FinalReport_AnshuKharel

by Anshu Kharel

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Module code: 607

Module name: Production Project

Module run: 2025

Coursework title: Building a Virtual Reality Platform for Interactive Learning.

Due Date: 2025/05/16

Module leader: (In LBU) Patrick Ingham

Module Supervisor: (In TBC) Saroj Sharma

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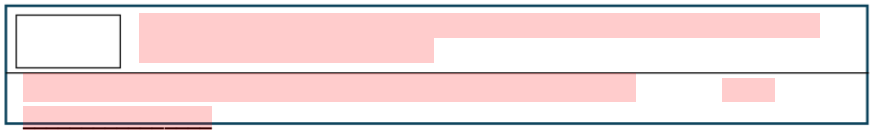

Abstract

This project presents the development of an interactive, Unity-based desktop application designed to enhance subject-based learning for Grade 5 students. The primary objective is to provide an engaging and structured learning experience through a virtual school environment, where students can log in, attend classes, watch educational videos, and complete quizzes in core subjects such as Math and Science.

The system integrates a secure user authentication process using PlayFab, allowing for registration, login, and password recovery via email. Upon successful login, students enter a main school building scene and navigate to subject-specific classrooms. Learning begins when the student sits at a designated spot, automatically triggering a video lesson. Quizzes are only activated after video completion to ensure proper knowledge delivery. Each classroom includes six quiz questions that must be completed before the game session ends.

Adding motivation and interactivity. The system also includes attendance tracking and a backend leaderboard feature, enabling teachers to monitor student participation and quiz performance.

The application was developed using the Waterfall model, and testing confirmed its functional stability, usability, and educational relevance. The project demonstrates how game-based learning and cloud integration can be combined to create a child-friendly, curriculum-aligned digital classroom experience.

Declaration

I hereby declare that this project report titled “Building a Virtual Platform for interactive Learning” is the result of my own independent work. It has not been submitted, either in whole or in part, for a degree or diploma at any other academic institution.

I confirm that:

- All sources of information used are acknowledged in the Bibliography.
- I have complied with the University’s Academic integrity and Ethics policies.
- Ethical approval has been obtained from where required and supporting documentation is included in the Appendices.

- Anshu Kharel

Acknowledgement

I would like to express my gratitude to Mr. Patrick Ingham, module leader of Production Project, for their contribution to the completion of my project.

I sincerely thank my supervisor, Mr. Saroj Sharma, for his guidance throughout this project. Your useful advice and suggestions were helpful to me during the project ‘s completion and I am deeply grateful for your support. I also extend my special thanks to our module leader, Mrs. Anita Gurung, for her invaluable guidance.

Lastly, I would like to acknowledge The British College it’s departments, staff and every individual of the college who contributed to making experience comfortable and ensuring the successful completion of my project. I am truly grateful for their support.

I also recognize that this project was entirely completed by me and not by someone else.

Signature

Anshu Kharel

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CHAPTER 1 Introduction

1.1 Background of Unity and Its Educational Role

Over the past two decades, digital technology has transformed nearly every aspect of our lives including the way we learn. From interactive websites to fully immersive 3D simulations, education has steadily embraced digital tools to enhance how knowledge is delivered and absorbed. One of the tools at the forefront of this transformation is the Unity game engine. Unity, developed by Unity Technologies and first released in 2005, began as a game development engine aimed at making high-quality game creation accessible to independent developers. What made Unity revolutionary at the time was its cross-platform deployment system, allowing developers to build once and deploy across multiple devices including PCs, mobile phones, game consoles, and eventually, VR headsets.

As Unity grew in popularity, it expanded far beyond gaming. Today, Unity is used in various fields such as architecture, film, automotive visualization, medical simulation, training environments, and education. Its powerful 3D capabilities, real-time rendering, intuitive editor, and scripting support through C# have made it a favorite among developers who need interactive and immersive experiences.

In the education sector, Unity has proven to be more than a technical tool; it is a medium for creativity, problem-solving, and engagement. Educators and developers use it to create simulations that bring complex topics to life from virtual chemistry labs to historical recreations. It enables learners to experience educational content in a more visual, hands-on manner, which research shows can significantly improve understanding and retention.

The shift towards experiential learning by doing has increased the demand for such platforms. Unity meets this demand by allowing developers to create rich environments where students can explore, interact, and learn in ways that traditional media cannot offer. The platform's flexibility and real-time feedback loop encourage iteration and personalization, which are essential for modern education. One of the reasons Unity is so well-suited for educational applications is its scalability. Whether the goal is to create

a small-scale interactive module or a full virtual campus, Unity provides the tools necessary to prototype, test, and deploy with efficiency. Its integration with various third-party services, real-time animation support, and scene management features further expand its capability for building immersive and engaging content.

Moreover, Unity has cultivated a strong developer community, complete with forums, tutorials, and a vast asset store. This has lowered the barrier to entry for aspiring developers including students and educators, who want to build their own educational experiences without starting from scratch. The asset store alone offers thousands of free and paid tools, ranging from 3D models and visual effects to AI tools and audio plugins, all of which can be integrated with minimal coding. In a world where attention spans are short and learners are surrounded by distractions; engagement is more important than ever. Unity's interactive and visually rich environments offer a way to capture that attention and hold it long enough for meaningful learning to occur. It offers the opportunity to go beyond flat slides and videos, turning content into experience that students can immerse themselves in, explore, and understand through interaction.

This project was born out of the recognition that Unity is not just a game engine but a powerful platform for educational innovation. The idea was to use Unity's strengths to create something that could support learning in a new, imaginative, and accessible way. Instead of passively consuming content, learners could be offered the opportunity to interact with it to be part of the learning environment itself.

1.2 Project Objectives and Vision

The central objective of this project is to explore the use of real-time 3D technology in enhancing digital education. The project sets out to harness Unity's creative potential to build an interactive educational experience that is both functional and visually engaging, with a strong focus on accessibility, visual design, and user-centered development.

Rather than relying on traditional content formats like documents or videos, this project aims to develop a system where learning feels more natural, immersive, and enjoyable.

It seeks to create a structured environment where educational themes can be explored in an interactive way, reinforcing concepts through engagement, discovery, and experience rather than rote memorization. One of the core intentions behind the project is to demonstrate how educational experiences can be made more accessible using technologies that are already widely available. Unity allows for desktop deployment, which means schools or learners without access to expensive VR headsets or specialized hardware can still benefit from interactive environments. This focus on inclusivity ensures that the experience can be used across diverse settings from classrooms to home learning environments without major resource limitations.

In addition to the development of a rich, user-friendly educational environment, the project places importance on scalability and adaptability. While the current version may target a specific level or theme, the underlying system is built in a way that it could later be expanded to include more content areas, visual scenes, or instructional themes. This modularity was a key consideration from the beginning, ensuring that future iterations or extensions could be added without having to rebuild the system from the ground up.

Equally important to this project is the experience gained through the development process itself. The entire system was created following a structured project development methodology specifically, the Waterfall model allowing each phase to build logically on the one before it. This included defining requirements, researching best practices, designing user interfaces and environments, developing scripts and interactions, testing functionality, and preparing final documentation and presentation materials. Starting from December 20, 2024, and concluding by May 16, 2025, the project followed a carefully scheduled timeline guided by a Gantt chart to ensure timely progress. This development process was not just about building a final product, but about learning how to manage a complete software project from beginning to end. It included making design decisions, learning new tools and languages (such as Unity's C# scripting environment), handling errors and debugging logic, and ensuring that the final build was both stable and visually coherent. These experiences provided valuable insights into the workflow of educational technology development insights that can be applied to future projects in this domain.

Ultimately, the vision for this project is to contribute to the growing field of interactive learning design. As education continues to evolve, especially in the digital era, tools like Unity can play a major role in shaping how students engage with knowledge. By offering experiences that are rich, immersive, and thoughtfully designed, we can make learning not only more effective but more enjoyable. This project represents one step in that direction, an attempt to show that with the right tools, creativity, and planning, educational technology can become both accessible and impactful.

Chapter 2 Literature review

Virtual Reality (VR) has become an increasingly significant tool in education, particularly in the realm of Collaborative Learning. Educational sectors and disciplines show interest in Virtual Reality for Collaborative Learning due to demand for innovation, community building and remote interaction among learners. Most systems rely on screen based Virtual Reality and traditional mouse and keyboard interfaces. There is a widespread positive outlook on the potential of Virtual Reality to improve and strengthen Collaborative Learning. (Specht, Werf, Meer, & Brinkman, 2023). This literature review explores existing studies on the role of VR in Collaborative Learning, evaluating its effectiveness, limitations and future potential.

With the rise of new technologies, Virtual Reality (VR) is gaining traction as an engaging educational tool that enhances interactivity and learner interest. Studies have shown its application in areas such as military training, fashion design, medical simulations and overcoming learning related anxieties. Using a systematic literature review (SLR) method, researchers have explored VR's benefit drawbacks and its (Suri, Syahputra, Amany, & Djafar, 2023)efficiency compared to traditional methods. Two main approaches are identified: a game-based model and simulation-based model. Immersive Virtual Reality(I-VR) is transforming how education is delivered by enabling interactive, high- quality learning using head-mounted displays. A review of 29 experimental studies revealed that I-VR often leads to better learning outcomes compared to less immersive approaches. However, common drawbacks included brief

study duration, limited focus on long term retention and an emphasis on science-related subjects. Additionally, the review found that many studies lacked strong evaluation methods, emphasizing the need for more robust research to accurately measure I-VR's effectiveness in education. (Hamiltion, McKechnie, Edgerton, & Wilson, 2021).

Imagine stepping inside your computer and engaging directly with the programs you build. While it may seem like science fiction, it's already a reality. Today surgeons practice procedures on virtual patients and architects explore digital models of building long before construction begins. (Rheingold, 1992). Java and VRML integration allows 3D apps to run on standard browsers without extra software. VRML supports virtual product demos, training and teamwork. (Diehl, 2001).

Virtual Reality (VR) involves computer generated 3D environments that users can explore and interact with stimulating their senses in real time. Key features include visualization through headsets, immersive experiences and interactivity via input devices. Terms like "virtual environments" and "virtual world" are often used interchangeably with VR, though definitions vary widely across studies (Yung & Khoo-Lattimore, 2019). Virtual Reality (VR) is widely recognized as an advanced computer-based technology designed to generate immersive simulated environments. According to researchers, this technology enables users to engage with artificially constructed digital surroundings in real time. Unlike conventional user interfaces that rely on flat-screen interactions, VR offers a deeply immersive experience by surrounding the user within a three-dimensional virtual space (Singh, Mohd, Abid, & Dhall, 2024). Rather than merely observing digital content on a screen, individuals can navigate and interact with dynamic 3D environments, thereby enhancing user engagement and realism.

Virtual Reality (VR) is an immersive artificial technology that enables users to interact with and navigate through a three-dimensional virtual environment (Malik, Sharma, & Chaudhary, 2024). These digitally constructed spaces are composed of computer-generated graphics and elements that closely resemble real-world settings, offering a highly realistic and engaging experience.

According to the (Lampropoulus, 2024)compared to conventional educational settings, gamified virtual reality learning environments provide higher levels of motivation, engagement, and interactivity, while also enhancing opportunities for individualized learning and collaborative experiences. Generative artificial intelligence enhances the learning experience by instantly crafting individualized educational content. It can develop customized assessments, practice tasks, and comprehensive lessons tailored to each learner's unique abilities and progress. (Scoble & Cornin, 2024)By continuously adapting the material, it ensures students remain engaged with content that is both meaningful and aligned with their learning goals, contributing to improved academic performance. Although VR has become more familiar through its use in theme parks and entertainment venues, it is still relatively new to many individuals (Lege, 2020).

While students might have prior exposure to virtual reality, diminishing its initial novelty, the technology continues to be a powerful and engaging tool in educational settings, maintaining its ability to motivate and capture learners' interest.

Chapter 3 Reality Behind the Project - Technology Review

Selecting the right tools and technologies was crucial for ensuring efficiency, interactivity and scalability with numerous software solutions available today, a careful evaluation was conducted to determine the most suitable option for the project goals. In the modern era of digital development, a wide range of technologies exist for implementing complex systems.

A detailed study was conducted to identify the most effective tools to support immersive interaction, user data, handling and running smooth system performance. The technologies were chosen based on their ability to support immersive environments, manage data effectively and deliver seamless user experience. The tools and platforms utilized in this project are outlined and discussed below.

A variety of tools and technologies were utilized in building this system are as follows:

Unity	Software

QSEE Superlite	Software
VR Occulus Headset	Hardware
VR Occulus Controller	Hardware
Visual Studio	Software
Microsoft Project	Software
PlayFab	Software

3.1Software

1)Unity

Unity is one of the most widely used development platforms for creating interactive applications, particularly in the fields of gaming, simulation and immersive technology like Virtual Reality (VR) and Augmented Reality (AR). Its popularity stems from its powerful game engine, user-friendly interface, and cross-platform capabilities, allowing developers to build both 2D and 3D applications efficiently. Unity uses C# as its primary scripting language, making it accessible to a broad range of programmers. Originally dominant in the gaming industry, Unity now extends to fields such as architecture, automotive, education, and even defense, supporting use cases like virtual walkthroughs, training simulations, and product visualization.

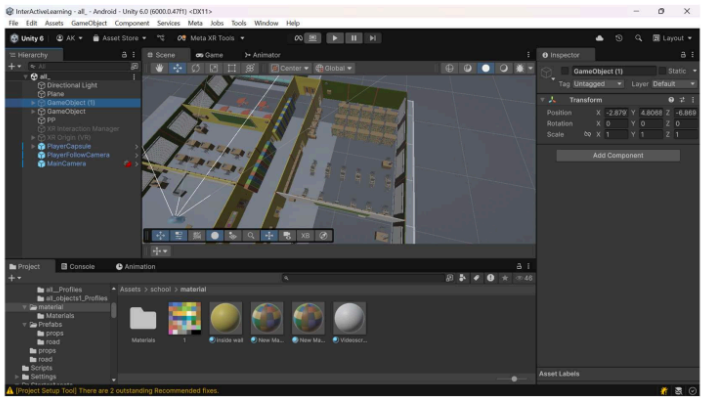


Figure 1(Unity)

Compared to other engines like Unreal, Unity is often preferred for its intuitive design and flexibility, especially for projects that don't require ultra-high-end graphics. Its wide adoption and supportive development community makes Unity a reliable and adaptable tool for both beginners and professionals in modern software development. I chose Unity for my project because it offers the right balance of performance, ease of use and VR development capabilities needed to bring my interactive learning experience to life.

2) Unity Hub:

Unity Hub is a dedicated application that helps users easily manage everything related to Unity in one place. It simplifies the process of installing and updating different versions of the Unity Editor, making it easier to work on multiple projects. Through the Hub, you can create new projects, access existing ones, and explore a variety of templates and sample projects suited for different experience levels. It also allows you to manage your Unity account, adjust preferences, and handle license activation. Additionally, Unity Hub provides access to learning resources and support, helping users get started and grow their skills more efficiently.

In the provided Unity Hub in Figure 2, interface, several key sections are visible on the left sidebar, each serving a specific purpose to streamline the development workflow:

Projects: This tab displays a list of all Unity projects on your system. In the image, a project titled Interactive Learning is shown as connected and recently modified. From here, you can create a new project, open existing ones, or manage project settings.

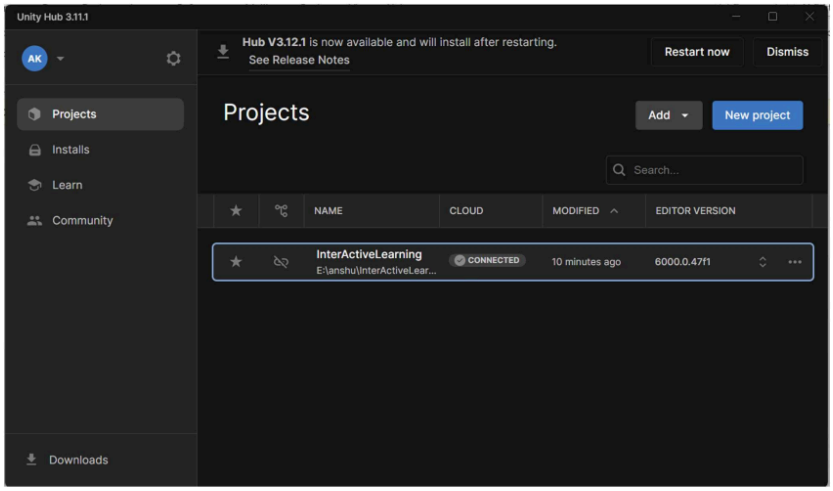


Figure 2(Unity Hub)

Installs: This section allows you to manage different versions of the Unity Editor. You can download, install, or remove versions depending on the requirements of your projects.

Learn: This tab provides access to learning resources, tutorials, and sample projects offered by Unity. It's designed to help users of all levels, from beginners to advanced developers, improve their skills directly within the Hub.

Community: This area connects users with the broader Unity community, offering access to forums, support, and community-driven content to help resolve issues, share ideas, and stay updated with the latest trends in Unity development.

Each of these sections contributes to making Unity Hub a centralized platform for efficient and organized project development.

2)QSEE SuperLite:

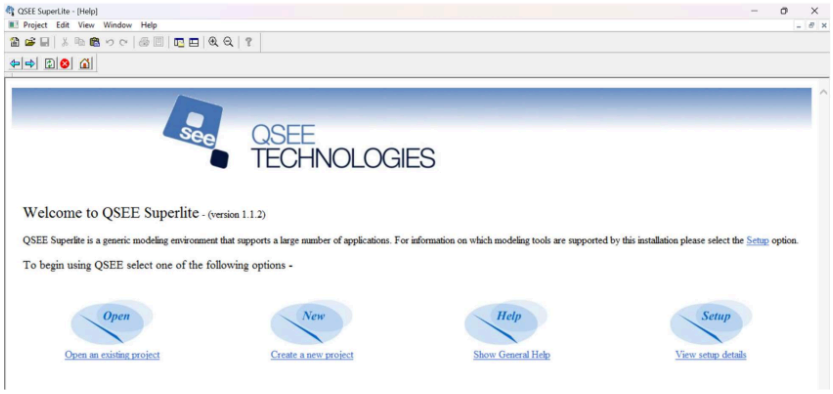


Figure 3(QSEE SuperLite)

QSEE SuperLite is a lightweight modeling tool that provides a user-friendly environment for designing and visualizing various software engineering diagrams. It offers broad functionality for designing various system models, including Data Flow Diagrams (DFDs), Entity Relationship Diagrams (ERDs), and Use Case Diagrams. In the context of my project, this tool proved valuable in mapping out the system's architecture and operational flow. It enabled me to illustrate key functional components, database relationships, and user interactions in a structured visual format. This significantly improved the clarity of the development process. Its user-friendly interface and effective modeling capabilities made it a suitable tool for the design and documentation stages of my system.

3) Visual Studio

Visual Studio served as the primary code editor and development environment for scripting in my Interactive Learning project. As shown in the Figure 4, I used Visual Studio to write and manage C# scripts that control the behavior of various interactive elements in the Unity environment. It organized interface and powerful tools, Visual Studio helped streamline the coding process and maintain a clean, manageable project structure.

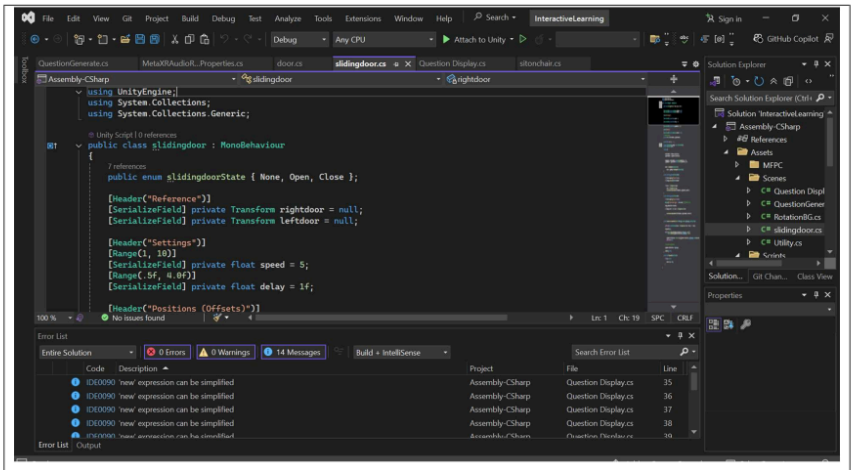


Figure 4(Visual Studio)

For example, the slidingdoor.cs script defines the states and movement of sliding doors, essential for creating realistic virtual environments. Visual Studio's integration with Unity made debugging easier, and features like IntelliSense, syntax highlighting, and error tracking significantly improved development speed and accuracy.

4) Microsoft Project.

Microsoft Project is a project management software that helps in planning, scheduling, resource allocation, and tracking the progress of tasks. It allows users to create detailed project timelines, set deadlines, assign responsibilities, and monitor the overall workflow. In my project, Microsoft Project was instrumental in organizing the entire

development process. I used it to break down the project into phases such as planning, design, development, testing, and deployment. It helped me set realistic deadlines, track task completion, and manage time effectively. By using Gantt charts and task dependencies, I was able to stay on schedule and ensure that every stage of the project progressed smoothly.

	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names	Ad
1		**1.Project Started**	**110 days**	**Mon 12/16/24**	**Fri 5/16/25**			
		2.Initiation	**12 days**	**Fri 12/20/24**	**Mon 1/6/25**			
		Research on virtual reality technology and its educational applications.	2 days	Fri 12/20/24	Sun 12/22/24			
		explore potential tools and resources	3 days	Mon 12/23/24	Wed 12/25/24			
		Research on project title ideas and themes.	4 days	Thu 12/26/24	Tue 12/31/24			
		Finalize project title.	2 days	Wed 1/1/25	Thu 1/2/25			
		Draft and submit the initial project plan	2 days	Fri 1/3/25	Mon 1/6/25			
		3.Planning	**5 days**	**Mon 1/6/25**	**Fri 1/10/25**			
		Generate a list of potential subtopics for the project report.	2 days	Mon 1/6/25	Tue 1/7/25			
11		Begin research on VR	2 days	Tue 1/7/25	Wed 1/8/25	7		

Figure 5(Microsoft Project)

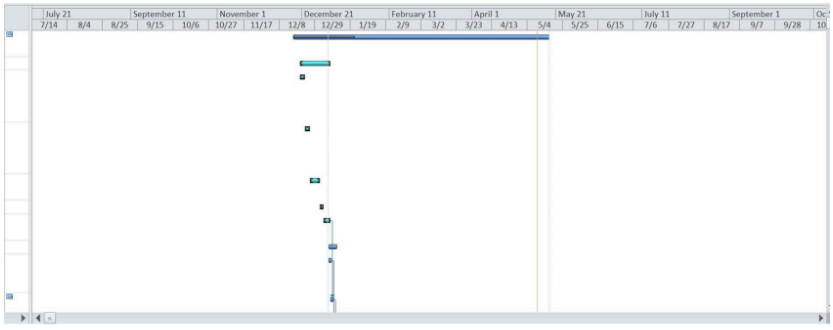


Figure 6(Microsoft Project)

5) PlayFab

PlayFab is a backend platform that provides essential services like user authentication, cloud data storage, leaderboards, and real-time analytics for games and interactive applications. In my project, I used PlayFab to handle user login and registration, store player progress, and manage data securely in the cloud. It helped streamline backend development without the need to build a custom server. PlayFab easy integration with Unity allowed me to track user activity and maintain a smooth, personalized experience within the application.

3.2) Hardware

1) Oculus VR headset:

The Oculus VR headset was a key component in delivering an immersive experience in my project. It allowed users to interact with the virtual environment in a realistic and engaging way, enhancing the overall learning and simulation experience. By using the headset, I was able to test how users navigate, interact, and respond to various elements in the virtual space. The Oculus controllers also made it possible to perform actions like grabbing, selecting, or moving objects, which helped in creating a hands-on, interactive environment. Overall, the headset played a crucial role in making the project more engaging, effective, and user centered.

Figure 7(Headset)

2)Oculus Controller:

The Oculus controllers were essential for enabling interaction within the virtual environment of my project. They allowed users to perform actions such as grabbing,

pointing, selecting options and navigating through the VR space with natural hand movements.

Figure 8(Controller)

This added a layer of realism and made the experience more intuitive and immersive. During development and testing, the controllers helped me fine-tune interactive elements and ensure smooth user input. Their precise tracking and ease of use significantly improved the overall interactivity and engagement of the project.

These were the technologies that I used in my project.

Chapter 4: The Developer Compass – Methodology

4.1 Research Approach

This project adopts a mixed-methods research approach, incorporating both quantitative and qualitative strategies to gain a comprehensive understanding of the VR platform's educational effectiveness and usability.

The quantitative approach focuses on measurable outcomes such as attendance data, quiz performance, time spent in interactive modules, and completion rates, which are collected using backend systems like PlayFab. The qualitative approach involves collecting user feedback through user observation. This provides insights into user satisfaction, engagement, and perceived effectiveness of VR as a learning medium.

To support structured development and evaluation, the project design also aligns with the Model-View-Controller (MVC) architectural pattern.

MVC separates data (model), interface (view), and control logic (controller), making the system easier to test, scale, and evaluate from a research perspective. This separation allows access to how data collection (model), user interface (view), and behavior (controller) influence learning outcomes, which aligns with both the qualitative and quantitative aspects of the study.

This mixed-methods approach is well-suited for a VR educational platform as it captures both the learning efficacy (through data) and user experience (through feedback), which are essential for holistic evaluation.

4.2 Development Methodology

The development of this Unity-based desktop educational platform followed the Waterfall Software Development Model. Waterfall is a linear and sequential development methodology in which each phase must be completed before moving on to the next. This model is especially useful when project requirements are clear from the beginning and the development can progress in a structured, step-by-step manner.

1) The Waterfall model includes the following key phases:

2) Requirement Analysis – Define what the system needs to do.

3) System Design – Plan how to build it (including the environment and technical setup).

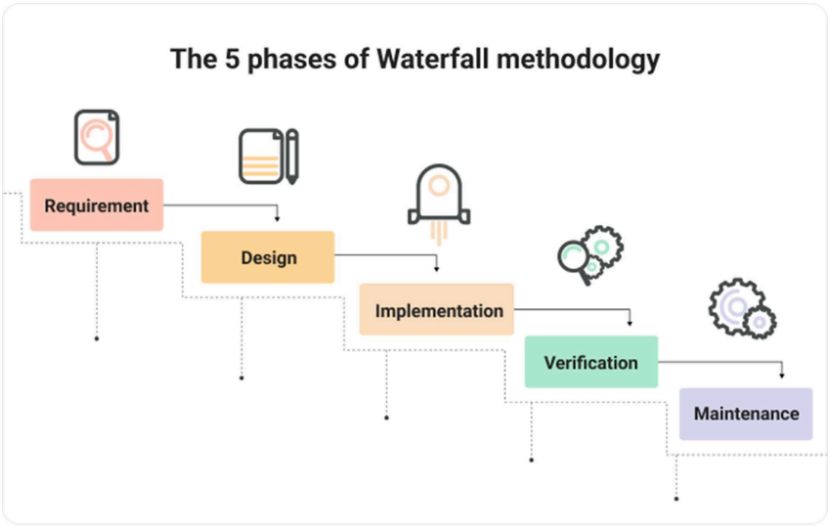


Figure 9(Waterfall Method)

4) Implementation – Build the system feature by feature.

5) Testing – Check that everything works as expected.

6) Deployment – Deliver the final version for use.

In this project, the Waterfall model was well-suited because the structure and goals were clear from the beginning: to build an interactive, game-like learning environment for Grade 5 students focusing on Math and Science.

The development process was as follows:

1) Requirement Analysis

The first step involved identifying key features and educational objectives. The system needed to allow student login, track attendance, and include subject-specific puzzles. Additionally, the environment had to be engaging and age-appropriate for young learners.

2) System Design

The next step was designing the structure of the project. The classroom environment (the main building) was created first to serve as the foundation. This included designing the 3D layout, wall placement, camera setup, and general scene arrangement. Once the basic environment was ready, interactive elements were planned and positioned. These included:

i) Chairs for sitting animations or navigation
ii) Blackboard or display screen for content delivery
iii) Doors with animations or interactions
iv) Lights to enhance visibility and atmosphere
v) Desks, decorative items, and UI panels.

This phase ensured that all assets were positioned and ready before logic or scripting was introduced.

3) Implementation

After the scene was visually and physically set up, development moved into the scripting and functionality phase. This included:

i) Creating the login and registration system using PlayFab.
ii) Building subject-specific puzzles for Math and Science.
iii) Implementing attendance tracking and interaction logging.

iv) Handling simple UI feedback, quiz responses, and navigation controls.

Each of these features was implemented one at a time, only after the prior system was complete, following the Waterfall sequence.

4) Testing

After each component was implemented, functional and usability testing was performed. Testing ensured that:

i) Students could log in and register successfully
ii) Puzzles appeared based on the selected subject

iii) Attendance and session data were recorded correctly

iv) UI elements were simple and readable for Grade 5 students

5) Deployment

Finally, the entire application was built and packaged for desktop use. It was tested in classroom-like scenarios to ensure that the system was stable and that interactions were suitable for the target age group.

This step-by-step progression from building the scene, placing objects, and then layering interactivity is perfectly aligned with the Waterfall methodology. Since each part of the system depended on the successful completion of the previous part, the structured flow ensured that development stayed organized, especially for a solo developer.

4.3 Design

1) Design of the product

The design of this educational desktop application focuses on creating an interactive and age-appropriate learning environment for Grade 5 students. Built in Unity, the system simulates a virtual classroom where students can log in, choose subjects, and solve educational puzzles in Math and Science. The design followed a step-by-step process,

The 3D classroom was created as the main setting for all activities. It includes walls, floors, and ceilings that mimic a real classroom as shown in Figure 10. Desks and chairs were placed for visual immersion, along with a blackboard or screen area to

display puzzle content. Lighting and windows were added to create a bright, welcoming space, and simple door animations helped make the environment more dynamic.

Figure 10(Design)

After setting up the environment, various Game Objects were added to bring the classroom to life as shown in figure 11. These included interactable chairs, desks, lights, and blackboards. All objects are there as shown in the figure

Figure 11(Design)

The user interface (UI) was designed to be simple and student friendly. It features large buttons, bright colors, and readable fonts. Students can log in and register from the home menu. The puzzle screen includes input fields, visual prompts, and motivational messages like "Well done!" or "Try again!" to guide and encourage students.

The learning system is divided into two subject modules: Math and Science. Math puzzles include number problems and basic arithmetic. Science tasks involve labeling diagrams and object identification. Each subject is handled separately, helping students focus on one area at a time. All puzzles align with Grade 5 learning objectives.

2) Use case Diagram

To better understand how a student interacts with my application, I created a Use Case Diagram that outlines the main features and functions from the user's perspective. This diagram helped me plan the flow of the application as shown in figure 12 and made it easier to visualize the learning journey within the system.

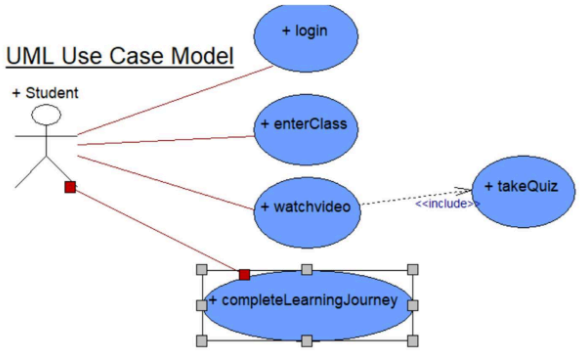


Figure 12(Use case)

In my project, the student is the only actor, and they interact with several key features. The process starts with the login, where the student enters their credentials to access the system. Once logged in, they can enter the classroom environment. Inside the classroom, they have the option to watch educational videos, which guide them through the topic.

After watching the video, the student is directed to take a quiz to check their understanding. I used an include relationship to show that the quiz is part of the video-learning process. Finally, when all these steps are completed, the student reaches the final stage of the system, which I called completeLearningJourney. This represents the full educational path within the application from logging in to completing the learning task.

I decided to include a Use Case Diagram in my project because it helped me clearly define what actions the student should be able to perform. It also ensured that I didn't miss any important features while building the system. Since my project is focused on learning flow and student interaction, the use case model made it easier to stay aligned with the core educational objectives. It served as a roadmap that guided the development of each module in a structured and student-centered way.

3)ERD (Entity Relationship Diagram)

To structure the backend of my system and ensure data flows logically between components, I created an Entity Relationship Diagram (ERD). This Figure13 helped me define the key entities in my application, their attributes, and the relationships between them.

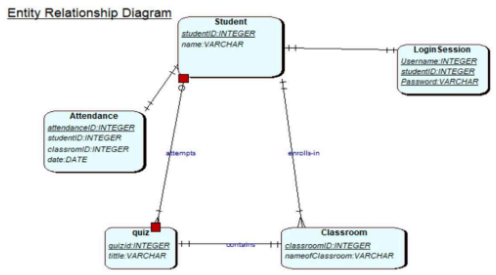


Figure 13(ERD)

My project focuses on building an interactive learning environment for students, so I identified five main entities as follows:

i) Student
ii) Login Session
iii) Classroom
iv) Quiz
v) Attendance.

Each of these plays a specific role in managing student data, classroom activities, and learning progress.

Now let's see the attribute inside the entities.

i) Student

The student entity is at the center of the system. It contains:

- studentID (INTEGER) – A unique identifier for each student.
- name (VARCHAR) – The student's name.

This entity connects to multiple parts of the system, including login, attendance, and quizzes.

ii) Login Session

The Login Session entity stores login credentials:

- username (VARCHAR) – The student's username.
- studentID (INTEGER) – A foreign key that links to the student.
- password (VARCHAR) – The student's password.

This allows each student to securely log into the system using PlayFab or local authentication logic.

iii) Classroom

Each student is assigned to a classroom, represented by the classroom entity:

- classroomID (INTEGER) – A unique identifier for the classroom.
- nameofClassroom (VARCHAR) – The name or label of the classroom.

Students enroll in classrooms, and each classroom contains multiple quizzes.

iv) Quiz

The Quiz entity represents subject-based puzzles or assessments:

- quizID (INTEGER) – A unique identifier for each quiz.
- title (VARCHAR) – The name or description of the quiz (e.g., "Math Puzzle 1").

Each student attempts quizzes, and each quiz is linked to a specific classroom through the contents of relationship.

v) Attendance

To track participation, I added an Attendance entity:

- attendanceID (INTEGER) – A unique identifier for each attendance record.
- studentID (INTEGER) – The student present (foreign key from Student).
- classroomID (INTEGER) – The classroom the student attended.
- date (DATE) – The date of the attendance.

This table helps record when students are active in the classroom environment.

Entity Relationship

Entity	To Entity	Relationship	Description
Student	LoginSession	One to one	Each student has one login session linked by studentID
Student	Classroom	Many to one	A student enrolls in one classroom
Student	Quiz	One to many	A student can attend only one quiz.
Student	Attendance	One to one	A student can have only one attendance records.
Classroom	Quiz	One to one	Each classroom contains multiple quizzes.

This ERD helped me map out how data is stored and linked within my application. It ensured that each component from login to quiz attempts and attendance was

connected in a meaningful way, which was especially important for tracking student activity and learning progress throughout the system.

4) Wireframe

To design the structure and layout of the virtual learning space, I created wireframes directly within Unity. These wireframes represent the key areas a student interacts with in the application. Instead of using external design tools, I used Unity's scene view and basic GameObject placement to visualize and plan the spatial arrangement of the environment. This approach helped me build a realistic and navigable experience.

There are four main areas in the wireframe design:

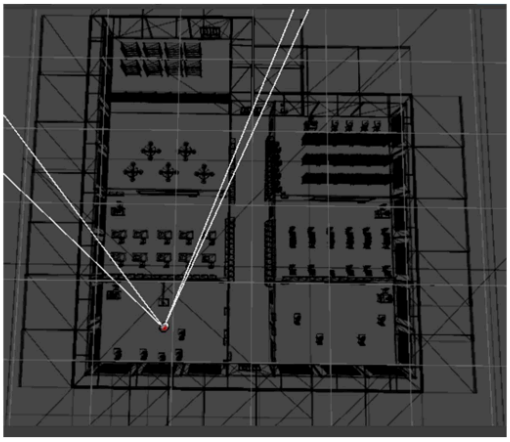


Figure 14(Main Building)

i) Main Building

As shown in Figure 14 this is the main building where it serves as the central hub of the application. It connects all other areas including the classroom, library and lunch area.

The student starts here after logging in. I designed it with a large hallway and multiple doorways to allow smooth navigation between different rooms. This structure helps students understand the virtual environment like a real school layout.

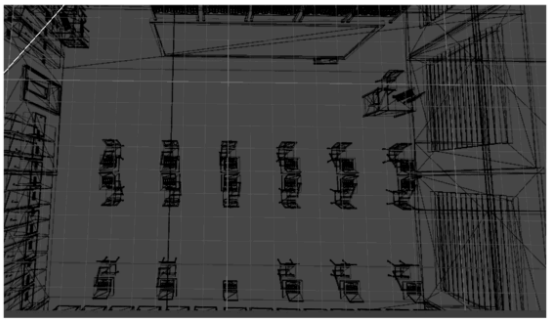


Figure 15(Classroom)

As shown in Figure 15 this is the classroom is the core learning space where students engage with subject-based puzzles. I placed desks, chairs, a blackboard and lighting to resemble a typical Grade 5 classroom. The UI components for subject selection, puzzle prompts, and quizzes are also anchored within this space. The design goal here was to make the environment both familiar and interactive.

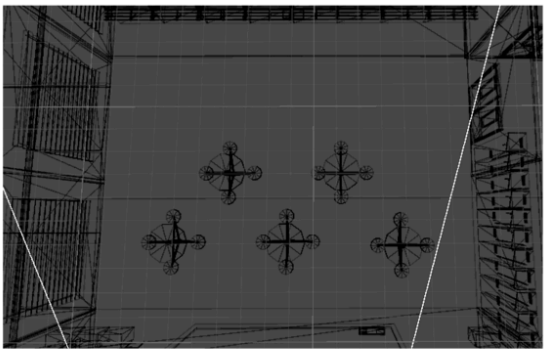


Figure 16(Lunchroom)

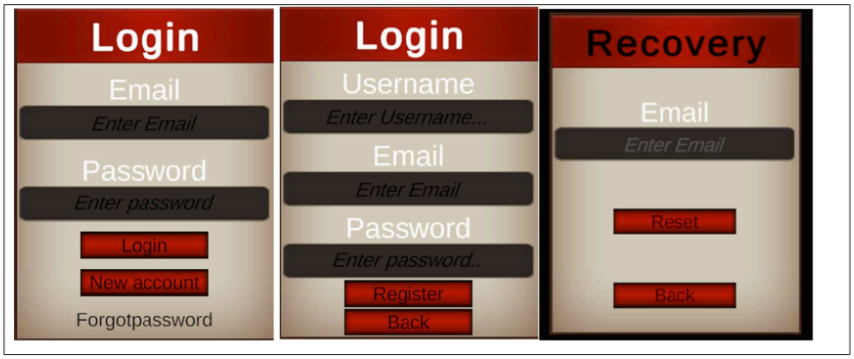
As shown in Figure 16 the lunch area simulates a casual space, giving students a break-like visual within the experience. It includes tables, chairs, and background elements like food counters. While no major interactions happen here, I designed it to enhance realism and give a complete feel to the school environment.

Figure 17(Library)

As shown in Figure 17 the library is designed as a quiet, informational space. While it's not used for puzzle interaction, it serves as a visual and thematic element in the virtual school. It includes bookshelves, tables, and ambient lighting to create a calm atmosphere. I may expand this area later for reading-based learning activities or storytelling modules.

Login Page

These are my login pages wireframes where it will help to login, register and email recovery in case you forgot the password.



Chapter 5 Building Worlds – Implementation and testing

5.1 Implementation

After completing the planning and design stages, I began implementing the educational desktop application using the Unity game engine. The implementation followed the Waterfall model, which allowed me to build the system module by module in a structured, linear flow. Each feature was tested before progressing to the next phase. My focus was on creating a user-friendly, age-appropriate learning experience for Grade 5 students with structured content delivery in Math and Science.

1) Environment Construction

The first step in implementation was to design and set up the game's environment. I created four key areas using Unity's scene editor: the Main Building, Classroom, Library, and Lunch Area. These were modeled to resemble real-world school spaces to ensure familiarity and engagement for the users.

i) The Main Building acts as the central hub where the user(student) starts after logging in. From here, they can navigate to other rooms.

ii) The classroom is where the actual learning process occurs through video and quizzes.

iii) The Library and Lunch Area were added to enhance realism, even though they are not interactive in the current version.

All objects such as walls, doors, desks and lights were placed using Unity's 3D layout tools. These rooms were created in separate scenes and are connected through scripted transitions that enable smooth movement between them using mouse clicks.

2) User Interface and Navigation

I designed the UI to be clean, intuitive, and age-appropriate for Grade 5 students. Using Unity's UI canvas system. I created large, colorful buttons for login, registration, scene navigation and quiz interaction. Font sizes and colors were carefully selected to maintain visibility and engagement for younger users.

Scene transitions were implemented using Unity's SceneManager.LoadScene() function, triggered by button events or object collisions (e.g., entering the classroom through a door). Navigation is restricted to mouse and keyboard inputs to match the desktop environment.

3)User Authentication System

A key feature of the system is the user authentication module, implemented using PlayFab, a backend platform that provides login, user data management, and cloud functionality. This system ensures that each student has a personal, secure account with persistent data storage.

i)Login Process:

When the application starts, the user is presented with a login screen. If the student already has an account, they can enter their username and password. Upon successful verification, they are granted access to the main game scene.

ii)Registration:

If the student does not have an account, they can click on the Register button. This opens a new panel where they can create a new username, password and email address. Once submitted, this information is stored in the backend via PlayFab API.

iii)Forgot Password:

In case a student forgets their password, a “Forgot Password” option is available. By entering their registered email address, PlayFab sends a password reset link directly to their inbox. This ensures account recovery is secure and user-friendly.

This authentication process ensures that all progress and attendance logs are tied to individual student accounts, allowing for personalized tracking and future extensions such as scoreboards or teacher dashboards.

4) Game Flow and Scene Transitions

Once the student logs in successfully, they are taken to the Main Scene, which represents the entrance of the school building. This scene marks the beginning of the educational game journey, referred to as the game flow. From the main entrance, the student can walk toward different doors labeled "Math" and "Science." These doors are connected to separate scenes that load the respective subject-specific classroom.
Entering a Classroom:

When the student enters either the Math or Science room, they are instructed (through on-screen prompts) to sit on a designated chair. This interaction triggered by collision detection with a sitting zone.

Once the player sits, the learning process automatically begins.

5) Video-Based Learning Trigger

One of the most important learning features in the system is video playback. When a student sits on the chair inside the classroom, a pre-recorded instructional video is triggered automatically.

This video:

i) Plays on a virtual board or screen inside the scene.

ii) Cannot be skipped or bypassed, ensuring that students watch the full lesson before moving on.

iii) Is subject-specific, meaning different content is shown in Math and Science classes.

This approach is designed to simulate a teacher-led session, where learning content must be viewed before assessment begins.

6) Quiz Module Integration

After the video is completed, the system automatically enables the quiz module, which consists of six questions per subject.

i) Each question is displayed one at a time.

ii) Students interact using multiple-choice buttons or input fields.

iii) Immediate feedback is provided (e.g., “Well done” or “Try Again”) to reinforce learning.

Once all six questions are answered, the quiz ends.

Completion Logic: After the last question, the system displays a message indicating the class session has been completed. The student is then returned to the main building.

7) Attendance Tracking and Progress Logging

To monitor student participation, attendance is recorded in the backend each time a student logs in and enters a classroom. A timestamp is stored using PlayFab’s user data API, which includes:

i) Login Date and Time

ii) Subject Entered

iii) Quiz Completion Status

Although quiz scores are not saved in the current version, the system architecture supports easy integration of scoring and result storage in future updates.

8) Additional Functional Highlights

i)Error Handling: All input fields have basic validation to prevent empty submissions or invalid credentials. Helpful messages are shown for failed login or registration attempts.

ii)Animations: Simple animations were applied to buttons, doors, and video screens to make the experience more engaging.

iii)Audio Feedback: Audio cues such as button clicks, door sounds, and video start/finish tones help enhance the experience for students.

9) Key Implementation Challenges and Solutions

During development, I encountered a few challenges:

i)Scene Loading Issues: Unity sometimes delayed video playback after scene transitions. I solved this by preloading the video player and adding a small buffer delay before starting playback.

ii)PlayFab Email Verification: Setting up email recovery through PlayFab required configuring the PlayFab Title ID and authentication methods. I followed PlayFab's documentation to connect the API properly.

iii)UI Scaling for Different Resolutions: Some UI elements appeared too small or large on different screens. I used Unity's canvas scaler with screen size settings to ensure consistent visuals.

iv) C#: I also face some lack of API knowledge for the codes for different functions.

These issues were resolved through testing and step-by-step debugging during the implementation phase.

10) Summary of Implementation

The implementation of this educational desktop application combined structured learning flow and immersive Unity environments to deliver complete experience for Grade 5 students. Starting from environment setup to video-guided learning and quizzes, each module was developed and tested to ensure functionality and ease of use. This phase laid the foundation for the next chapter Testing where I evaluated each component and user flow to ensure the system worked as expected and delivered a meaningful learning experience.

5.2 Testing

After completing the implementation phase, I conducted extensive testing to ensure that all components of the system worked as intended. Since the system is designed for Grade 5 students, I focused on functionality, ease of use, interaction flow, and error handling. The testing was performed module by module, using a combination of manual walkthroughs, simulated scenarios, and Unity's built-in debugging tools

1) Functional Testing: Th

2) User Interface Testing - The interface was tested for clarity, responsiveness, and accessibility for the target age group (10–11 years old). All button sizes and placement were tested to be easy to click using a mouse, with sufficient spacing and text readability Fonts were reviewed for visibility and size across various screen resolutions.

Figure 18(User interface)

3. Login Page Testing: I simulated full student workflows to ensure a smooth end-to-end experience.

i) Registered with a new account a pop message will be there in login message for the registered account after you registered as shown in the figure19 and if not valid email address this will be the pop-up text.

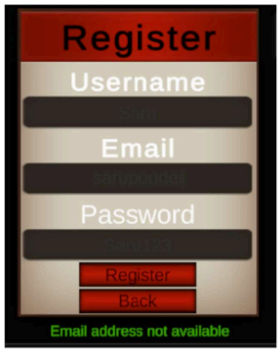


Figure 19 (registered)

ii) Login In: If you enter your login email address and password there will be the text popping login in shown in figure 20.

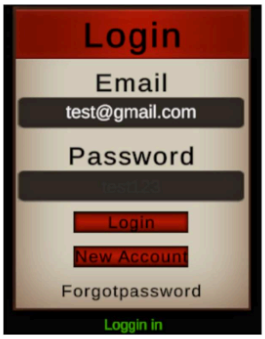


Figure 20(Login in)

iii) Recovery: In case you forgot your password you can write an email in the input field written down an email will be sent in your email address if you are registered. The text pop email sent as shown in Figure 21 and Figure 21 is a recovery email being sent.

Figure 21(Recovery)

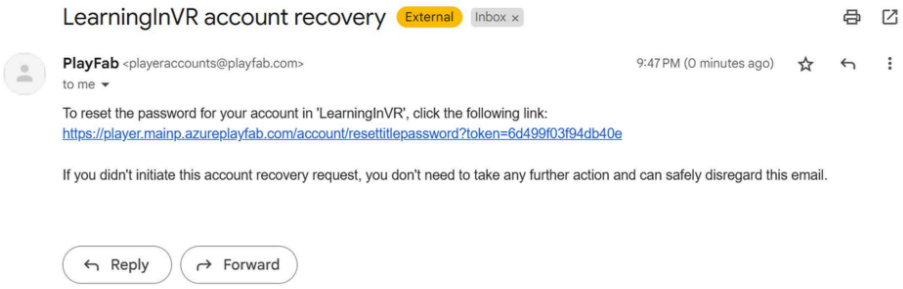


Figure 22(recovery email)

iv) Backend PlayFab: In PlayFab after you register your attendance will be saved as player in PlayFab account of the teacher as shown in figure 23.

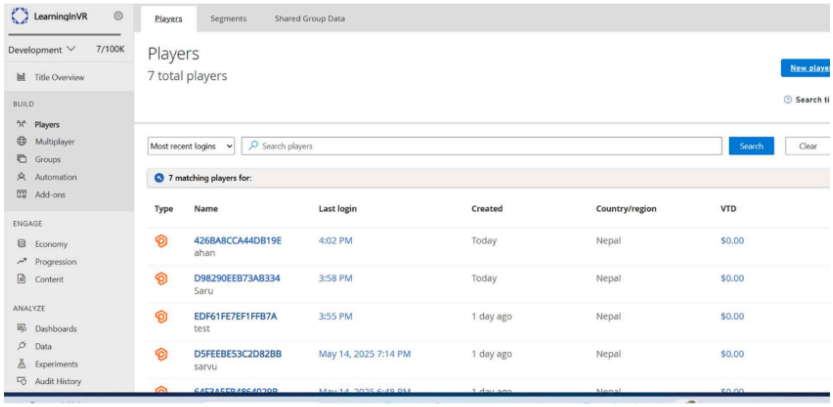


Figure 23(attendance)

v) Interactive Building: I've attached the video of interactive building.

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Figure 24(Video of Building)

vi) Quizzes: After the video is completed the quiz will start as the video attached in figure 25.

b215c78e72ee4e0a9
a59997e3d4d3900.M

Figure 25(Quizzes)

vii)Video: The video playing has been attached to figure 26.

Figure 26(Video)

5.3 Functional Testing

Each major feature of the application was tested individually to confirm its functionality.

Feature Tested	Description	Result
Login System	Tested with valid and invalid credential.	Working properly.
Registration	Tested with new usernames and duplicate entries.	Duplicate check passed.
Password Recovery	Entered a registered email to receive a reset link via PlayFab.	The email was received successfully.
Scene Transition	Navigated from the main building to the classroom and back.	The scene transitions were smooth
Sit to Start Video	Sat on chair inside the classroom to start the video.	The video triggered correctly.

Video Completion to Quiz Flow	Waited for the video to end and checked if the quiz was loaded or not.	Quiz appeared correctly.
Quiz Interaction	Answered all six questions and received feedback.	Login and UI working.
Attendance Logging	Checked if login time and subject were recorded in PlayFab	Data Stored correctly.

Chapter 6 Stepping into the Rift - Product Evaluation

After completing the implementation and testing phases, I evaluated the overall performance, usability, and educational impact of my application. This evaluation was important to determine whether the system met its original objectives to provide a structured, engaging, and subject-aligned learning experience for Grade 5 students in a desktop environment.

1) Functionality

From a functional perspective, the application works as intended. All major features including login, registration, password recovery, scene transitions, video-based learning and quizzes were successfully implemented and tested. Students can securely log in or create an account. If they forget their password, they can retrieve it through a PlayFab-managed email reset system. Once logged in, the system smoothly transitions into the main game environment, allowing students to explore and enter different subject rooms. The logic flow requires students to first sit in a classroom, watch a video, and then complete a 6-question quiz enforces a structured learning path. All these components functioned properly and integrated well together.

2) Usability

One of my goals was to create a child-friendly user interface for Grade 5 students. Based on testing and observation, the system is easy to use and visually appropriate for

the age group. Buttons are large and colorful, and navigation is guided through on-screen prompts. Overall, the interface is intuitive, requiring little to no training for students to begin using it.

3) Performance and Stability

The application was tested across various screen sizes and computer configurations. It maintained stable performance, with no crashes or major bugs. Scene transitions were smooth, video playback was uninterrupted, and quiz interactions were responsive. Unity's optimization tools were used to ensure consistent frame rates, and the application ran well even on lower-spec machines. Load times between scenes were acceptable, and no lag or input delay was observed during gameplay.

4)Educational Effectiveness

This application was designed to support learning in two subjects Math and Science for Grade 5 students. The system encourages students to engage with subject-specific content through short videos followed by quizzes. The enforced sequence (sit → watch → quiz) ensures students do not skip learning material. Quizzes provide immediate feedback, which helps reinforce understanding and motivates retrying if they get answers wrong.

5) Backend Integration and Data Tracking

The integration of PlayFab was a significant technical achievement. It allows for:

i)Secure user login and registration

ii)Password reset through email

iii)Cloud-based tracking of login timestamps and attendance

This backend connectivity opens possibilities for future improvements such as storing quiz scores, tracking progress, or generating student reports for teachers or parents.

6) Challenges and What I Learned

While the final product met its goals, I encountered several challenges during implementation:

i)My limited familiarity with C# scripting and Unity's API led to some delays in setting up event triggers, managing video states, and connecting scenes.

ii)Integrating PlayFab requires reading a lot of documentation and experimenting with code for authentication, email recovery, and data saving.

iii)Ensuring UI responsiveness across different resolutions involved learning how to use Unity's Canvas Scaler and anchor presets effectively.

Overcoming these issues helped me strengthen my skills in Unity development, backend integration, and user-centered design.

7) Limitations

i)While the product works well, there are a few limitations:

ii)The quiz system is currently static; questions don't change or randomize.

iii)There is no score tracking or student progress dashboard yet.

iv)Only two subject rooms (Math and Science) are included — additional subjects would add more value.

v)The system does not include audio feedback or accessibility options for students with special needs.

8) Future Improvements

If I were to continue developing this project, I would aim to:

i) Add more subject areas like English, Social Studies, and Computer Science.

ii) Include score tracking and performance summaries for students and teachers.

iii)Enable randomized questions and difficulty levels.

iv) Add voice narration and hint systems during quizzes.

v) Create a teacher portal to monitor student activity.

vi) Create an escape room for more activity.

9 Overall Evaluation

The final product successfully meets its core objectives: to provide a guided, interactive, and subject-aligned learning experience for young students using Unity. It combines structured educational content, engaging visuals, and smooth backend integration in a way that's accessible and easy to use.

This project not only demonstrates my technical ability to develop and integrate systems but also reflects a user-focused design that prioritizes both functionality and learning value. With further development, this platform could grow into a complete virtual school solution.

Chapter 7 Reflection from the Dev's Chair- Project Evaluation

7.1Project Evaluation

Developing this Unity-based educational platform has been a transformative journey — not just in terms of learning new technical skills but also in managing a real-world project from concept to completion. What began as a simple idea to create a learning tool eventually evolved into a full-fledged virtual classroom experience tailored for Grade 5 students. Over the course of several months, from December 2024 to May 2025, I went through all the stages of software development from research and planning to design, implementation, testing, and final submission each bringing its own set of challenges and growth opportunities.

The journey began during the initiation phase on December 20, 2024, when I started researching virtual reality and its educational relevance. Over the next two weeks, I explored different tools and platforms and finalized Unity as the development engine due to its visual flexibility and compatibility with desktop systems. I also looked at the scope of the project: a desktop-based virtual school where students could navigate different rooms and interact with content designed to reinforce classroom learning. By January 6, 2025, I had submitted my initial project plan and confirmed my development direction.

The planning phase, which lasted until January 10, involved mapping out the virtual environment and organizing how the student journey would unfold from the school entrance to subject-specific classrooms. I broke down the entire experience into stages that felt natural and goal-oriented for young learners. This included selecting the key scenes I wanted to build: a main hallway, a classroom for learning, a library for aesthetics and realism, and a lunch area to give the environment a sense of completeness. During this time, I also began drafting the core interaction logic, such as triggering lessons based on seating position and progressing only after completion of learning content.

The most demanding period was the implementation phase, which spanned January to March 2025. This phase involved translating design into functionality. I created virtual environments using Unity's 3D tools, placed interactive objects like chairs and doors, and developed scripts that handled scene transitions and learning progression. One of the most unique features I implemented was the "sit to start" mechanism, where students had to sit on a chair in the classroom for the lesson to begin. This ensured active participation before moving forward.

To support a structured learning path, I scripted lesson delivery through video playback, followed by a six-question quiz. While this flow seems simple, ensuring that it worked without bugs across multiple scenes and scenarios required precise event handling and user flow control. Additionally, I developed a progression system inspired by escape room mechanics. For example, classroom doors would only open after all quiz questions were answered correctly, which created a feeling of accomplishment for students and encouraged task completion.

From March 27 to April 9, I entered the testing phase, where I examined every part of the system thoroughly. I tested usability and flow with simulated users, identifying minor bugs and interface misalignments. One of the key aspects I tested was whether the video would reliably play and be completed before the quiz appeared. I also evaluated how scene transitions behaved on different screen resolutions and verified that the classroom environment responded well across various setups. Additionally, I tested the

accuracy of user activity tracking, ensuring that every classroom visit and completed lesson was properly logged in the background.

By the time the finalization phase began on April 10, the system was nearly complete. Over the next several weeks, I focused on optimizing the experience and preparing the documentation and materials for submission. This included cleaning up animations, organizing scenes, refining the user interface, and conducting walkthroughs to ensure nothing was missed. I also recorded visual demonstrations of the student flow from start to finish. This helped capture not only the technical features but the atmosphere and structure that I had envisioned from the beginning.

A major strength of the platform lies in how it balances realism and simplicity. Students are introduced into a school-like environment that includes elements they recognize a hallway, classroom, blackboard, and seating which makes the experience feel authentic. At the same time, the learning journey is intentionally streamlined so that students focus on one goal at a time: enter the room, complete the task, and progress naturally. The project maintains clarity while still encouraging interaction.

In terms of structure, following the Waterfall development methodology helped significantly. Each stage from initiation to implementation built on the previous one, ensuring that the project didn't lose direction. This allowed me to track progress effectively using the Gantt chart and remain on schedule. Working within deadlines helped me stay disciplined, especially as the tasks became more complex over time. Looking back, the timeline structure reflected in the Gantt chart was a critical tool in keeping everything on track, from early research in December 2024 to final submission on May 16, 2025. What makes this project personally fulfilling is how it integrates educational design with immersive interaction. Instead of making students click through lessons passively, the system encourages them to take part in a virtual space, engage actively, and complete meaningful tasks. The use of visual storytelling, progressive unlocking of content, and subject-specific classrooms creates an environment that supports learning while remaining fun and intuitive. Even the smallest design decisions such as requiring the student to sit before the video plays were made with the user experience in mind. By the end of this project, I feel I have created more than just a

technical solution. I've developed a foundation for a digital learning tool that could one day support broader classrooms or school systems. It's designed with young learners in mind, but also considers the practical needs of instructors, such as tracking participation and performance. While there is room for expansion, the core system from user journey to lesson delivery functions effectively and offers complete experience.

7.4 Timeline Insight briefly.

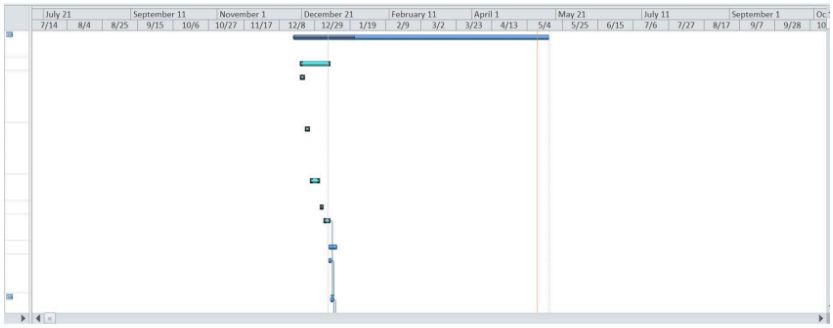
Phase	Dates	Achieved
Initiation	December 20 – January 6	Research, project planning, title finalization
Planning	January 6 – January 10	The scene layout, flow structure, Tech stack confirmed.
Implementation	January – March	Full building: environment, logic, backend and quiz.
Testing	March 27 – April 9	Usability, logic, flow, and backend and testing
Finalizing Report	April 10 – May 16	Polish, presentation, and submission.

Project Planning:

	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names	Ad
		1.Project Started	**110 days**	**Mon 12/16/24**	**Fri 5/16/25**			
		2.Initiation	**12 days**	**Fri 12/20/24**	**Mon 1/6/25**			
		Research on virtual reality technology and its educational applications.	2 days	Fri 12/20/24	Sun 12/22/24			
		explore potential tools and resources	3 days	Mon 12/23/24	Wed 12/25/24			
		Research on project title ideas and themes.	4 days	Thu 12/26/24	Tue 12/31/24			
		Finalize project title.	2 days	Wed 1/1/25	Thu 1/2/25			
		Draft and submit the initial project plan	2 days	Fri 1/3/25	Mon 1/6/25			
		3.Planning	**5 days**	**Mon 1/6/25**	**Fri 1/10/25**			
		Generate a list of potential subtopics for the project report.	2 days	Mon 1/6/25	Tue 1/7/25			
		Begin research on VR frameworks like Unity	2 days	Tue 1/7/25	Wed 1/8/25	7		

		Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Na
28			**6. Testing**	**10 days**	**Thu 3/27/25**	**Wed 4/9/25**		
29			Conduct usability testing with educators and learners.	2.5 days	Fri 3/28/25	Tue 4/1/25		
30			Collect user feedback to refine the platform.	2.5 days	Tue 4/1/25	Thu 4/3/25		
31			Test scalability to ensure the platform handles multiple users effectively	2 days	Thu 4/3/25	Fri 4/4/25		
32			Finalizing Project	4 days	Fri 4/4/25	Wed 4/9/25		
33			**7. Finalizing**	**16 days**	**Thu 4/10/25**	**Thu 5/1/25**		
34			Production Presentation	8 days	Thu 4/10/25	Mon 4/21/25	32	
35			Report Submission	20 days	Mon 4/21/25	Fri 5/16/25		
36			**8. Supervisor Meeting**	**14 days**	**Tue 4/29/25**	**Fri 5/16/25**		

Gnatt Chart:


July 21
September 11
November 1
December 21
February 11
April 1
May 21
July 11
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7/27
8/17
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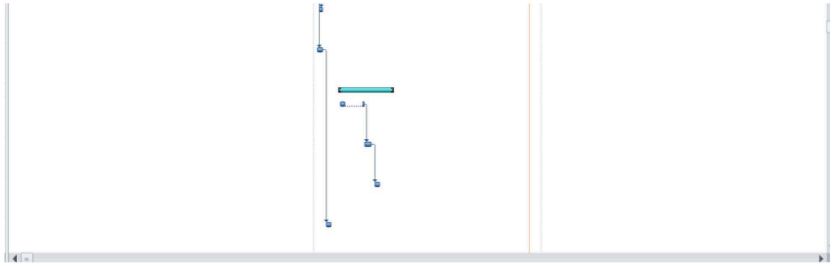
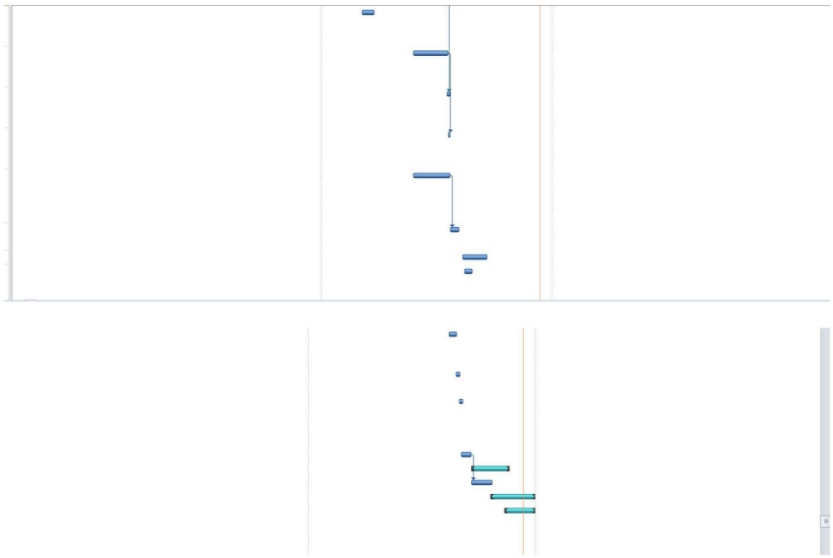
9/28





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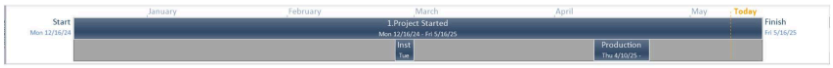

Chapter 8 The Final Lock - Conclusion

Developing this educational desktop application using Unity has been one of the most meaningful and rewarding experiences of my academic journey. Throughout this project, I had the opportunity to explore how technology can be used not just to deliver content, but to shape how students experience and engage with learning.

The concept behind the project was to simulate a virtual school where students could log in, move through different rooms, and learn through videos and quizzes. I wanted to create something more than a traditional quiz app or textbook-based tutorial. My goal was to make students feel like they were entering a school, sitting in a classroom, watching their teacher explain a topic, and then applying what they learned immediately afterward.

One of the most important parts of this system was the login and registration module, built using PlayFab. Being able to connect Unity with a cloud-based backend like PlayFab was a major step in taking this project from a simple local app to a system that could grow and scale.

In terms of technical performance, the application runs smoothly on desktop devices and handles scene transitions, video playback, and quiz interactions without any major issues. I tested it across different screen resolutions and hardware setups to ensure a stable and consistent experience. All UI components were designed to be large, clear, and easy to understand, especially important for the age group I was targeting.

From the beginning, I used the Waterfall development methodology to plan and execute the project. I started with requirement gathering, followed by design, implementation, and testing. Each phase built upon the previous one, and I only moved forward once I was confident that the current phase was complete. This structure helped me stay organized and focused, even when the project became complex.

This project taught me not only how to build a functional system, but also how to think about user experience, educational structure, and backend integration. It showed me how powerful tools like Unity and PlayFab can be when used together with a clear purpose. Most importantly, it reminded me that technology has the potential to make learning more accessible, more engaging, and more effective, especially for students who may not thrive in traditional classroom settings.

As I reflect on this journey, I feel proud of what I've built. It's not a perfect system, but it's a solid first step. It brings together creativity, logic, design, and purpose—and that's exactly what I set out to achieve.

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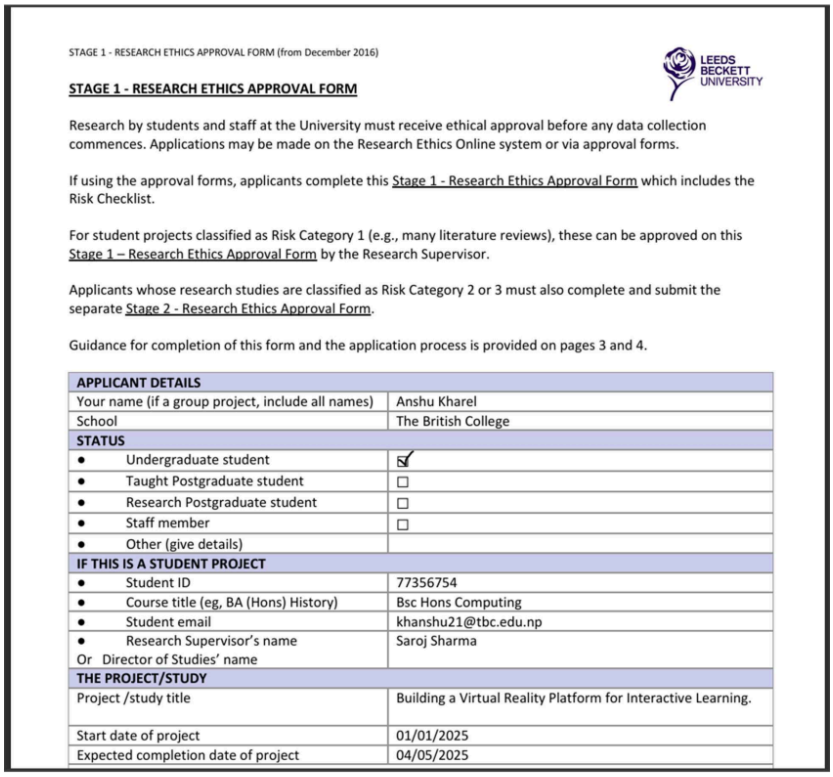
Appendices

Ethical Form



STAGE 1 - RESEARCH ETHICS APPROVAL FORM (from December 2016)

STAGE 1 - RESEARCH ETHICS APPROVAL FORM

Research by students and staff at the University must receive ethical approval before any data collection commences. Applications may be made on the Research Ethics Online system or via approval forms.

If using the approval forms, applicants complete this Stage 1 - Research Ethics Approval Form which includes the Risk Checklist.

For student projects classified as Risk Category 1 (e.g., many literature reviews), these can be approved on this Stage 1 – Research Ethics Approval Form by the Research Supervisor.

Applicants whose research studies are classified as Risk Category 2 or 3 must also complete and submit the separate Stage 2 - Research Ethics Approval Form.

Guidance for completion of this form and the application process is provided on pages 3 and 4.

APPLICANT DETAILS	
Your name (if a group project, include all names)	Anshu Kharel
School	The British College
STATUS	
• Undergraduate student	☑
• Taught Postgraduate student	☐
• Research Postgraduate student	☐
• Staff member	☐
• Other (give details)	
IF THIS IS A STUDENT PROJECT	
• Student ID	77356754
• Course title (eg, BA (Hons) History)	Bsc Hons Computing
• Student email	khanshu21@tbc.edu.np
• Research Supervisor's name Or Director of Studies' name	Saroj Sharma
THE PROJECT/STUDY	
Project /study title	Building a Virtual Reality Platform for Interactive Learning.
Start date of project	01/01/2025
Expected completion date of project	04/05/2025

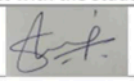
Project summary – please give a brief summary of your study (maximum 100 words)	
The project "Building a Virtual Reality Platform for Interactive Learning" aims to create a platform that uses virtual reality (VR) to make learning more engaging and immersive. By simulating real-world scenarios, the platform will transform traditional education into an interactive experience. The project will explore VR technologies and tools like Unity and Unreal Engine, focusing on how they can improve knowledge retention and student engagement. Ultimately, the goal is to create a scalable, interactive learning environment that can revolutionize education.	
CONFIRMATION STATEMENTS	
The results of research should benefit society directly or by generally improving knowledge and understanding. Please tick this box to confirm that your research study has a potential benefit. *If you cannot identify a benefit you must discuss your project with your Research Supervisor to help identify one or adapt your proposal so the study will have an identifiable benefit.*	☑
Please tick this box to confirm you have read the Research Ethics Policy and the relevant sections of the Research Ethics Procedures and will adhere to these in the conduct of this project.	☑

	RISK CHECKLIST - Please answer ALL the questions in each of the sections below – tick YES or NO WILL YOUR RESEARCH STUDY.....?	YES	NO
1	Involve direct and/or indirect contact with human participants?	☐	☑
2	Involve analysis of pre-existing data which contains personal or sensitive information not in the public domain?	☐	☑
3	Require permission or consent to conduct?	☐	☑
4	Require permission or consent to publish?	☐	☑
5	Have a risk of compromising confidentiality?	☐	☑
6	Have a risk of compromising anonymity?	☐	☑
7	Collect / contain sensitive personal data?	☐	☑

8	Contain elements which you OR your supervisor are NOT trained to conduct?	☐	☑
9	Use any information OTHER than that which is freely available in the public domain?	☐	☑
10	Involve respondents to the internet or other visual/vocal methods where participants may be identified?	☐	☑
11	Include a financial incentive to participate in the research?	☐	☑
12	Involve your own students, colleagues or employees?	☐	☑
13	Take place outside of the country where you are enrolled as a student, or for staff, outside of the UK?	☐	☑
14	Involve participants who are particularly vulnerable or at risk?	☐	☑
15	Involve any participants who are unable to give informed consent?	☐	☑
16	Involve data collection taking place BEFORE informed consent is given?	☐	☑
17	Involve any deliberate deception or covert data collection?	☐	☑
18	Involve a risk to the researcher or participants beyond that experienced in everyday life?	☐	☑
19	Cause (or could cause) physical or psychological harm or negative consequences?	☐	☑
20	Use intrusive or invasive procedures?	☐	☑
21	Involve a clinical trial?	☐	☑
22	Involve the possibility of incidental findings related to health status?	☐	☑
23	Fit into any of the following security-sensitive categories: concerns terrorist or extreme groups; commissioned by the military; commissioned under an EU security call; involves the acquisition of security clearances? If yes, see the guidance.	☐	☑

CLASSIFICATION **The following guidance will help classify the risk level of your study**	**Tick the box which applies to your project**
If you answered **NO** to all the above questions, your study is provisionally classified as **Risk Category 1** (literature reviews will be Risk Category 1).	☑
If you answered **YES** to any question from 1-13 and **NO** to all questions 14-22, your study is provisionally classified as **Risk Category 2**.	☐
If you answered **YES** to any question from 14-22, your study is provisionally classified as **Risk Category 3**.	☐
If question 23 has been answered **YES**, your application will be reviewed by the Chair of the University Research Ethics Sub-committee	☐

DECLARATION AND SIGNATURE/S			
I confirm that I will undertake this project as detailed above. I understand that I must abide by the terms of the approval and that I may not make any substantial amendments to the project without further approval.			
Signed		*Date*	3/3/2025

FOR RISK CATEGORY 1 STUDENT PROJECTS					
Approval from the Research Supervisor or Director of Studies for a student project: *I have discussed the ethical issues arising from the project with the student. I approve this project.*					
Name	Saroj Sharma	*Signed*		*Date*	3/3/2025

NEXT STEP

RISK CATEGORY 1 PROJECTS: IF YOUR PROJECT HAS BEEN CLASSIFIED AS RISK CATEGORY 1:

- Students: The Research Supervisor should return the signed form to the student and send a copy to the Local Research Ethics Co-ordinator and where relevant, the Research Module Leader, for information.
- Staff: Submit this form to your Local Research Ethics Co-ordinator.

RISK CATEGORY 2 OR 3 PROJECTS: IF YOUR PROJECT HAS BEEN CLASSIFIED AS RISK CATEGORY 2 OR 3 please complete the Stage 2 - Research Ethics Approval form and submit both forms together with supporting documentation.

QUESTION 23: If this question has been answered **YES**, your application will be reviewed by the Chair of the University Research Ethics Sub-committee, and the forms should be submitted directly to Professor Karl Spracklen, k.spracklen@leedsbeckett.ac.uk. You will need to submit the Security-sensitive research form available from the Research Ethics web page.

Research ethics application forms will be retained in the School for the purposes of quality assurance of compliance and audit for THREE years

NOTES FOR COMPLETION

available from the Research Ethics web page.

Research ethics application forms will be retained in the School for the purposes of quality assurance of compliance and audit for THREE years

NOTES FOR COMPLETION

University Research Ethics Policy and Procedures: The University Research Ethics Policy and Research Ethics Procedures should be read prior to commencing this application. Consideration of the application by the reviewer/s will be undertaken in accordance with the Policy and Procedures.

External requirements for the project: Applicants should consider if there are requirements by any relevant professional, statutory or regulatory body, or learned society, which may be relevant to the project or if the project also requires external approval.

Submission

- Student applicants: email the typed form/s to your Research Supervisor or Director of Studies.
- Staff applicants: email the typed form/s to your Local Research Ethics Co-ordinator.

How to complete the form

You can navigate through the form by using the tab keys. If you prefer to complete a normal Word document, you can unlock the form by selecting the 'Restrict Editing' button on the Developer tab, then click on 'Stop Protection'. The boxes should expand to allow space for your text.

Signatures

Signatures

Electronic/typed signatures are acceptable for emailed forms, as the emails provide the audit trail for all parties' agreement and approval of the forms (e.g., student applicant →Research Supervisor →Local Research Ethics Co-ordinator).

Outcome

Applicants will be advised of the outcome of the application by receipt of the signed form fromm:

- The Research Supervisor or Director of Studies for Risk Category 1 student projects;
- The Local Research Ethics Co-ordinator or the School level group for Risk Category 2 and 3 projects.

YOU MAY ONLY BEGIN ANY DATA COLLECTION ONCE YOU RECEIVE NOTIFICATION THAT THE PROJECT HAS ETHICAL APPROVAL. If the circumstances of your research study change after approval it is your responsibility to revisit the Risk Checklist and complete a further application.

Advice

When completing the Stage 1 - Research Ethics Approval Form,. if you are uncertain about the answer to any question, read the relevant section of the Research Ethics Procedures document, and if you are still unsure:

- if you are student, seek guidance from your Research Supervisor or Director of Studies;
- if you are a staff member, contact your Local Research Ethics Co-ordinator.

Meeting Logs

School of Computing, Creative Technologies and Engineering 2024/25

Level 6 Production Project

MEETING RECORD SHEET: Meeting Number: 1

Student: Anshu Kharel	**Student I.D.:** 77350754
Date of Meeting:	**Supervisor:** Saroj Sharma

Actions agreed at previous meeting (completed or comment):

1		☐
2		☐
3		☐
4		☐
5		☐
6		☐

Comments of student (if any):

ABOVE here – student to complete before Meeting with supervisor. BELOW here – complete at the Meeting.

Next meeting (date/time):

Agreed Actions to complete before next meeting:

1	To complete the ethics form
2	Project Specification elaboration
3	
4	
5	
6	

School of Computing, Creative Technologies and Engineering 2024/25

Level 6 Production Project

MEETING RECORD SHEET:

Meeting Number: 2

Student: Anshu Kharel	**Student I.D.:** 77356754
Date of Meeting:	**Supervisor:** Saroj Sharma

Actions agreed at previous meeting (completed or comment):

1	To complete the ethics form	☑
2	Project specification elaboration	☑
3		☐
4		☐
5		☐
6		☐

Comments of student (if any):

ABOVE here *– student to complete before Meeting with supervisor.* ***BELOW here*** *– complete at the Meeting.*

Next meeting (date/time):

Agreed Actions to complete before next meeting:

1	To connect the VR with PC
2	project specification elaboration
3	
4	
5	
6	

School of Computing, Creative Technologies and Engineering 2024/25

Level 6 Production Project

MEETING RECORD SHEET:

Meeting Number: 03

Student: Anshu Khayel	**Student I.D.:** 77350754
Date of Meeting:	**Supervisor:** Saroj Sharma

Actions agreed at previous meeting (completed or comment):

1	To connect the VR with PC	☐
2	Project specification elaboration	☐
3		☐
4		☐
5		☐
6		☐

Comments of student (if any):

ABOVE here *– student to complete before Meeting with supervisor.* ***BELOW here*** *– complete at the Meeting.*

Next meeting (date/time):

Agreed Actions to complete before next meeting:

1	To complete the [redacted] form.
2	Project specification elaboration.
3	Analysis of the project.
4	
5	
6	

School of Computing, Creative Technologies and Engineering 2024/25

Level 6 Production Project

MEETING RECORD SHEET:

Meeting Number: 4

Student: Anshu Khatri | **Student I.D.:** 7748.

Date of Meeting: | **Supervisor:**

Actions agreed at previous meeting (completed or comment):

1	About ERD	☐
2	Analysis of the project.	☐
3		☐
4		☐
5		☐
6		☐

Comments of student (if any):

ABOVE here – student to complete before Meeting with supervisor. BELOW here – complete at the Meeting.

Next meeting (date/time):

Agreed Actions to complete before next meeting:

1	To show the product
2	To complete full set up.
3	To complete project specification
4	
5	
6	

Comments of supervisor (if any):

School of Computing, Creative Technologies and Engineering 2024/25

Level 6 Production Project

MEETING RECORD SHEET:

Meeting Number: [redacted]5

Student: Anshu Kharel	**Student I.D.:** 7748.
Date of Meeting:	**Supervisor:**

Actions agreed at previous meeting (completed or comment):

1	About ERD	☐
2	Analysis of the project.	☐
3		☐
4		☐
5		☐
6		☐

Comments of student (if any):

ABOVE here – student to complete before Meeting with supervisor. BELOW here – complete at the Meeting.

Next meeting (date/time):

Agreed Actions to complete before next meeting:

1	To show the product ~~final~~ review
2	To To complete full setup properly
3	To complete project specification again
4	To complete the setup UR.
5	To view full development.
6	

Comments of supervisor (if any):

FinalReport_AnshuKharel

ORIGINALITY REPORT

6%	4%	1%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to The British College Student Paper	2%
2	Submitted to Online Education Services Student Paper	1%
3	www.coursehero.com Internet Source	<1%
4	Submitted to University of Hertfordshire Student Paper	<1%
5	Submitted to University of Ulster Student Paper	<1%
6	Submitted to University of Greenwich Student Paper	<1%
7	Rapolu, Devender. "An Analysis of Virtual Reality Utilization Among STEM Undergraduate Students (Agricultural Sciences and Technology and Freshman Engineering-I) at an HBCU", Southern University and Agricultural and Mechanical College, 2024 Publication	<1%

8	Submitted to Middle East College of Information Technology Student Paper	<1%
9	Submitted to Edith Cowan University Student Paper	<1%
10	Submitted to University of Massachusetts-Dartmouth Student Paper	<1%
11	Submitted to HELP UNIVERSITY Student Paper	<1%
12	www.packtpub.com Internet Source	<1%
13	Submitted to Miva Open University Student Paper	<1%
14	Alastair M. Morrison, Cristina Maxim. "World Tourism Cities - A Systematic Approach to Urban Tourism", Routledge, 2021 Publication	<1%
15	Submitted to American University of the Middle East Student Paper	<1%
16	Hannah Lewi, Wally Smith, Dirk vom Lehn, Steven Cooke. "The Routledge International Handbook of New Digital Practices in	<1%

	Galleries, Libraries, Archives, Museums and Heritage Sites", Routledge, 2019 Publication	
17	Submitted to University of Wales Institute, Cardiff Student Paper	<1 %
18	gflec.org Internet Source	<1 %
19	www.kiwop.com Internet Source	<1 %
20	eprints.nottingham.ac.uk Internet Source	<1 %
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Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		