CHAPTER 2: BACKGROUND AND LITERATURE REVIEW

2.1 Introduction

Learnity is a web application e-learning platform especially designed for Pakistani students to get education online from the best tutors out there, according to their particular board curriculum. Learnity enables students to select tutors of their convenience and can interact with teachers through daily tasks assigned by teachers, and parents can track their progress reports with the help of our gamification system. Tutors can set their own prices, enabling tutors to not only earn but also teach from their place.

2.2 Online Tutoring and Educational Technology

2.2.1 Evolution of Online Education

Online education has come a long way in past years, from being a mere content delivery platform to an advanced interactive platform. This fast development of technology allowed the students and tutors to interact and share information through their device.Not only this our online tutoring technology is still progressing, integrating video conferencing, resource sharing, interactive whiteboards, and adaptive learning systems.

In modern life,tutoring platforms have become an essential component of the modern learner’s life. It is also beneficial for struggling students who lack in studies due to lack of focus , in online tutoring they can control the video according to their pace.

2.2.2 Market Growth and Demand

The global online tutoring services market has seen significant growth, with a value of $7.69 billion in 2022 and a compound annual growth rate of 14.9% from 2023 to 2030. This is due to increasing use of smart devices and also the COVID-19 pandemic had also increased the consumption of online education.

2.2.3 Key Features of Effective Online Tutoring Platforms

Some important elements that makes online tutoring platforms successful are virtual whiteboards, gamification system, video conferencing, and other collaborative tools. Accessibility elements like, language support, hearing and visual accessibility and compatibility with devices ensure that the platforms covers a wide range of users.

Data security and privacy is taken care of by encryption of communication, safe and authorized storage of data, strict privacy policies, and authentication techniques for users. Some websites or platforms are also using the combination of AI and machine learning to offer personalized learning based on the learning style of each individual student.

2.3 Peer-to-Peer Learning

Peer-to-peer learning, also referred to as collective or group besed or shared learning, in which students of same batch assist each other in gaining knowledge and skills. The idea of peer learning has been around from old times to improve literacy and healthy competition among students.

Modern studies have widely verified the advantages of peer learning. Research has shown that the process of teaching others about recently acquired knowledge helps individuals to better memorization of things.

2.3.1 Benefits of Peer Instruction

Peer instruction is effective for learning, the answers and confidence levels of students before and after peer discussion were analyzed in several classes. The results showed that peer discussion of questions increased accuracy in all classes and grades.

Peer instruction supports learning in several ways. First, it produces new knowledge through the process of explanation and perspective sharing. Second, peer instruction enhances metacognition by encouraging more thorough checks of the coherence of answers. Third, social processes aid students in monitoring and regulating their cognition more effectively than self-explanation. Studies have shown that people actively participating in peer learning activities are one and a half times more likely to successfully finish their studies and pass exams than those who are passive consumers of content.

2.4 Web Technologies for Educational Platforms

2.4.1 Technologies used in Web Development

Frontend: Next.js, Tailwind CSS.

Backend: Node.js, Nest.js(Typescript).

Database: Neon Database(PostgreSQL), MongoDB Atlas, Firebase.

Design Tool: Figma + Stitch.

Version Control: GitHub, GitHub Actions(CI/CD).

Deployment: Vercel (frontend), AWS (backend).

Other tools: VS Code, Postman, JWT, Bcrypt.

2.4.2 Creating Dynamic and Interactive Websites

Dynamic websites are different from static websites in terms of their interactivity, dynamic content and content consumption by users . Node.js allows programmers to create server-side application that can handle user input, data manipulation, and requests from user. Dynamic websites are perfect fit for educational website that requires personalized user experience, safe & authorize login, and content recommendations according to data provided by user.

Modern web development emphasizes on responsive design to ensure users best experience on any device. Responsive web design techniques uses flexible design, media queries, and adaptive images to design user interfaces that are smooth on computers, tablets, and smartphones. Responsive design are useful for an educational website because users may access the website using different devices depending on their convenience.

2.4.3 Security Considerations

Security is a major concern in web application development, especially in educational websites that deal with private user data and process financial transactions. Security best practices include the use of strong authentication systems, the verification and validation of all user input to avoid SQL injection attacks, strong access control to user, and the encryption of sensitive data.

2.5 Intelligent Tutoring Systems and Adaptive Learning

2.5.1 Artificial Intelligence in Education

Intelligent Tutoring Systems (ITS) are computer programs that encourage human tutors by providing personalized learning and feedback to students. ITS have been shown to increase students' performance by some ratio compared to conventional learning approaches. ITS use artificial intelligence technologies like machine learning to provide students with interactive and personalized learning experiences.

AI-based ITS differ from conventional tutoring approaches is that they provide cdynamic learning curriculam that adjust to students' performance, real-time feedback systems, gamification system to track reports and interactive learning.

2.5.2 Personalization and Adaptive Learning

Personalization in educational technology is the process of adapting learning to the individual requirements, individual preferences, and individual `s learning style. Adaptive learning systems use data from student performance or record and provides personalized learning materials, and guide students the areas where they require extra effort or learning.

2.6 Challenges and Considerations

2.6.1 Digital Divide and Accessibility

Although there are great numberof benefits of online tutoring platforms but the digital divide is still a major hurdle. Students belonging to lower-income classes or living in rural areas may not have regular access to high speed internet connectivity, computers, phones or quiet study space or environment that are suitable for online tutoring. These reason can cause increase of gap in education instead of reducing it.

To overcome these issues, Plans or techniques such as optimizing platforms for low-bandwidth connectivity, consumption of UI friendly design for students using smartphones, allowing offline access to notes or materials , and collaborating with local organizations to provide access points in rural areas. Otherwise, online tutoring may lead to educational inequality.

2.6.2 Maintaining Engagement and Social Connection

Online learning platforms can also be unpleasant even when video conferencing and messaging options are available, especially for younger learners who can greatly benefit from direct human interaction. Conventional teaching approaches can also encourage better student-teacher relationships than online interactions. Problems include the sense of recognizing that student is getting bored or zoning out between the lecture, limiting our regular conventional learning can cause health risks associated with prolonged screen time and procrastination.

Online tutoring platforms therefore must include functionality that encourages engagement and interaction, such as interactive learning exercises and activities, opportunities for group work, and mechanisms for question answer between the lectures, as well as breaks to avoid fatigue. Combining both approaches is the best way to strengthen the learning and social life.

2.7 Related Work and Existing Platforms

There are a number of established platforms that offer reference for the development of Learnity. Preply, a popular online tutoring marketplace, allows students to be matched with tutors for a variety of subjects and languages, using advanced matching algorithms, video conferencing tools, and scheduling systems.

Other platforms are international and their target audience are mostly Cambridge students but our Learnity platform enables student from all boards in Pakistan to select courses according to their particular board curriculum right now we are only focusing on Sindh province.

2.8 Summary

The summary is that online tutoring systems are a major and ever-growing area in educational technology.The concept of peer-to-peer learning, along with advancements in web technology and artificial intelligence, provides flexible, affordable and curriculum dependent education. Learnity is developed to make learning easy by connecting students and tutors online. The main objective of learnity is to provide a local web based platform for the students and teachers of Sindh province of Pakistan. Learnity platform to facilitate remote tutoring, to improve learning flexibility and to enable teacher monetization.