CHAPTER I

INTRODUCTION

This chapter provides a background of the study, research problems, research objectives, scope and limitation, research significance, and definition of the key term.

1.1. Research Background

Web3 technologies, which are the next generation of the internet built on blockchain, offer new ways to make learning more interesting and interactive. Research shows these decentralized systems provide built-in privacy, secure archiving, and trust mechanisms that transform how educational achievements are recorded and recognized (Panagiotakopoulos & Karatrantou, 2022). In traditional classrooms, students often feel bored because the lessons are delivered in a one-way style, without much interaction (Hartanti et al., 2019). This research looks at how Web3 features—like digital rewards and secure records—can help students feel more motivated and involved in their learning. The QualiChain project demonstrates how blockchain-based Smart Badges create immutable educational accreditation that increases learner engagement through transparent achievement tracking (Panagiotakopoulos & Karatrantou, 2022), similar to the tokenized rewards system proposed in this study.

To solve the problem of students losing interest, this study implements Web3 technologies in educational games, building on established gamification principles that demonstrate increased engagement through reward systems and

interactive mechanics (Seaborn & Fels, 2015). Research shows that well-designed game elements can transform learning experiences by providing clear goals, immediate feedback, and progressive challenges (Sailer & Homner, 2020). The proposed Web3 game framework incorporates blockchain-based tokens that serve both as achievement markers and redeemable assets, creating a dual incentive system that aligns with established motivational theories. This approach makes learning more engaging by combining the proven psychological benefits of gamification with the novel economic incentives enabled by decentralized technologies, effectively making education feel more like a rewarding game than a chore.

The educational game in this study uses a "prototyping and simulation" approach, which means the game is tested and improved based on feedback. Building on empirical evidence that gamification effectiveness depends on proper context and implementation (Hamari et al., 2014), the game incorporates GameFi features (gaming + finance) with carefully designed reward mechanics. Students earn digital tokens through meaningful achievements, which research shows increases sustained engagement when rewards align with learning objectives. These tokens can unlock new game content or special rewards, creating a progression system that motivates continued participation while supporting educational goals (Nisa & Susanto, 2022).

For example, when students' complete tasks, they earn digital coins (called ERC-20 tokens) that can be used in the game or exchanged outside it. Students also collect verifiable digital certificates (as ERC-1155 NFTs) upon reaching

milestones, similar to the NFTCert system that demonstrates how blockchain creates tamper-proof academic credentials (Zhao & Si, 2022). These NFT certificates serve as immutable proof of achievements while protecting student privacy, allowing secure verification without exposing personal data. The certificates unlock new game content and progression paths, giving students both tangible rewards and verifiable ownership of their learning journey. Research shows this combination of tokenized rewards and NFT-based credentialing significantly increases learner motivation by making progress visible and achievements permanently recordable (Rone et al., 2023; Zhao & Si, 2022).

This research aims to demonstrate how Web3 technologies can transform learning through gamified approaches, building on evidence that well-designed game elements significantly increase student engagement and motivation (Gejandran & Abdullah, 2024). The study addresses the research gap in Web3 educational applications by implementing a project-based learning framework that has proven effective for emerging technologies (Mentzer et al., 2020). The central research question investigates: How can Web3 and tokenized reward systems create more effective solutions for modern learning challenges while maintaining educational integrity? This approach combines the motivational benefits of gamification - including real-time feedback and collaborative learning mechanics - with the novel affordances of decentralized technologies to create a more immersive and rewarding educational experience.

Teachers have observed that many students find traditional classroom instruction unengaging and lack motivation (Rone et al., 2023). Therefore, teachers

need to find new ways to make learning more interesting and exciting for students. Education is a dynamic process that can be enhanced through diverse strategies that foster creativity and engagement of the learners (Saro et al., 2022). Creating a positive and supportive learning environment is essential for fostering student growth and development. Students today often struggle with staying focused and attentive, both in and out of the classroom. This can be attributed to various factors, including distractions and competing demands (Mauliya et al., 2020)). The traditional classroom setting may not be conducive to all students' learning styles, leading to boredom and disengagement.

While existing research on educational NFTs focuses mainly on credential verification (Enache, 2023) and technical implementations (Rikus et al., n.d.), there remains a significant gap in understanding how Web3 technologies like tokenization and NFTs can create more immersive, personalized learning environments. Current educational games lack integration with decentralized systems that could provide true ownership of achievements and interoperable rewards. This research addresses these limitations by developing a Web3-based educational game prototype that leverages tokenized rewards (ERC-20) and NFT-based progression systems (ERC-1155) to create a more engaging and verifiable learning experience.

1.2. Research Problems

a) How will the Web3 technologies be effectively integrated into educational games while ensuring seamless gameplay and learning experiences?

b) How can educational content be effectively incorporated into Web3 games to enhance learning outcomes without compromising the gaming experience?

1.3. Research Objectives

This research & development aims to:

a) Prototype an educational game with integrated Web3 features specifically designed for English language learning.
b) Develop a functional educational game prototype that incorporates Web3 technologies (using Thirdweb SDK) to enhance student engagement, motivation, and English language learning outcomes.
c) Create a token-gated (ERC-20 and ERC-1155) educational game with integrated Web3 features that rewards student for their achievements in English language tasks and promotes personalized learning.
d) Evaluate the effectiveness of the Web3-integrated educational game in enhancing student engagement and perceived learning outcomes in English language learning.

1.4. Scope And Limitation

This research aims to explore the integration of Web3 technologies into educational games to enhance English language learning experiences. By leveraging features such as tokenized rewards (ERC-20), NFT-based achievement systems (ERC-1155), and the Thirdweb SDK, the study seeks to develop a framework for gamified learning platforms that improve student engagement and motivation. The research is limited to a prototype implementation with 24 students from SMKN 2 Dompu and focuses specifically on reading comprehension,

vocabulary, and basic grammar aspects of English language learning. Additionally, the prototype's development was time-intensive due to the complexity of integrating Web3 technologies with educational content.

1.5. Research Contributions

This thesis contributes to a growing body of literature on the use of Web3 technologies in education. By developing a functional educational game prototype with integrated Web3 features, this study demonstrates the potential of Web3 to enhance student engagement, motivation, and learning outcomes. The findings of this research can inform the development of future educational games and provide valuable insights for policymakers and educators interested in leveraging Web3 for educational purposes

1.6. Definition of Key Terms

To understand many of the terms in this study, the researcher provides some definitions of the key terms below:

a) Web3

Web3 is the next version of the internet, where information is stored on many computers (blockchain) instead of just a few big servers. This gives users more control over their own data and makes it harder for anyone to change or misuse information. In this study, Web3 means using blockchain features like digital coins and certificates to make learning more interactive and secure.

b) Educational Game

An educational game is a game made for learning, not just for fun. These games are designed to help students understand new topics or practice skills in an enjoyable way.

c) GameFi

GameFi stands for "Game Finance." It is a way to combine games with digital rewards. In GameFi, players can earn digital coins or items while playing, which can sometimes be used outside the game. This makes playing more exciting because achievements have real value.

d) ADDIE model

The ADDIE model is a structured framework used in instructional design that guides researchers through systematic stages (Analysis, Design, Development, Implementation, Evaluation) for creating educational products.

e) ERC20

ERC20 is a standardized token interface on the Ethereum blockchain for creating fungible tokens, allowing for functionalities like transferring tokens and checking balances

f) ERC1155

ERC1155 is a token standard that allows for the creation and management of multiple collections of unique digital items (NFTs) using a single smart contract.

g) ERC721

ERC721 is a token standard specifically designed for non-fungible tokens (NFTs), where each token represents a unique and distinct item.

h) ThirdwebSDK

Thirdweb SDK is a technical tool used for integrating Web3 functionalities, such as handling wallet interactions and blockchain transactions, into applications.