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Kautilya – A Game That Educates

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ABSTRACT

In recent years, the variety of digital games for children aged 5 to 10 has expanded across platforms like large screens, handheld devices, electronic learning systems, and toys. This paper introduces an innovative approach to preschool education by integrating children's rights awareness into the curriculum through digital gaming. The educational intervention aimed to familiarize preschoolers with fundamental rights—survival, development, non-discrimination, and protection—via interactive digital games. Findings revealed a significant increase in children's self-awareness and understanding of their individual rights, ethical reasoning, and social rules post intervention. This research highlights the potential of digital games to foster a critical understanding of social issues rooted in rights among preschoolers. It also underscores the need for serious games aimed at educating children about their rights, calling for further research to explore the perspectives of both students and parents on this educational approach.

Keywords: Children, Preschool, Kindergarten, Digital games, Media, Video games.

Introduction

Empowering children with knowledge and skills related to online safety is crucial to ensure their well-being and protect them from potential harm. Equipping children with an understanding of their rights from a youthful age is crucial for fostering a generation that can uphold and advocate for human rights, both for themselves and others, in all aspects of their lives. One such means to educate them while engaging in recreational activities is digital gaming.

Digital games engage children in decoding various multimedia elements, fostering understanding of the world while offering motivation through goal setting, strategy development, and active participation in the game's narrative. Well-designed games can offer rich, interactive experiences that foster learning, cognitive development, skill building, social interactions, physical activity, and healthy behaviours. A gap exists in our understanding of how digital games can be effectively used to educate preschoolers about their rights. This paper proposes an innovative approach to using digital games for rights education in preschoolers, focusing on fundamental concepts.

The concept of using games for educational purposes has evolved significantly over the past few decades. In the early days of computer-based learning, educational games were simple, often focusing on basic skills such as math and spelling. As children's understanding of their rights matures, so too can the educational tools used to cultivate that awareness. Today, educational games cover a wide range of subjects and skills, from science and history to critical thinking and problem-solving. In the 1980s and 1990s, educational games such as "Oregon Trail" and "Math Blaster" became popular in schools. These games demonstrated the potential of interactive media to engage students in learning. However, they were limited by the technology of the time, offering simple graphics and gameplay. The advent of the internet in the late 1990s and early 2000s brought a new wave of educational games. Online platforms provided access to a broader range of resources, enabling the development of more complex and interactive games.

Games like "BrainPOP" and "Cool Math Games" became popular among students and educators alike, offering a variety of educational content that could be accessed from any computer with an internet connection. With the rise of smartphones and tablets in the 2010s, educational games became even more accessible. Mobile apps such as "Duolingo" and "Khan Academy" provided on-the-go learning opportunities, making it easier for students to engage with educational content outside of the classroom. These apps utilized the capabilities of modern devices to offer interactive and personalized learning experiences.

Through a designed educational intervention named 'Kautilya: The Game That Educates', it aims to empower children to understand and critically engage with these rights within digital game content. By analysing existing solutions and incorporating user feedback, this research contributes to the advancement of digital game-based learning technologies. The findings and methodologies discussed herein aim to inform future developments in this domain.

1.1 Development of Educational Games

The development of educational games involves a multidisciplinary approach, drawing on insights from education, psychology, child development, and technology. Creating a game that is both engaging and educational requires careful planning and execution, ensuring that the content is not only informative but also appealing to children.

1.2 Insights from Education

Educational theories and practices play a crucial role in the development of educational games. Understanding how children learn and what motivates them is essential in creating content that is both effective and engaging. Constructivist theories, which emphasize active learning and the importance of building on prior knowledge, are particularly relevant to the design of educational games.

Games that encourage exploration, experimentation, and problem-solving align well with constructivist principles. By presenting information in a way that allows children to interact with and apply what they have learned, educational games can facilitate deeper understanding and retention of knowledge.

1.3 Insights from Psychology

Psychology provides valuable insights into how children think, feel, and behave. Understanding cognitive development, motivation, and learning styles is essential in creating games that are both engaging and effective. For example, games that incorporate elements of reward and feedback can motivate children to continue playing and learning.

Social and emotional learning (SEL) is another important aspect to consider. Games that address SEL can help children develop important skills such as empathy, self-regulation, and collaboration. By creating scenarios that require players to make ethical decisions or work together to solve problems, educational games can promote social and emotional development.

1.4 Insights from Child Development

Child development theories provide a framework for understanding the physical, cognitive, and social changes that occur as children grow. These theories can inform the design of educational games, ensuring that the content is appropriate for different age groups and developmental stages.

For example, younger children may benefit from games that focus on basic skills such as counting and letter recognition, while older children may be ready for more complex challenges that involve critical thinking and problem-solving. Understanding the developmental milestones of different age groups can help game designers create content that is both age-appropriate and engaging.

1.5 Cutting-Edge Technology

By harnessing innovative technology to deliver a sophisticated game-based learning platform. Developed was done on Django for backend and PostgreSQL for database management, it ensured robustness and scalability. The frontend, crafted with HTML, CSS, and JavaScript, guarantees responsiveness and interactivity. With real-time data synchronization and cloud-based services, our platform offers seamless operation across devices. This results in a more immersive and effective learning experience.

1.6 Key Capabilities:

The web application offers a range of essential features tailored to enrich the learning experience. It includes interactive quizzes in various formats, customizable content creation for parents and educators, instant feedback mechanisms, detailed performance analytics, and stringent security measures for user authentication.

1.7 User-Friendly Interface

Designed for ease of use, our interface captivates young learners with engaging graphics and intuitive design. It boasts straightforward navigation, responsive layout across devices, and interactive elements such as badges and rewards to motivate continued engagement. With vibrant colours, playful animations, and a clean layout, our platform ensures an enjoyable and effective learning environment for children.

1.8 Real-Time Processing

The education learning platform incorporates real-time processing capabilities to enhance user engagement and responsiveness. This facilitates seamless communication between users and the server, allowing for dynamic content delivery and live feedback during quiz sessions. By leveraging real-time processing, our website ensures a fluid and immersive experience, fostering active participation and learning engagement for children, parents, and educators alike.

Materials and methods

Here are some essential materials and tools may require:

Hardware:

- **Computer System:** A powerful computer or tablet or smartphone capable of smooth running of the platform.
- **Camera/ Microphone:** Optional. May or may not use.

Software:

- **Python Installation:** Python served as the primary programming language for our project, providing a versatile and powerful toolset for backend development. Its extensive libraries and intuitive syntax facilitated the implementation of various features and functionalities within our web application.

- **Django Framework:** Leveraging the Django framework accelerated our development process by providing a robust and scalable foundation for building web applications. Its built-in components, such as the ORM (Object-Relational Mapping) system and authentication system, streamlined database interactions and user management, respectively.
- **Django REST Framework:** Integrating the Django REST Framework enabled us to develop RESTful APIs seamlessly, facilitating communication between the frontend and backend components of our application. This allowed us to create endpoints for data retrieval, manipulation, and interaction, ensuring smooth and efficient data exchange between client and server.
- **JavaScript:** JavaScript played a pivotal role in enhancing the interactivity and responsiveness of our web application's frontend. It was used to implement dynamic user interfaces, handle client-side form validation, and enable asynchronous data fetching through AJAX requests, resulting in a seamless and engaging user experience.

Other:

- **Internet Resources:** Identified the need for reliable internet access to enable real-time interaction, updates, and data synchronization within the platform.
It ensures seamless user experience and continuous access to the latest content and features.

By assembling the following resources and tools, we will be well-equipped to design, develop, and rigorously evaluate a game-based learning platform that seamlessly blends education and entertainment, catering directly to our project's unique requirements, preferred technology stack, and available resources.

Procedure

The methodology for building a game-based learning platform involves several key steps aimed at ensuring efficient development, testing and deployment of the application. These steps include:

A. Requirement Gathering: The first step Requirements gathering entailed eliciting and documenting the functional and non-functional requirements of the web application. Pinpoint the functionalities most crucial for our game-based learning platform, we will conduct stakeholder interviews, user focus groups, surveys with target audience, competitor analysis. Identify the various user roles and their interactions with the system. Use cases will define the functionalities and features required for each user role, including children, parents, educators, and administrators.

B. Design and Prototyping: The design phase encompasses both user interface (UI) and system design. This framework utilizes a Model-View-Template (MVT) architecture, where the Model manages data and business logic, the View handles presentation, and the Template structures the user interface. Model is the structure of storing the data in the database, the view is a python function used to manage the web request, and the template contains static content like HTML, CSS, and JavaScript.

C. Development: Development involves coding the app according to the design specifications. Agile methodology may be utilized to manage development tasks and ensure timely delivery of features. The development phase involved the implementation of frontend and backend components of the web application. The front-end development leveraged a combination of HTML, CSS, and JavaScript. Backend development focused on building robust server-side infrastructure using Django. For database PostgreSQL was used. Development was done for responsive and interactive components for gameplay, user interactions, and navigation.

D. Testing: Comprehensive testing procedures were employed to validate the functionality, usability, and performance of the web application. This included unit testing of individual components, integration testing to verify interactions between modules, and user acceptance testing with real users to identify and address any usability issues or bugs.

E. Maintenance: Ongoing maintenance activities focused on monitoring its performance, addressing user feedback, and releasing updates and patches to enhance functionality and address any issues or bugs. Continuous improvement efforts aimed to adapt the app to evolving user needs and technological advancements in the game-based learning and online education as well as gaming industry.

Results and Discussion

- **Functionality Implementation:** Developed a versatile quiz system allowing children to select quizzes from various genres, including educational and fun activities. Implemented a scoring mechanism that provides immediate feedback, displaying the number of correct and incorrect answers.
- **Customization and Flexibility:** Talk about the virtual assistant feature's ability to offer help, automatic answers, and interactive feedback. Assess the system's capacity to conduct commands, comprehend user inquiries, and support educational activities. A user-friendly quiz editor allows non-technical users to create and edit quizzes with ease, promoting widespread adoption.

Customizable settings enable the adjustment of difficulty levels and the inclusion of specific subjects to meet individual learning goals.

- **User Interaction and Learning Experience:** The user interface is designed to be intuitive and user-friendly, ensuring a positive interaction experience for children. Children reported enjoying the interactive nature of the quizzes, which enhanced their engagement and motivation to learn.
- **Parental Involvement:** Parents found the system straightforward to use, enabling them to actively participate in their child's learning by creating personalized quizzes. The customization feature was highly appreciated for its ability to cater to individual learning requirements and preferences.
- **Comparative Analysis:** Compare the new system's performance with that of other systems currently in use or conventional educative platforms. Emphasize the benefits and drawbacks of upgrading user engagement and learning via the implementation of other such game-based learning applications.

Figures

Appealing Interface: The interface of the game-based learning platform is designed to be visually engaging and child-friendly, featuring vibrant colours, intuitive navigation, and playful graphics that captivate young learners. The layout is straightforward, with clear instructions and easy-to-use controls, ensuring that children can navigate the platform independently. Interactive elements such as animations, sound effects, and character avatars enhance the user experience, making learning feel like an adventure. The design prioritizes accessibility, with large buttons and readable fonts, accommodating children of various ages and abilities.

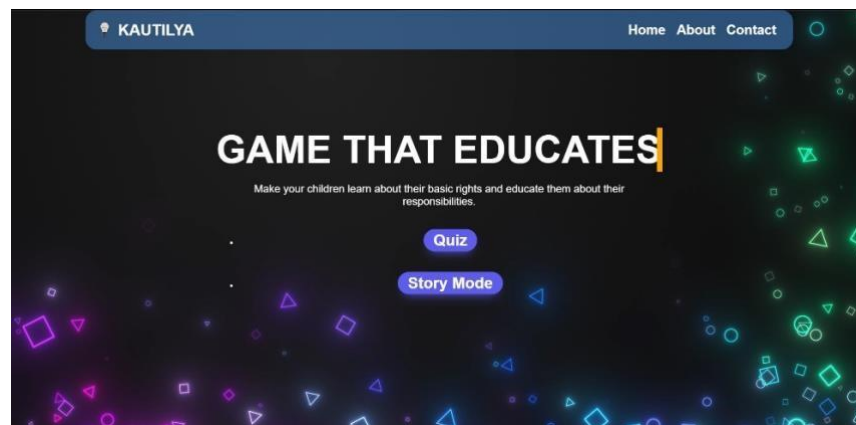


Figure 1: Interactive and appealing interface

Undertaking the Quiz: Upon completing a quiz, the platform instantly displays the child's score in an engaging and motivating manner. A results screen pops up showing the total number of correct and incorrect answers, often accompanied by colourful graphics, animations, and celebratory sounds for correct answers. This immediate feedback helps reinforce learning by highlighting areas of success and identifying topics that may need further review. Additionally, a summary of the questions, with explanations for the correct answers, is provided to enhance understanding and retention.

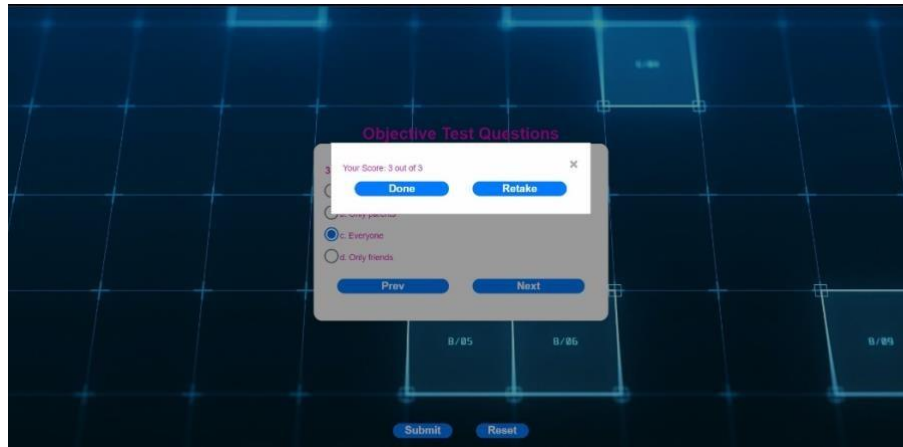


Figure 2: Final Score Display

Conclusion and Future Scope Conclusion:

In conclusion, the development of this game-based learning platform represents a significant endeavour to address educational gaps and promote child protection and empowerment in the digital age. A comprehensive feasibility study confirmed the project's technical, operational, economic, and schedule feasibility. The identified need for innovative educational tools, along with the project's potential to fulfil this need, underscores its relevance.

Children used various objects and symbols to create roles and scenes expressing social messages, addressing rights issues and social roles through games. Starting with familiar topics, they expanded to issues like hunger and poverty. Under appropriate instructional management, developmentally appropriate games can be effectively used in kindergarten. Observations showed that children could compare and connect different rights, analyse meanings, and recognize individual and collective responsibilities. Parents play a crucial role by guiding and sharing the digital gaming experience with their children.

Crucially, parental involvement emerged as pivotal in guiding and enriching the digital gaming experience for children, accentuating the importance of collaborative parent-child engagement in educational endeavours. By leveraging technology to deliver immersive educational experiences, the project endeavours to cultivate critical thinking, decision-making, and communication competencies while bolstering awareness of rights and responsibilities among children.

Collaborative ventures with stakeholders promise to significantly impact children's lives, bolstering their well-being and resilience in the digital epoch and beyond. This endeavour stands poised to bridge educational lacunae and nurture a generation of informed, empowered individual's adept at navigating the complexities of the contemporary world while championing human rights and social justice.

The project holds promise in empowering children with the knowledge, skills, and confidence to navigate the digital world safely and responsibly. By leveraging technology for immersive educational experiences, it aims to foster critical thinking, decision-making, and communication skills while raising awareness of their rights and responsibilities. Through collaboration with stakeholders, the project seeks to significantly impact children's lives, promoting their well-being and resilience in the digital age and beyond.

Future Scope: This project establishes a solid foundation for future advancements and lays the groundwork for further exploration in this area. and development in several critical areas:

Parental Mediation Strategies: Explore parental mediation strategies in the context of digital games and children's rights education. Investigate how digital skills can be leveraged to maximize opportunities and minimize risks for children online, while also promoting responsible and informed engagement with digital media.

Cultural Adaptation and Localization: Investigate the potential for culturally adapted and localized versions of the game to cater to diverse cultural contexts and languages. By tailoring the content to reflect the specific social norms, values, and rights frameworks of different regions, the game can be more accessible and impactful for children around the world.

Integration of Emerging Technologies: Emerging technologies like augmented reality (AR) and virtual reality (VR) offer exciting opportunities to enhance the educational experience provided by the game. By incorporating AR and VR elements, the game can create more immersive and interactive learning environments, allowing children to explore abstract concepts related to their rights in a more engaging way.

Expansion to Upper Primary Schools: This involves adapting the game-based learning approach developed for preschoolers to suit the needs and developmental levels of upper primary school children. By customizing the content and gameplay mechanics, the game can address specific issues relevant to older children, such as bullying prevention, conflict resolution, and understanding complex global challenges like poverty and hunger. This expansion would require collaboration with educators and child psychologists to ensure the content aligns with the curriculum and developmental milestones of upper primary school students.

Collaboration with NGOs and Advocacy Groups: Partner with non-governmental organizations (NGOs) and advocacy groups working in the field of children's rights to amplify the reach and impact of the game-based learning intervention. By collaborating with organizations already engaged in rights education and advocacy, researchers can leverage existing networks and resources to promote the game and facilitate its integration into educational programs and initiatives worldwide.

This project lays the groundwork for significant advancements in interactive smartboard technologies within educational settings. The project has enormous potential to influence the direction of interactive learning experiences and improve interaction between users in educational environments by consistently experimenting with new methods, combining innovative technologies, and taking user feedback into account.

Authors' Contributions

Vasundhara Chandel as the first author, is primarily responsible for the research and conceptualization of the project. This includes defining the scope, objectives, and theoretical framework of the project related to game based leaning technologies and development of this web application efficiently. Vasundhara also played a vital role in the documentation of the project work.

Saurav Pandey's role as the second author focuses on frontend development. This includes designing and developing the user interface (UI) components, interactive elements, and visualizations for the interactive educational platform, so as it looks appealing to the age group who will be its main target audience. Saurav contributes to creating a user-friendly and intuitive interface that enhances user interaction and learning experience.

Anand Singh's contribution as the third author centres on backend development. This involves implementing the backend infrastructure, server-side logic, data processing, and integration of machine learning algorithms and computer vision techniques for real-time processing on the interactive smartboard platform. Anand plays a crucial role in ensuring the system's functionality, performance, and reliability.

Anushka Trivedi's role as the fourth author focuses on the front-end part and documentation of the project and other documents as well. This includes presentations and data gathering.

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