TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING
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Proposal
On
Khela ra Sikha

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ABSTRACT

This project aims to create an interactive, text-based educational game in C that makes learning physics, chemistry, and mathematics engaging through a gamified approach. The program offers a menu providing users with features of three subject-specific games:

1. **KBC (Physics Edition)** – A multiple-choice quiz with 14 questions covering fundamental physics concepts. Players earn points for each correct answer and can use two lifelines: **50/50**, which removes two incorrect options, and **Swap the Question**, which replaces the current question with a new one. A scoreboard tracks performance to encourage competition and mastery.

2. **Hangman (Chemistry Edition)** – A word-guessing game where players attempt to uncover the names of chemical elements or compounds by guessing letters. With a limited number of incorrect attempts, this game reinforces chemistry terminology in a fun and challenging way.

3. **Equation Solver Challenge (Math Edition)** – Players solve algebraic equations where they must determine the missing value x. The game includes different difficulty levels to cater to learners of varying skill levels.

Designed for accessibility, the program runs on any standard C compiler without requiring additional libraries. It promotes interactive learning by combining education with game mechanics, making science and math more engaging and enjoyable.

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INTRODUCTION

1.1 Background Introduction

Gamification has become a widely used technique in education to improve student engagement and retention. It leverages the principles of game design, including challenges, rewards, and competition, to make learning more interactive and enjoyable. Traditional learning methods often struggle to maintain students' interest, resulting in decreased comprehension and motivation. However, by integrating gaming elements into educational materials, learners are more likely to stay engaged and retain information for a longer period.

Educational games create an immersive environment where students actively participate in the learning process rather than passively consuming information. This approach enhances cognitive skills, problem-solving abilities, and subject mastery. The "Khela ra Sikha" project aims to develop a text-based educational game using C programming that combines physics, chemistry, and mathematics into an engaging learning experience. This project is designed to appeal to students who enjoy interactive learning and wish to reinforce their understanding of these core subjects in a fun and challenging way.

The "Khela ra Sikha" game consists of three subject-specific modules, each catering to a different discipline:

- **KBC (Physics Edition)**: This module is designed as a multiple-choice quiz where players answer physics-related questions to test and enhance their conceptual understanding. The game includes two lifelines to assist players: "50/50" removes two incorrect answers, making it easier to choose the correct one, and "Swap the Question" replaces the current question with a new one. A scoreboard tracks the player's performance, encouraging competition and repeated practice.

- **Hangman (Chemistry Edition)**: This word-guessing game focuses on chemistry-related terminology, helping players memorize the names of chemical elements, compounds, and key concepts. The player must guess the word by

selecting individual letters, with a limited number of incorrect attempts allowed. This approach reinforces students' knowledge of chemical nomenclature while also making learning more engaging and enjoyable.

- **Equation Solver Challenge (Math Edition)**: This module focuses on algebraic problem-solving, where players must determine the missing variable in an equation. The game offers different difficulty levels, ensuring that players of all skill levels can participate and improve their mathematical abilities over time. By practicing with various equation types, students can develop their logical reasoning and problem-solving skills in a gamified manner.

By combining these elements, "Khela ra Sikha" aims to transform the way students engage with science and mathematics. This game-based learning approach makes education more appealing and effective, ensuring students stay motivated while reinforcing their knowledge through interactive play.

1.2 Motivation

Traditional education methods often lack interactivity, making it difficult for students to stay engaged. Passive learning through lectures and textbooks often fails to capture students' interest, leading to lower retention rates and reduced enthusiasm for studying. By integrating gaming elements into learning, this project aims to make studying more enjoyable and effective. Gamified learning environments provide instant feedback, rewards, and challenges that help maintain motivation and encourage active participation.

The motivation behind developing "Khela ra Sikha" is to provide a fun and accessible way for students to strengthen their understanding of fundamental scientific concepts. Through interactive quizzes and challenges, students can reinforce their knowledge while enjoying the learning process. By combining education with play, the project seeks to create an innovative and engaging learning platform that makes science and mathematics more approachable and exciting for students of all backgrounds and learning styles.

1.3 Problem Definition

Students often struggle with abstract scientific concepts due to a lack of engaging learning resources. Traditional classroom teaching methods sometimes fail to provide the necessary interactivity and real-world applications required for better understanding. Many students find it difficult to grasp complex theories when they are presented in a purely theoretical manner.

This project addresses these challenges by providing an interactive, game-based platform where learners can reinforce their knowledge through practice and play. By offering an engaging and immersive learning environment, "Khela ra Sikha" helps bridge the gap between theoretical knowledge and practical application. Students can learn by doing, which is proven to be more effective than passive learning techniques. Through the use of interactive challenges and problem-solving exercises, the game promotes deeper comprehension, boosts retention, and enhances critical thinking skills. Ultimately, this project aims to make science and mathematics more enjoyable and accessible, ensuring that students gain a strong conceptual foundation in these subjects.

1.4 Objectives

The key objectives of this project are:

- To develop a text-based educational game using C programming, ensuring accessibility across different platforms and devices.
- To create an engaging and immersive learning experience in physics, chemistry, and mathematics by incorporating interactive and gamified elements.
- To improve retention and comprehension of core scientific concepts through interactive quizzes, challenges, and problem-solving exercises.
- To develop a program that is lightweight, efficient, and executable on standard C compilers without requiring additional dependencies or complex installations.
- To encourage self-learning and competition by integrating a scoring system that tracks progress and motivates users to improve their performance.
- To provide an expandable framework where additional features, subjects, and difficulty levels can be incorporated in future updates.

1.5 Applications

- Serves as an interactive learning tool for students preparing for physics, chemistry, and math exams, reinforcing key concepts through practice-based learning.
- Can be utilized in classrooms as a supplementary educational resource to promote active participation and engagement in scientific topics.
- Helps students develop problem-solving and critical-thinking skills by providing a dynamic learning environment that encourages logical reasoning.
- Assists educators by offering a gamified teaching method that can be seamlessly integrated into lesson plans and interactive workshops.
- Provides an engaging alternative for self-paced learners who prefer interactive educational tools over traditional study materials.
- Can be adapted for various age groups, allowing younger students to build foundational knowledge while offering advanced topics for older learners.

1.6 Scope

The project is primarily focused on developing a game-based learning experience within a text-based C programming environment. It aims to deliver an interactive educational tool that is lightweight, efficient, and accessible to users with minimal system requirements. The text-based nature ensures that the program can run on any standard C compiler without requiring graphical dependencies.

While this version does not include graphical elements, it lays a strong foundation for future enhancements. Potential future improvements include:

- Graphical User Interface (GUI) integration for an enhanced visual experience.
- Expansion of question sets to include a wider variety of topics across different educational levels.
- Implementation of multiplayer modes to encourage collaborative learning and competition among students.
- Inclusion of adaptive difficulty levels that dynamically adjust based on the user's performance, ensuring a personalized learning experience.
- Development of a mobile or web-based version to increase accessibility and reach a broader audience.

By establishing this robust foundation, "Khela ra Sikha" has the potential to evolve into a comprehensive educational tool that transforms the way students engage with science and mathematics.

LITERATURE REVIEW

Gamification in education has gained significant attention as an effective strategy to enhance learning. Research has shown that incorporating gaming elements into educational content improves engagement, motivation, and knowledge retention. Various studies indicate that students are more likely to grasp complex subjects when interactive elements such as quizzes, challenges, and competition are involved.

Educational games have been widely implemented across different disciplines, from language learning applications to STEM-based simulations. Platforms like Duolingo and Kahoot have demonstrated the effectiveness of gamification in education by fostering interactive learning environments. By employing similar techniques, "Khela ra Sikha" integrates subject-specific educational games to make learning more engaging and impactful.

Furthermore, studies highlight that game-based learning promotes problem-solving skills, enhances critical thinking, and encourages self-paced learning. The use of instant feedback and reward systems in gamified applications increases students' willingness to participate and improve their performance. This project leverages these principles to create a well-rounded, interactive learning tool designed for students of varying academic backgrounds.

PROPOSED SYSTEM ARCHITECTURE

3.1 UI Layer

The UI layer is responsible for displaying the game’s interface to the user, accepting inputs, and showing results in a structured format. It ensures smooth interaction by providing clear prompts, error messages, and feedback to guide players through the game.

3.2 Game Logic Layer

The game logic layer handles the core functionalities of each game mode, including processing user responses, enforcing rules, and calculating scores. This layer ensures that the game remains fair, challenging, and engaging for the users.

3.3 Data Management Layer

This layer stores questions, answers, and user progress to enhance the learning experience. It maintains structured databases for efficient retrieval and updates, ensuring a seamless gameplay experience.

3.4 Control and Architecture Layer

This layer manages interactions between the UI, game logic, and data management layers, ensuring smooth execution and performance. It coordinates user inputs and system responses for optimal functionality.

METHODOLOGY

4.1 Game Design & Development

The game is structured into different modules, each representing a subject area with unique gameplay mechanics. A modular approach ensures easy expansion and maintenance.

4.2 User Interaction

The game will feature intuitive keyboard inputs for navigation, answer selection, and user commands, ensuring accessibility for all users.

4.3 Game Logic and Algorithm Implementation

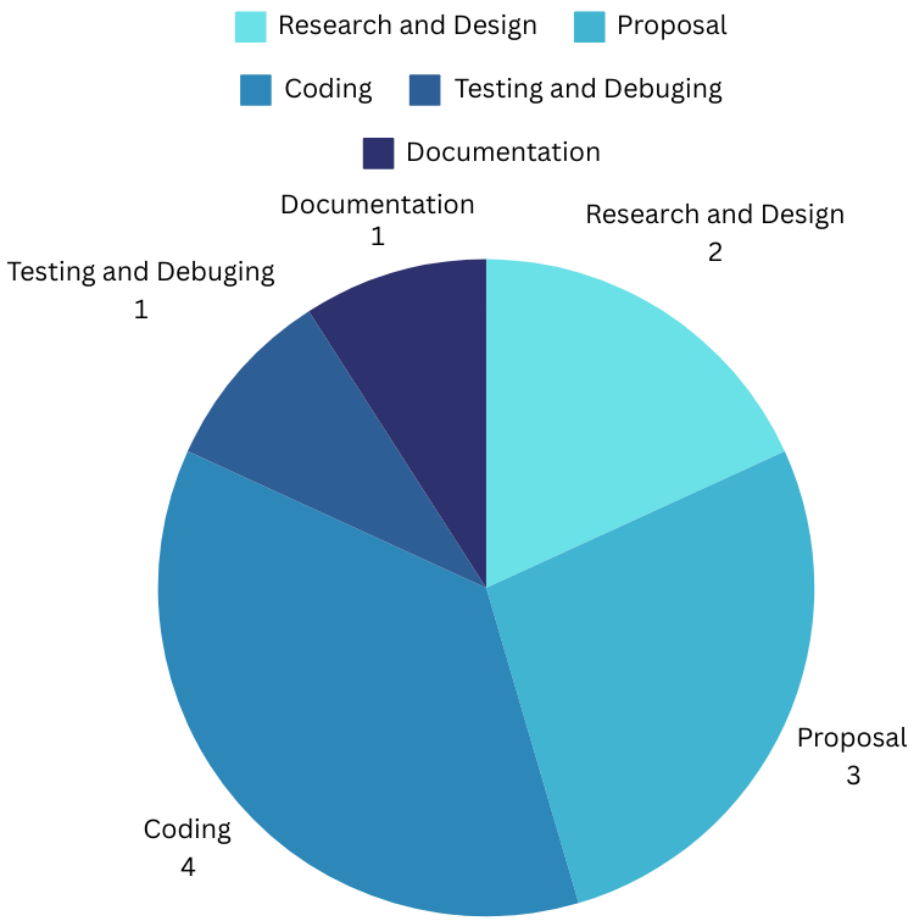
- **KBC Physics Quiz:** Implements a structured question-answer format with lifeline options for assistance.
- **Hangman Chemistry Edition:** Uses a word-guessing algorithm with limited attempts to reinforce learning.
- **Equation Solver Challenge:** Integrates mathematical logic to validate and provide real-time feedback on solutions.

4.4 Testing and Implementation

The game will be tested using unit tests for each game mode to ensure correctness and usability.

TIME ESTIMATION

The estimated timeline for project completion:



Numbers represent days: Total completion time is 11 days

FEASIBILITY ANALYSIS

Technical Feasibility

The game is built using C programming, a widely used and efficient language for system-level and application-level programming. Since C is highly portable, the game can run on any standard C compiler without requiring additional libraries or complex installations. This ensures that users can easily compile and execute the game on different operating systems, including Windows, Linux, and macOS. Additionally, C provides robust memory management and efficient execution, making the game lightweight and optimized for performance.

From a development standpoint, the game follows a modular structure, making it easy to update and maintain. Each component—such as the game logic, user interface, and data management—is designed independently, allowing for future enhancements and scalability. Given that C is one of the foundational programming languages, the knowledge and resources required for development and debugging are widely available, making technical implementation highly feasible.

Economic Feasibility

One of the major advantages of this project is its cost-effectiveness. The development environment for the game is entirely free, as it utilizes open-source compilers such as GCC and Code::Blocks. There are no licensing fees or additional hardware requirements, making it financially viable for both developers and users.

The project also eliminates the need for expensive proprietary software, as the entire game can be developed, tested, and deployed using freely available tools. Moreover, since the game is text-based and does not require high-end graphics or extensive processing power, it can be executed on standard computers and even older hardware, further reducing economic constraints. This makes it an ideal educational tool for institutions with limited financial resources.

Operational Feasibility

The game is designed to be user-friendly, with a simple text-based interface that requires only basic keyboard inputs for navigation. This ensures accessibility for a broad audience, including students, educators, and learners with varying levels of computer literacy. Since the game does not rely on complex graphical interfaces, it can be run on low-spec devices without performance issues.

The modular design of the game allows for easy updates and maintenance. New features, such as additional question sets, difficulty levels, and multiplayer modes, can be integrated with minimal modifications. Additionally, since C is a widely supported programming language, any necessary troubleshooting or modifications can be handled efficiently without requiring specialized tools.

From an educational perspective, the game offers high operational feasibility as it can be incorporated into classrooms, online learning platforms, and self-study sessions. It serves as a complementary tool for science and mathematics education, reinforcing key concepts in an interactive manner. Educators can utilize the game to engage students in competitive learning activities, thereby improving knowledge retention and problem-solving skills.

Overall, the technical, economic, and operational aspects of this project demonstrate its high feasibility, ensuring that it can be successfully developed, deployed, and sustained with minimal resource requirements.

REFERENCES

- Research papers on gamification in education.
- Online C programming resources.
- Documentation of similar educational game projects.
- Existing implementations of quiz-based and word-guessing games.
