful design with easy objectives. The 4 characters created are based on real species to invoke curiosity in our audience. Whether or not the audience takes interest is their choice, the game presents a simple idea as a fun door to the marine biology field. Just like a vast field of knowledge, we've also integrated an education based mechanic; answering a few questions in exchange for useful gameplay status effects.

By basing off the enemies in the game off real aquatic life forms, it showcases a certain extent of our real-life oceans. Implementing simple mechanics gives the opportunity to attract all ages into playing our game, thus introducing them to the marine ecosystems. As it is based on ecosystems, the concept of prey-predator plays a role as the main mechanic. This will then establish the notion of a food chain. Arguably, the player is considered 'at the near bottom' of the food chain and they must come out on top.

To conclude, we aim for early exposure of the marine biology field to our audience. The game will act as a catalyst to invoke the marine ecosystem to people of all walks of life. As an advantage, the marine biology field will synchronously continue to grow and prosper in future studies. Coming up with a method to implement the 'educational element' is not an easy feat. Popular games with brilliant mechanics and plotlines became popular due to its complexity, length of gameplay, and most importantly delivery. In fact, the educational part is not even direct- players themselves realize that they are acquiring something new albeit fictitious.

Regardless, most games base their stories and mechanics off something real. For example, fictional characters in a game may go on a journey and come across an environment similar to a particular country in reality. Let's say the developers then said it was intentional as the environment is based on Japan in a certain period. Unknown to them, the game educates the players on the livelihood and culture of Japan at that time. Due to the game's features and mechanics, the players are enjoying a form of entertainment in between learning a new culture. If they are interested, this would prompt them to find out more on their own.

Therefore, this suffices our definition of the word 'educational' that will be prevalent to reach our objectives. We expect to soar in our goals for this project, as well as developing our own growth to contribute even more in future canvasses. Games make you, have better interaction learn from your mistakes and the gap between gaming and education.

Method

System development methodology is described as a method for enhancing the management and control of software and product development processes by identifying the tasks that must be completed while utilizing the proper methods (Anis & Mohd Safar, 2022). For this project, an Addie model was selected. Addie model is a rapid software development model. The primary objective of the model is to expedite development and successfully implement the proposed adjustments (Alsaqqa et al., 2020). There are several uses for Addie models, including analysis, design, development, implementation and valuation. The Addie Model is suitable for our game's development.

Analysis

Analysis is important for early development to identify the cores of our work. It's the first phase where we plan, research, calculate project costs, finalize codes and illustrations, as well as manage a timeline for work completion.

Design

In the designing phase, we discuss the visual aids and internal aids to complete the look of our game. These would include sprites for the player, enemies, obstacles and even interactable objects. Designing this game means we needed to put thought into its mechanics. A good chunk of time was spent considering how movement would work in the gameplay- which often involves calculations towards the physics of existing items. We also come up with drafts of illustrations to either be used in the game's release or to scrap them.

Development

Development phase is where we integrate our drafted designs with the initial programming script. The process involves numerous attempts of trial and error. It is a priority to ensure that minor defects are detected early so bugs and glitches in the final product are less likely to occur. When one step is completed with no issues, it is an indication to move onto the next step. For example, one of the first stages in developing gameplay involved the player's movement. Once we are certain that the movement can be flawlessly executed, we move onto interactions between players and objects in the game. Other integral components also face the same process until we've put together a complete game.

Implementation

In the implementation phase, we introduce our game to a group of gamers known as 'beta testers', this is known as 'closed beta testing (CBT)'. These beta testers will be playing the game and are free to give feedback to the team. Beta testers' feedback plays an important role in harmonization of the game. Everything shown to them in the gameplay must connect to the visual illustrations provided according to the theme we have chosen. At the same time, it is also the phase where the team priorities bug fixes, visual fixes and any other occurrences that take away the testers' enjoyment of playing the game. While we ensure there are no gameplay bugs or glitches, these beta testers will spend their time to not only beat the game but purposefully attempt 'breaking' the game by letting them discover potential issues. Often, players are seen to try going out of bounds from the game or find a way to not take any incoming damage from enemies.

Evaluation

To evaluate our game, we created a feedback form for our beta testers. One of the aspects we questioned them revolves around the game's enjoyability. One of our main goals do involve ensuring enjoyment is present at the same time as our educational mechanics are. Other than that, we also measure any of their negative feelings towards the game. Measuring both enjoyment and lack thereof will draw a clear distinction in whether we've achieved enjoyability or not.

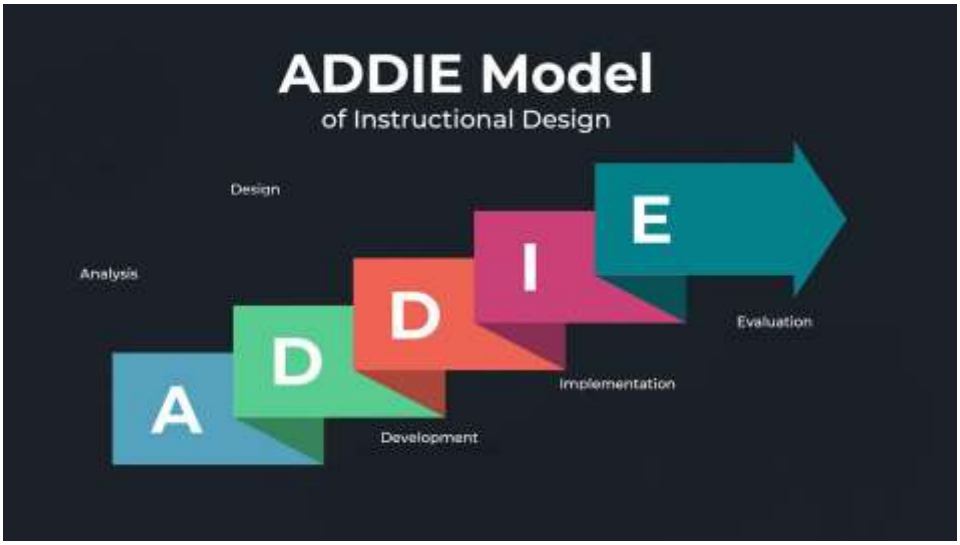


Figure 1 <Addie Model>

Results and Discussions

Game is a fun method to provide motivation to the students, so they'll become more inclined to listen, learn, and participate in set tasks. Though motivation is bound to run out, it is a form of adrenaline that keeps an individual striving. They will have a sense of purpose in carrying out multiple tasks in life, and knowledge acquisition is a continuous process in our life. Without that purpose, everything would just feel hollow and nothing anyone does will change a thing. For example, the player may encounter a 'predator' that could

potentially chase them. As per the game's objectives, players are supposed to beat the game by coming out at the top of the food chain. To do this, simply grow bigger by 'preying' on smaller species and acquire the 'gameplay status effects' obtainable via the education elements. The game does not directly tell you where or how to win this 'chase' per se. Rather, winning relies solely on the player. We introduce engaging mechanics to ensure an efficient learning process. As summarized by Green and Seitz (2015), video games are predominantly active forms of learning. The moment a player carries out an action, they are given an immediate response- often in which they can see the effect of the response taking place. Since a scale of difficulty is always present along with positive interactions in games, it takes effect on time spent to complete a task.

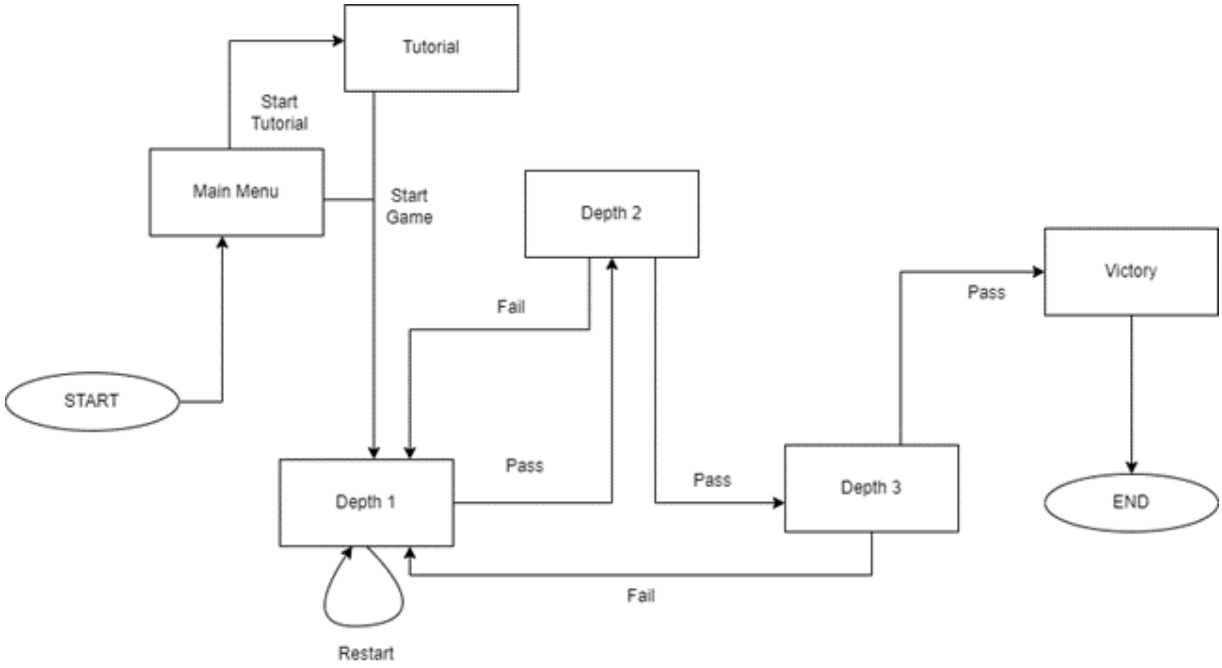


Figure 2 < Game's system diagram overview>

In video game development, graphic design is an integral part of the development process. Graphic design consists of creating visuals that provide value and aid in fulfilling user experience to ensure the final product is visually pleasing and convenient to navigate, while creating high quality art and media to implement in the game. It is important as visuals that are pleasing to the eye, while also being captivating is what sets apart great video games to mediocre ones. For "Jeff: The Hungry Fish", we wanted to achieve a bubbly, user-friendly interface with a simple live background. keep it short and straightforward to let our players know how the game works. To exit, simply click on the 'X' icon on the top right.

Figure 3 <Introduction Screen>

The Home Screen is also known as the main menu. Here, players may navigate around before playing the game if they choose to.

Figure 4 < Home Screen>

Settings are also known as 'options' in some games. As our project is a basic 2D click-and-drag game, we prioritized our players' comfort to adjust the audio and display.

Figure 5 < Setting Screen>

At the start, players can see their timer, progress bar, score, and health. These indicators help players to keep track of their actions in the sea. The green highlights around the fishes is a way for players to distinguish between their 'preys' and 'predators'.

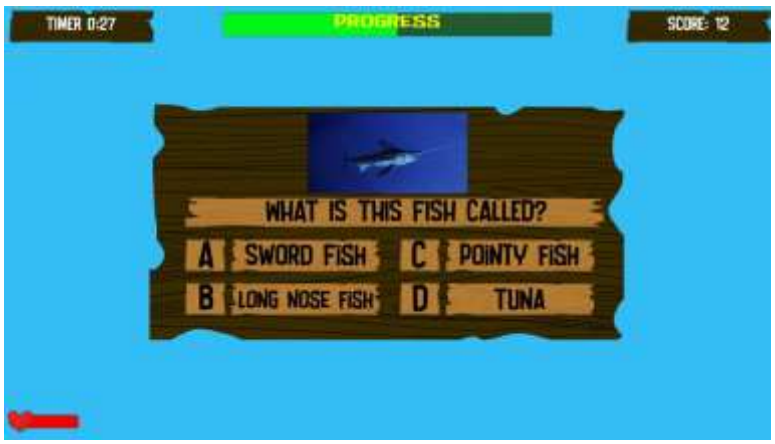


Figure 6 <Question Screen>

The first figure is the format we used for each question available. An image is shown at the top, followed by the question, and then a set of answers. Players can simply click on the answer and if they're correct, the second figure pops up. Otherwise, they'll be informed that they are wrong.

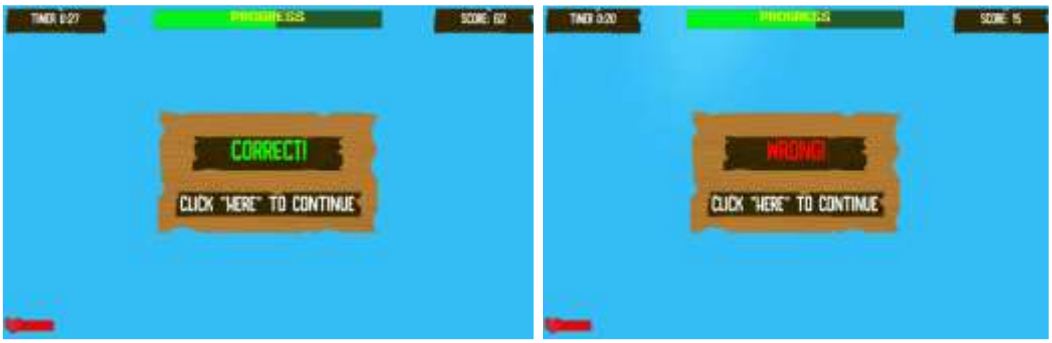
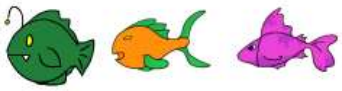


Figure 7< Respond>

At the very end, the player's score, high score and obtained coins are shown. Then, they have the option to play again by selecting 'restart' or return to the main menu. Meanwhile, Visual Assets are the visual materials that are used in the development of a video game. Visual Assets comprise of many elements, such as character, object, images, background images, user interface elements (e.g icons), tile sets, and more. Visual Assets is a core aspect of game development because they make up the entirety of what the players see in the video game. In our development, we aimed to have the best representation of the marine creatures featured in our game, drawn with a cartoonish, visually pleasing style as below;

Table 1<Player, AI and Enemies Character Sprite>

Tier	Player Character Sprite	AI Character Sprites	Enemies
Tier 1			
Tier 2			
Tier 3			

Conclusions

This study explored the development of Jeff: The Hungry Fish, an educational game designed to teach players about marine life through interactive gameplay using Unity 3D and C#. The project successfully demonstrated how game-based learning can be both engaging and informative, blending entertainment with educational objectives. By incorporating exploration, simulation, and strategic challenges, the game encourages players to learn about marine ecosystems while developing critical thinking skills. The game's simplicity is a major attraction for our players. They favored the straightforwardness and easy-going vibe. Its simplicity also allowed the players to not worry about completing the game and exploring its environment. This opens the opportunity for the game to be a marketable edu-game. Straightforwardness in delivering facts about aquatic life piqued players' interest to complete the game and attentively paid attention to the many fun facts. In the educational sense, our main goal is to expose a wide range of audience to marine biology, a field that is continuously needing awareness and expertise of all kinds. To advocate for an essential field does not require anyone to be a scientist, rather being aware and knowing what to do is the best manpower anyone can contribute. Our method to achieve this goal is by creating an interactive game platform. By virtue of our game developer, the game uses C# language,

with integrated educational elements. We've used simple ideas while the game developer brought them together and finished crafting our game; "Jeff: The Hungry Fish".

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