Prehistoric VR Simulations as educational content

R25-056

Project Proposal Report

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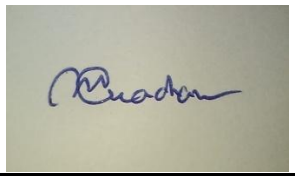
DECLARATION

We declare that this is our own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Group Member Name	**Student ID**	**Signature**
Ilangamveera M.M.	IT21284502	

Signature of the Supervisor
(Mr. Ishara Gamage)

Date

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ABSTRACT

This study introduces Virtual Reality (VR) simulations, which are intended to provide immersive and interactive learning environments that increase learner engagement. Traditional teaching methods, while educational, frequently lack engagement and fail to completely engage students in grasping scientific and historical themes. This limitation is especially important in subjects like prehistoric studies, where interactive exploration considerably improves understanding, especially because prehistoric events cannot be directly observed in the present.

The proposed system features four core components: an AI-powered Virtual Guide for real-time interaction with spatial awareness, Prehistoric Animal Behavior Simulation to showcase lifelike behaviors such as hunting patterns and survival strategies, Prehistoric Extinction Event Simulation allowing users to trigger and explore scenarios like asteroid impacts, and a Prehistoric VR Simulation where users can experience, interact, learn about the prehistoric ecological evolution focusing the most important ecological evolutionary milestones happen in a specific Era. Combining expertise in AI modeling, VR development, 3D animation, and game engine technologies, the project ensures accurate and engaging content. By incorporating AI-driven interactivity and dynamic simulations,

By bridging the gap between traditional teaching mediums and current interactive instruction, the research gives museums, exhibits, and schools an effective tool to engage and educate visitors, learners of all ages. This method encourages more curiosity and appreciation by converting typical learners into interesting, hands-on explorations This Proposal Focus on the Prehistoric VR Timeline component.

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LIST OF ABBREVIATIONS

Abbreviation	**Description**
AI	Artificial Intelligence
VR	Virtual Reality
XR	Extended Reality
VAK	Visual, Auditory, and Kinesthetic (learning model)
SDK	Software Development Kit

1. INTRODUCTION

1.1 Background & Literature survey

Background and Context

When it comes to traditional visual timelines in education, they are text-heavy, low engaging and have poor memory retention. In this research component there will be a VR timeline that consists of immersive Virtual Reality (VR) environments, narrations, pre-questions, and interactive micro-activities to improve learning experience with memory retentive, attention improving techniques

Relevant Studies and Techniques

To develop prehistoric VR timeline, we need several key technologies. Including low poly 3D model development for VR integration, virtual reality development to create environments and interfaces for interactions and content display, animation for interactions, proficiency in Unity engine for overall application development. And some basic knowledge of prehistoric ecological evolution

State of the Art

Most existing solutions for the traditional timelines are either focusing on 2d Web application that let user explore timelines through mouse ,keyboards and monitor or using 360 videos in VR ,both of them fail to make the user involve in the learning experience ,it's always a one way learning experience, and the existing researches didn't involve any memory retentive, attention/ focus improving techniques

1.2 Research Gap

Previous initiatives to improve the teaching of prehistoric timeframes have mostly used 2D online technologies or 360° video content distributed via VR platforms. While these technologies provided a digital alternative to textbooks and static displays, they were lacking in immersion and involvement. 2D web-based timelines displayed information in a linear, clickable fashion but lacked the potential to completely engage learners or create a sense of presence. Similarly, 360° videos enabled passive observation of environments but did not promote meaningful participation or deeper cognitive engagement. Importantly, neither technique included known learning tactics like active recall, attention stimulation, or interactive exploration, which are crucial for boosting memory retention.

1.3 Research Problem

“Can we teach people about prehistoric timelines better using VR interactive timeline that includes narration, Pre questions, interactions and gamification?”

This study investigates if standard ways of teaching prehistoric subjects, including books, static displays, and movies, may be improved by using immersive VR experiences. Unlike passive mediums, VR allows students to interact directly with the subject, sparking curiosity and enhancing attentiveness through involvement. The proposed VR timeline includes narrative for guided learning, pre-questions to activate past information, and micro-interactions that allow users to investigate Mesozoic ecological milestones. Gamification elements during the recap stage improve memory retention and create a sense of accomplishment. By combining these components, the study analyses if learners obtain a deeper comprehension, enhanced recall, and increased engagement compared to traditional ways. The findings will help to understand VR's potential as an innovative teaching tool in both formal and informal learning situations.

2. OBJECTIVES

2.1 Main Objectives

- Deliver concise and engaging content on Mesozoic ecosystems in a short time using a VR timeline
- Design simple yet memorable, attention improving interactions for all ages above 12
- Enhance knowledge retention using VAK learning model (kinesthetic, auditory, visual) and pre-questions and Gamifications

2.2 Specific Objective

- Create accurate environments for each period in Mesozoic era
- Create animations for animal actions and user activities
- Create user interfaces for interactions, Content display
- Create pre questions
- Create narrations
- Conduct user testing by comparing traditional teaching mediums with this component to evaluate whether its purpose is achieved; if not, identify the underlying reasons

3. METHODOLOGY

3.1 Understanding the key pillars of the research domain.

3.1.1 Implementing Prehistoric Environments & Animals

Realistic 3D environments and prehistoric animals will be created to immerse users in authentic ecosystems. These reconstructions aim to enhance understanding of ecological structures, species interactions, and evolutionary milestones within the Mesozoic era.

3.1.2 Implementing Memory Retentive and Attention Improving techniques

To improve learning effectiveness, the system integrates pre-questions, narration, user interactions, and gamification. These elements activate curiosity, maintain focus, and reinforce memory retention throughout the VR timeline experience

3.1.3 Implementing Recap with gamifications

At the end of the experience, users engage in a recap-based game. This interactive review reinforces key concepts from the timeline, evaluates knowledge retention, and provides feedback, ensuring the learning objectives are effectively achieved.

3.2 System Architecture Diagram

The proposed system consists of four main functionalities, and this component is regarding the educating learners about prehistoric ecological evolution. Inside of the component there are three main sections which are divided for the purpose of understanding and to do further implementations.

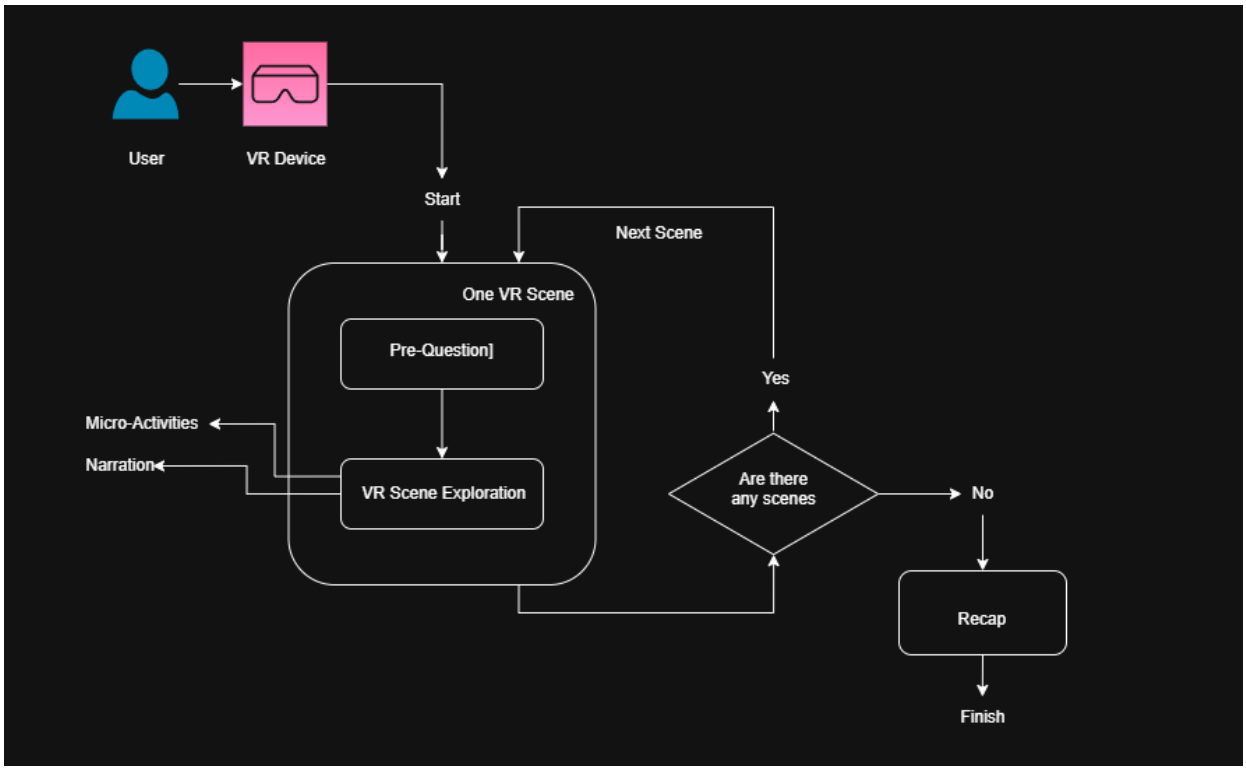

Figure 3. 1: High Level Architecture Diagram

3.3 Project Requirements

3.3.1 Functional Requirements and Non-Functional Requirements

Table 3. 1: Functional and Non-functional requirements

Functional Requirements	**Non-Functional Requirements**
Users should be able to answer a Pre-question before user, experience each scene	Application should be easily understandable.
Users should be able to participate in certain interactions using VR controllers	Application should have good efficiency regarding 3D models and performance
Users should be able to participate in a simple game at the end of the Timeline	The system shall present questions without overwhelming or stressing users.
The system shall provide responsive feedback to all user interactions	Finish the experience in a less time

3.3.2 System Requirements

- Software requirements
    - Unity
    - Blender
    - XR SDKs

3.4 Software Solution

High-quality software design, development, and testing are outlined in the Software Development Life Cycle (SDLC). Nonetheless, one of the simplest and most effective ways to produce a top-notch product is through the use of the agile software development technique.

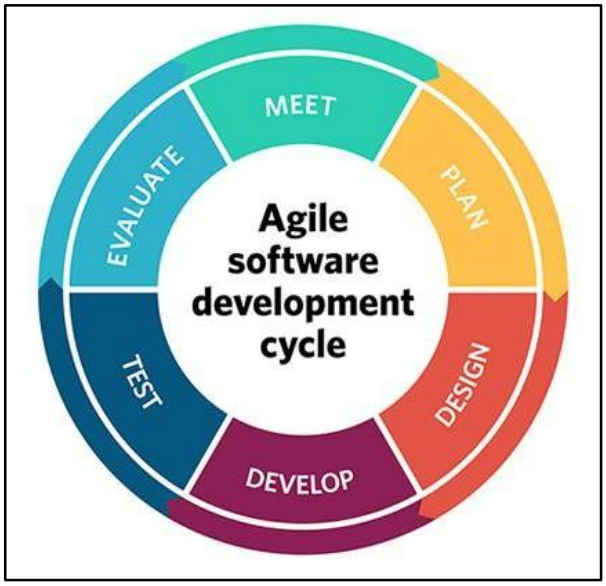

Figure 3. 2: Agile Software Development Cycle

3.4.1 Requirement Gathering and Analysis

- **Requirements gathering**

  Requirements were gathered through a survey of books, videos, and online resources, supplemented by insights from subject matter specialists. These resources guaranteed scientific integrity, historical authenticity, and educational usefulness. The investigation aimed to determine user demands, learning objectives, and technical feasibility in order to create an immersive and pedagogically effective VR timeline experience.

3.4.2 Feasibility study

- **Technical Feasibility**

  I should have an expert knowledge in VR development in Unity ,3D in Blender.

- **Market Feasibility**
  Students, teachers, museum visitors, and exhibition organizers are among the target audience. As VR adoption in education grows, current VR projects primarily concentrate on visual immersion, despite research showing that students prefer interactive VR experiences for increased engagement, satisfaction, and memory retention.

- **Operational Feasibility**
  The system will have user-friendly interfaces and guided navigation and be made for users with little to no VR expertise.

- **Scheduling Feasibility**
  This component must be finished withing the scheduled duration with the completion of required needs and presented on the planned due date

3.4.3 Implementation

The implementation phase consisting of sub functionalities as below,

- Create Accurate prehistoric environments, Optimized them for maximum efficiency
- Create animal activities
- Create interactions for users
- Create pre questions
- Create recap game for test user knowledge acquired from the VR timeline

3.4.4 Work breakdown chart

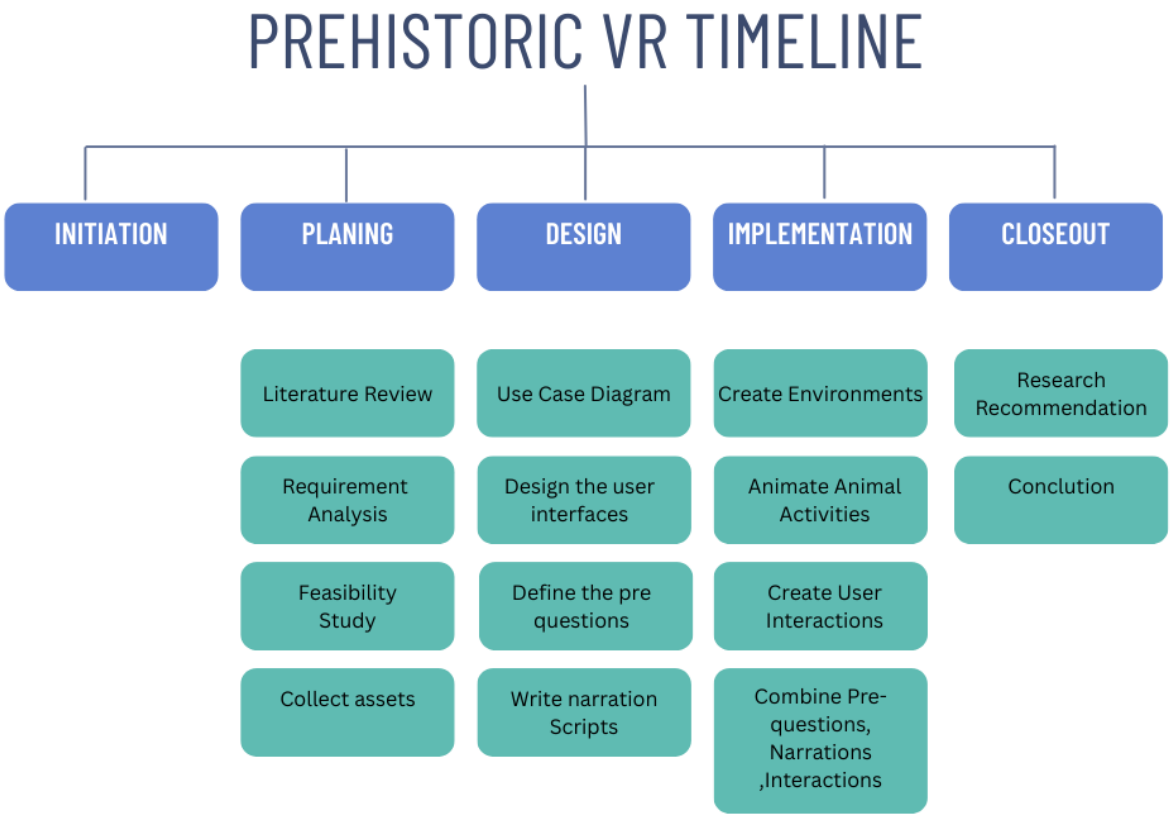

Figure 3. 3: Work breakdown chart

4. GANTT CHART

Figure 4.1: Gantt chart

5. DESCRIPTION OF PERSONAL AND FACILITIES

- Facilitators:

  Mr. Ishara Gamage – Sri Lanka Institute of Information Technology (SLIIT).

  Mr. Nushkan Nizmi – Sri Lanka Institute of Information Technology (SLIIT).

6. BUDGET AND BUDGET JUSTIFICATION

Table 6. 1: Budget Plan

Requirement	**Cost (Rs.)**
Realistic 3d models	5000-10000
VR Headset	160,000
Total	165,000 – 170,000

7. COMMERCIALIZATION

7.1 Target Audience and Market Space.

- **Target Audience.**
    - 12+ Museum / Exhibit visitors
    - Students
    - History and science enthusiasts
    - Museums and cultural institutions looking to modernize exhibits
    - Educational institutes

- **Market Space.**

  Targeting the market for interactive educational technologies, this VR component offers immersive learning to individual students, museums, and educational institutions. It satisfies the increasing need for captivating virtual reality experiences and has the potential to branch out into other historical or scientific fields within the larger edutainment industry.

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