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"DINO Vs. DINI" educational game to increase children's cognitive abilities—what are its level elements?

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Abstract

Games designed for children have the potential to serve as educational tools, incorporating learning components that promote engagement and facilitate the child's cognitive and developmental progress, tailored to their specific age group. The significance of Early Childhood Cognitive Abilities is in their association with everyday tasks and functions. The promotion of cognitive development in individuals with AUD necessitates the provision of many opportunities for cognitive stimulation. Children must attain fundamental competencies commensurate with their chronological age in cognitive development. The objective of developing this educational game is to assist early childhood education (PAUD) teachers and parents in delivering instruction through imaginative and inventive simulations. This study employs the Research and Development (R&D) technique using a 4D model. The instructional game incorporates many level features that assess difficulty, accuracy, memory, and thinking abilities. This educational game encompasses four distinct learning modules tailored for early infant development. These modules include word completion exercises, counting activities, picture guessing tasks, color identification exercises, and competitive elements. The utilization of educational games is anticipated to facilitate the enhancement of children's cognitive capacities, thereby preparing them for the subsequent stages of their primary education.

Keywords: Cognitive abilities; Dinosaurs; DINO Vs. DINI; Educational games; 4D.

Introduction

The communication science and technology field is experiencing significant advancement in games that utilize technology to captivate children's interest in learning (A. et al. et al., 2022; Nafisah et al., 2023; Suharsiwi et al., 2018). The progress in information and communication technology has impacted many sectors (Kurwiyah et al., 2023), like trade (F. Fauzi et al., 2022), health (Rokhmawati et al., 2022), games (Alfaeni et al., 2022). Technological advancement in gaming is a specific technological development (Setiyanti et al., 2022; Supriatna et al., 2023; Wati et al., 2023). Games are a form of technology designed primarily for entertainment, but with time, technology can also serve as an educational tool to enhance children's skills and academic curriculum (Purba et al., 2021; Salamah, 2018; Simorangkir et al., 2022).

Entertainment apps, such as games, are frequently perceived as detrimental to youngsters (Carera et al., 2017; Fatra et al., 2023; Salamah et al., 2019). Games serve several advantageous purposes and benefit children (Angraini et al., 2019; Dwiastuti et al., 2022; Zahroh et al., 2022). These include fostering familiarity with computer technology (Cholily et al., 2023; Dimyati et al., 2023; Dwirahayu et al., 2023). Next, facilitate educational learning, honing problem-solving and logical reasoning abilities, refining motor coordination and spatial skills, and promoting communication between children and parents during joint play sessions. The program accurately, while parents can oversee it by establishing regulations about usage, content, and the types of games children can access through technology.

Effective games for children incorporate educational components to foster engagement and facilitate their cognitive and developmental progress according to their age (Abus & Usmiyatun, 2023; Majid & Ridwan, 2019; Schachter, 2019). This game has the potential to impact the cognitive growth of the child. At PAUD, the idea of integrating learning and play is inseparable (Fonsén, 2019; Jamil, 2018; Wang, 2022). Hence, there is a want for education (A. et al. et al., 2022; Nafisah et al., 2023; Suharsiwi et al., 2018).

As Usmiyatun et al., (2021) stated, developing cognitive abilities in early childhood is crucial due to the strong connection between cognitive skills and everyday tasks. Providing ample stimulation is crucial for the cognitive growth of individuals with AUD (Abe, 2018; Ahmed, Usmiyatun, Darmayanti et al., 2021; Sarter, 2018). Within cognitive development, fundamental abilities exist that the child's age-related progress must attain. These abilities include creativity and the capacity to recall and identify the surrounding environment. Early childhood is a critical period for the cognitive development of recognizing number ideas, letters, colors, and problem-solving skills (Ahmed, Usmiyatun, Nurhidayah, et al., 2021; Choirudin, Darmayanti et al., 2021; Darmayanti, 2023). The learning process can be tailored to the child's developmental stage and implemented through engaging and enjoyable educational activities. It is crucial to select appropriate learning materials to ensure successful outcomes. Cognitive terms are synonymous with intellectual phrases (Fauza et al., 2023; Safitri et al., 2023; Triono et al., 2023). Cognitive processes are intricately linked to an individual's level of intellect. Intellectual capacity in an individual can assist them in resolving life's challenges. An individual's cognitive faculties and intellectual capacity can be enhanced from early childhood through adulthood.

Children are naturally inclined towards play, so most young children already engage in gaming activities on electron. By engaging in instructional games, children have both enjoyment and the opportunity to enhance their cognitive abilities. This educational game is a pedagogical program designed for young children (Choirudin, In' am et al., 2021; Fikri et al., 2023; Vedianty et al., 2022). It includes content on shape recognition, color identification, number comprehension, letter recognition, and singing. By incorporating educational games into the curriculum, children are expected to enhance their cognitive talents, such as learning, creative thinking, and acquiring more advanced knowledge.

Much research has been conducted to develop educational gaming media to improve students' cognitive abilities (Chaidi & Drigas, 2022; Pradana & Uthman, 2023; Rizany, 2023; Subrahmanyam & Renukarya, 2015; Zainuddin, 2023). This research has focused on using Android applications, websites, and learning management systems (LMS). The material consists of five components, including mathematics. The unique aspect of this research lies in the methodology used and the game's substance, which includes a competitive session that enables multiple players to participate. Content apps are created and uploaded utilizing a flexible digital platform that provides a wide range of features and enables offline and online consumption. In addition, the upcoming media will include a feature where, if the player fails in the game, they will not be able to continue, and the dinosaur will exhibit behaviors or actions that suggest it is about to vomit. The dinosaur will promptly eject it upon the player's selection of an erroneous response. However, a game level exists where the dinosaur determines the player's answer. If the answer is correct, the dinosaur will ingest it; if incorrect, the dinosaur will eject it.

The educational game "DINO VS. DINI" was created with parents and instructors in mind to enhance children's cognitive development. It presents multiplication facts, animal shapes in drawings, words with several letters, and various colors. According to Suryani (2019), educational games are those that make use of the sophisticated features of Android smartphones and integrate learning elements.

Research Method

This study employs the English RnD (Research and Development) methodology, explicitly utilizing a 4D model (Vedianty et al., 2023). The R&D method, short for Research and Development, is a systematic approach to creating specific goods and evaluating their efficacy. Thiagarajan (1984) outlines that R&D research has four steps, although researchers typically employ only three stages best suited to the field's characteristics. Figure 1 displays the necessary research stages that need to be conducted.

Figure 1. Development flow of the 4D educational game "DINO Vs. EARLY"

Figure 1 illustrates the initial stage of the research process when preliminary investigations were conducted, and data was gathered through a needs analysis. This involved distributing questionnaires to lecturers who are specialists in the subject matter and media. The second step involves the production of the design product, while the third stage focuses on creating an early prototype for product development.

Results and Discussion

The forthcoming section will analyze the instructional game "DINO VS. DINI," which was developed using the Canva tool. To utilize this application, we must authenticate ourselves using the following hyperlink: https://www.canva.com/. Applications that are accessible through both personal computers and mobile phone applications. Therefore, we shall examine the process of downloading Canva for both mobile devices and personal computers. Utilizing Canva necessitates the subsequent action: Accessing your account. Select the "Create Design" option. Select a template based on your tastes. Upload a picture or photograph. Insert additional text if required. Apply various effects or filters to modify and personalize the visual presentation. Preserve or distribute your design outcomes. Canva offers additional features and tools to establish a website and get online directly. Like the previous guide, locate your preferred site template using the search area. Upon selecting "Customize this template," you will be promptly redirected to the editor page, where you can construct a website. Subsequently, you can promptly conceive and fabricate games.

The forthcoming games will include educational activities such as word completion, numerical counting, image inference, and color identification. The researcher's objective in developing this educational game is to facilitate the transition of PAUD teachers and parents from conventional teaching techniques to simulation-based learning methods through educational game media. Additionally, the game aims to assist PAUD students in their learning process. Enhance children's cognitive capacities using educational games incorporating level aspects to assess difficulty, accuracy, reasoning skills, and memory. This game comprises four educational resources for preschool children: word completion exercises, picture counting activities, picture guessing challenges, and color identification tasks. Children are taught through games, which serve as a means for play and learning. This approach is efficient for preschool children (PAUD) in enhancing their cognitive abilities, and utilizing the game "DINO VS. DINI" as an instructional medium is expected to foster children's enthusiasm for learning in Figure 2.

Figure 2. utilizing the game "DINO VS. DINI" as an instructional medium

Figure 2 shows the starting display of the instructional game, which includes three buttons: a menu button, an exit button, and a credit button. The exit button allows the player to terminate the game, while the credit button displays information about the game developer. The menu button offers four options for game material: word completion, counting, picture guessing, and color identification, as depicted in Figure 3.

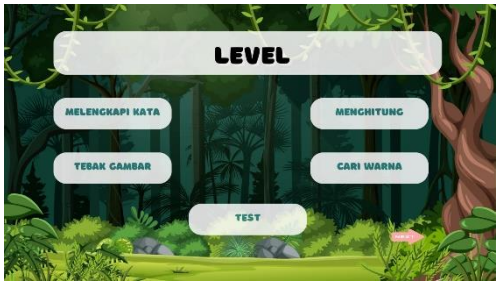

Figure 3. A level selection screen

A level selection screen will be displayed upon selecting a menu option, featuring three levels corresponding to the game's difficulty, as depicted in Figure 4.

Figure 4. Featuring three levels corresponding

The subsequent discourse pertains to an examination of each substance present inside the game, specifically:

1. In Montessori thought, a child's initial reading ability begins with the fundamental components of letters. Montessori reading games involve utilizing visuals to represent each newly given letter. For instance, the letter "t" is paired with an image that begins with the letter "s," and the same is done for the letter "h" and subsequent letters. This approach is the benchmark for creating educational games, including word completion exercises (Backhouse, 2018; Kesäläinen, 2022; Usmiyatun et al., 2023).

2. According to Harwinanda (2018), initial numeracy ability refers to the capacity to begin with one's immediate surroundings, such as oneself, and then go to higher levels. When youngsters develop the ability to identify numbers and comprehend the concepts of addition and subtraction, this instructional game incorporates a menu that fosters the development of fundamental numeracy skills.

3. Guess Picture is an educational exercise that involves using pictures to learn. Players are presented with imitations of objects such as people, animals, and plants on paper, and they must guess the corresponding names. According to (Ellahi et al., 2017 Rizany, 2023 Sabirli & Çoklar, 2020), playing Guess the Photo can enhance children's problem-solving skills by presenting them with unrevealed visuals. The game was then incorporated into educational games created by researchers.

4. Order Colour: Noraddin & Kian (2014) asserted that color is the visual perception resulting from the reflection of sunlight by things exposed to that light. Brewster's theory categorizes colors into four distinct groups: primary, secondary, tertiary, and neutral (Beasley, 2013; Galizzi, 2019; Nurkanti et al., 2020). The process of acquiring knowledge about colors in the early stages of childhood commences with the fundamental primary and secondary colors. Hence, this instructional game emphasizes primary and secondary colors, as depicted

5. Contest: Parents who teach their children healthy competition can instill qualities such as diligence, tenacity, and independence, which will benefit them in adulthood (Choirudin, Mahmudah et al., 2021; Muassomah et al., 2023).

In addition, exposing children to competition can enhance their comprehension of empathy for the positive. Children will also get more familiar with the escalating competition they will encounter as they mature (Setiyanti et al., 2022; Vahter, 2020; Wilson, 2015). This condition promotes a sense of tranquility in youngsters when confronted with competition, mitigating the risk of encountering numerous health issues, including depression, tension, and anxiety disorders.

Exposing children to competition at a young age will develop resilience and perseverance, making them less likely to give up in the face of challenges (Linsell, 2019; Sandilos, 2018; Suyadi, 2020). Children's motivation to achieve optimal outcomes will be heightened, leading them to exert their utmost effort. This serves as a source of motivation for children, encouraging them to actively pursue and enhance their skills to be better equipped for competition.

Early exposure to healthy competition fosters children's appreciation for the endeavors of others. This fosters more social acceptance of youngsters within their social milieu. Entertainment apps, such as games, are frequently perceived as exerting a detrimental influence on youngsters. Games offer children numerous advantages, such as acquiring computer literacy, honing problem-solving skills, enhancing cognitive ability, and fostering communication between children and parents during joint play sessions (Astuti et al., 2023; Khoiriyah et al., 2022; Kusumaningsih et al., 2024). Games designed for children can effectively teach and incorporate learning components that promote age-appropriate activities and foster growth and development in youngsters. Within cognitive development, it is imperative to attain fundamental skills that align with the child's chronological age.

These include thinking creatively and remembering and recognizing one's surroundings. The significance of fostering cognitive abilities in children lies in their capacity to form diverse perceptions through visual, auditory, and tactile stimuli (Choirudin, Ridho' i et al., 2021; Gunawan et al., 2023; Rizki et al., 2023). Additionally, children can enhance their memory retention of past events and experiences and cultivate their ability to establish connections between different occurrences. Children possess the ability to comprehend the diverse symbols present in their surroundings. They can engage in logical thinking that arises spontaneously or during deliberate experimentation (Laila et al., 2022; Sugianto et al., 2023; Zahroh et al., 2023). Furthermore, children can effectively resolve the challenges they encounter in their lives.

Consequently, academics endeavor to create instructional games that are structured as games built upon educational platforms (Anjarwati et al., 2023; Latipun et al., 2022; Sefira et al., 2024). This game facilitates the enhancement of children's cognitive capacities, including acquiring innovative thinking patterns and expanding information.

Conclusion

The game consists of 5 levels that assess the difficulty level, accuracy, memory, and reasoning skills. This game offers four educational resources specifically designed for young children. The initial stage involves filling in the word, followed by the subsequent stage of numerical counting. The third level entails the challenge of deducing the image, while the fourth level necessitates the identification of various colors. Creating educational games aims to enhance children's cognitive capacities, preparing them for advanced elementary school.

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