

Comparison of AI-enhanced educational games for students with disabilities

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Abstract: In recent years, artificial intelligence (AI)-enhanced educational games have become powerful tools for people with disabilities. These games use AI algorithms to customize and personalize the learning experience to meet learners' unique needs and abilities. This comparative analysis aims to evaluate and compare different AI-powered educational games specifically developed for people with disabilities. This article attempts to provide insights so that developers, educators, and people with disabilities can use AI to select appropriate educational games. Highlights how AI-powered educational games can improve accessibility, engagement, and learning outcomes for people with disabilities.

Keywords: AI, educational games

1. Introduction

Artificial intelligence (AI)-enhanced educational games have drawn a lot of attention as potential aids for people with impairments. In order to modify and customize the learning experience, this study offers a thorough examination and comparison of numerous educational games made exclusively for people with impairments.

The comparison focuses on important factors including personalization, engagement, accessibility, and learning results. The accessibility elements of each game are evaluated, taking into account movable interfaces, additional input options, and audible prompts to guarantee inclusion. The issue of personalization looks at how AI algorithms assess user data to modify the game's challenges and content to suit different players' preferences and skill levels. The visual appeal, dynamic gameplay, and gripping tales of the games are used to gauge how well they engage and enthrall players. The learning outcomes section evaluates how well each game accomplishes various learning goals, such as enhancing cognitive abilities, language fluency, mathematical prowess, or memory recall. The user experience portion, which comes to a close, evaluates the usability, responsiveness, and intuitiveness of the controls, interfaces, and AI-assisted aspects of the game.

This paper focuses on five games with artificial intelligence (AI) enhancements: Brain Power (Section 2), Cognoa (Section 3), Abilitations AI Playground (Section 4), EMMA's World (Section 5) and Floreo (Section 6).

2. Brain Power

Brain Power, by Brain Power, LLC is an educational game specifically designed for children with Autism Spectrum Disorder (ASD). The game uses advanced AI technology to provide real-time feedback and social-emotional learning support. One of the key capabilities of AI is using computer vision and facial recognition algorithms to analyze facial expressions and provide social interaction prompts.

Accessibility

In terms of accessibility, "Brain Power" includes various elements to meet individual needs. This includes visual and auditory cues to improve understanding and engagement. The game also features customizable settings that allow users to tailor the game's interface, difficulty, and sensory input to their specific needs.

Engagement

Engagement is a key aspect of gaming and Brain Power ensures that through interactive activities, gameplay elements and immersive virtual environments. These features attract children's attention and motivate them to actively participate in the game. By providing an exciting and fun experience, this game promotes the development of social skills in children with ASD.

Learning Outcomes

Brain Power learning outcomes focus on improving multiple areas in children with ASD. Using AI-driven feedback and assistance, the game helps improve social communication skills such as understanding and expressing emotions, interpreting facial expressions, and participating in appropriate social interactions. Additionally, the game aims to develop self-regulation skills, helping children with ASD manage their emotions, behaviors and reactions in social situations.

3. Cognoa

Cognoa, by Cognoa Inc. is an educational game for children with developmental disabilities and autism. One of Cognoa's key AI capabilities is the ability to tailor content and activities to each child's unique strengths, challenges, and learning style. AI algorithms analyze your child's performance, preferences and areas for improvement to customize the learning experience.

Accessibility

Accessibility is a priority of "Cognoa" to meet different needs. The game offers a multimodal learning experience that includes visual support, auditory cues, and other sensory inputs to accommodate different learning styles. It also offers a customizable interface that allows users to customize game settings, interface design, and accessibility options to suit their tastes and needs.

Engagement

Engagement is driven through interactive games, educational content, and rewards on Cognoa. The game features a variety of activities designed to be engaging and fun for children. Through interactive gameplay and challenging experiences, this game motivates children to actively participate and develop targeted skills.

Learning Outcomes

Cognoa's learning outcomes are focused on supporting the cognitive, social and emotional development of children with developmental delays and autism. This game targets specific skills such as communication, problem solving, self-regulation, and other areas of development. By providing personalized interventions and adaptive content, "Cognoa" aims to support the holistic growth and development of children.

4. Abilitations AI Playground

Abilitations AI Playground by Abilitations, Inc. is an educational game specifically designed for students with motor or sensory impairments. The game uses AI algorithms to analyze each student's movements and provide personalized feedback. We tailor activities, assignments and environmental factors to each student's abilities and needs.

Accessibility

Accessibility is the focus of the Abilitations AI Playground, ensuring the inclusion and participation of students with motor or

sensory disabilities. The game includes assistive technologies such as adaptive interfaces and customizable settings to meet different needs. With options to customize controls, visual displays, and input methods, students can engage in games through the interface that works best for them.

Engagement

Engagement is driven through a variety of interactive physical play experiences in the Abilitations AI Playground. The game offers a variety of activities designed to entertain and inspire students. AI guidance is provided to enhance the gameplay experience, providing real-time feedback, suggestions, and prompts to support motor development, sensory integration, and cognitive growth.

Learning Outcomes

The Abilitations AI Playground learning outcomes focus on improving different areas for students with motor or sensory impairments. This game is aimed at motor coordination and helps students improve their motor skills, balance and control. It also supports sensory processing, helping students with sensory integration and conditioning. Additionally, the game improves spatial awareness and helps students better understand their body's position in space. Cognitive skills can also be addressed as the game features challenges and activities that promote problem-solving, critical thinking and decision-making skills.

5. EMMA's World

"EMMA's World" by Mindtech Global Ltd is an educational game specially designed for children with Attention Deficit Hyperactivity Disorder (ADHD). This game uses AI algorithms to monitor your child's attention and performance in real time. Based on this monitoring, the game dynamically adjusts the environment, pacing, and stimuli to keep you engaged and optimize your attention.

Accessibility

Accessibility is an important aspect of EMMA's World to meet the unique needs of children with ADHD. The game offers customizable settings that allow users to tailor their gaming experience to their own tastes and requirements. Also included is an adaptive difficulty level to ensure the game offers the right challenge for every child. Visual aids are integrated to support attention and comprehension during gameplay.

Engagement

Engagement is an important aspect of EMMA's World. The game offers an immersive virtual reality experience, immersing children in an immersive digital world. Interactive tasks, rewards and engaging game mechanics encourage children to actively participate in the game. By providing an exciting and challenging experience, this game aims to improve attention, concentration and executive function skills.

Learning Outcomes

The EMMA World learning outcomes focus on improving attention regulation, concentration, cognitive control and executive function in children with ADHD. Using AI algorithms, the game adapts to the child's attention level and provides interventions to optimize attentional skills. By participating in game activities and challenges, children can practice and improve their ability to maintain attention, manage distractions, and exercise cognitive control.

6. Floreo

"Floreo" by Floreo Inc. is an educational game developed specifically for people with Autism Spectrum Disorder (ASD). One of Floreo's key AI capabilities is its ability to provide dynamic, personalized feedback. The game uses AI-driven feedback to guide individuals in social interactions and provide suggestions, prompts, and enhancements based on their performance. This personalized feedback helps individuals learn and generalize social skills beyond the game, improving their ability to navigate real-world social situations.

Accessibility

Accessibility is Floreo's priority to meet the diverse needs of people with ASD. The game has customizable settings that allow users to customize the difficulty, pace, and sensory input of the game to suit their tastes and requirements. Visual aids such as clear instructions and visual cues are also integrated to aid comprehension and comprehension during gameplay.

Engagement

The use of virtual reality (VR) technology at Floreo drives engagement. The game creates immersive and realistic social situations for individuals to practice their social skills in a simulated environment. Interactive challenges, feedback and rewards are built in to increase engagement and motivation. By providing an immersive and interactive experience, the game encourages individual active participation and develops social communication skills.

Learning Outcomes

Floreo's learning outcomes focus on improving a range of social skills in individuals with ASD. The game covers areas such as conversational skills, taking turns, and social communication such as understanding social cues. It also aims to improve eye contact, perspective acquisition and social interaction skills. By practicing these skills in the 'Floreo' virtual environment, individuals improve their social skills and become more confident in real-world social interactions. ***Accessibility***

7. Comparison

This section summarizes game target, AI futures, accessibility, engagement, and learning outcomes and compares games based on those.

Target

The games described in this white paper target specific population groups with disabilities. Brain Power, Cognoa, and Floreo provide customized learning experiences designed for people with Autism Spectrum Disorder (ASD) to improve social communication, cognitive and emotional skills. The Abilitations AI Playground, on the other hand, focuses on students with motor or sensory impairments, offering interactive activities that improve motor coordination and sensory integration. Finally, EMMA's World is aimed at children with Attention Deficit Hyperactivity Disorder (ADHD) and aims to improve attention coordination, concentration and executive function skills. These games address the unique needs of people with disabilities and use AI technology to provide personalized interventions and learning and developmental support.

AI futures

The use of AI algorithms is a feature common to the five games analyzed in this comparison. "Brain Power" uses AI algorithms to provide real-time feedback and social-emotional learning support to enhance children's learning experiences. Similarly, Cognoa uses AI algorithms to assess a child's developmental progress, offer personalized interventions, and track development over time. This personalized approach allows the game to adapt to each child's unique needs and abilities. Abilitations AI Playground uses AI

algorithms to analyze movement and provide personalized feedback, making it an effective tool for improving motor skills and coordination. EMMA's World uses AI algorithms to monitor children's attention levels and performance in real-time, enabling coordinated interventions to improve attention regulation and cognitive control. Finally, Floreo incorporates AI algorithms to create dynamic and adaptive scenarios for social skill training, providing individuals with autism spectrum disorder (ASD) with a safe and controlled virtual environment to practice and develop your social communication skills. Using AI in these games will make them more effective by providing personalized experiences, real-time feedback, and adaptive learning approaches, ultimately resulting in better outcomes for people with disabilities.

Accessibility

When it comes to accessibility, the five games reviewed in this paper show a strong commitment to addressing different needs. Brain Power includes visual and auditory cues, customizable settings, and adjustable difficulty levels so that people with different abilities can effectively participate in the game. Similarly, Cognoa offers a multimodal learning experience, visual support, and a customizable interface to meet the diverse needs of its users. The Abilitations AI Playground features integration of assistive technologies, adaptive interfaces, and customizable settings to facilitate participation and active participation of people with disabilities. For EMMA's World, the game features customizable settings, adjustable difficulty levels, and visual support specifically tailored to the unique needs of children with Attention Deficit Hyperactivity Disorder (ADHD). Finally, Floreo prioritizes accessibility by providing customizable settings, visual support, and clear instructions so that individuals with Autism Spectrum Disorder (ASD) can fully participate in the game. These games demonstrate a commitment to accessibility by leveraging a variety of features and customizable options to meet the diverse needs of audiences and deliver a comprehensive and enjoyable gaming experience.

Engagement

Engagement is a key aspect of educational games, and the five games analyzed in this paper offer unique approaches to engaging and motivating users. Brain Power excels at providing interactive activities, gamification elements, and immersive virtual environments to create immersive experiences that encourage social skill development. Similarly, Cognoa offers interactive games, educational content and rewards to motivate children and encourage active participation in specific skill areas. "Abilitations AI Playground" focuses on interactive physical play experiences complemented by AI guidance to promote motor skills, sensory integration and cognitive development. In "EMMA's World" users can expect an immersive virtual reality experience with interactive tasks, rewards and immersive gameplay. It aims to improve attention, concentration and executive function skills. Finally, "Floreo" uses virtual reality (VR) technology to create and practice immersive and realistic social situations. The game includes interactive challenges, feedback, and rewards to keep you engaged and motivated. Each game employs different strategies to ensure active participation and enjoyment, ultimately contributing to the effectiveness of the learning experience for people with disabilities.

Learning outcomes

The five games examined in this comparison offer unique learning outcomes for people with disabilities. Brain Power focuses on improving the social communication, cognitive and emotional skills of individuals with Autism Spectrum Disorder (ASD). Through real-time feedback and social and emotional learning support, the game encourages the development of these important skills. "Cognoa" aims to assess a child's developmental progress and provide individualized interventions to improve overall development over time. This game targets specific skills such as communication, problem-solving and self-regulation to support the cognitive and social-emotional growth of children with

developmental delays and autism. The Abilitations AI Playground is designed to improve motor coordination, sensory processing, spatial awareness, and cognitive skills in students with motor or sensory impairments. Games that focus on physical gaming experiences help individuals develop these essential skills in an interactive and engaging way. Specifically targeted at attention deficit hyperactivity disorder (ADHD), EMMA's World aims to improve attention regulation, concentration and executive function skills through real-time monitoring and adaptive gameplay. Finally, "Floreo" focuses on improving social her communication, eye her contact, perspective acquisition, and social interaction skills in individuals with ASD. The game's dynamic and adaptive social skill training scenarios create an immersive learning environment that facilitates these specific outcomes. Each game provides a customized experience to address the unique learning needs of people with disabilities and support their cognitive, social and emotional development.

8. Conclusion

Each of the educational games covered in this article is created with specialized objectives in mind, focusing on certain cognitive development areas and tackling particular problems. The main goal of Brain Power is to help kids with autism spectrum disorder (ASD) by offering resources and treatments that improve social and emotional connection. Through the detection of possible delays and the provision of individualized suggestions for intervention, Cognoa strives to enhance early childhood development. Children with impairments are catered to by Abilitations AI Playground, which provides adaptive learning opportunities to support cognitive growth and problem-solving ability. Children with neurodevelopmental impairments can improve their cognitive, physical, and social abilities by participating in EMMA's World in virtual reality. Last but not least, Floreo offers autistic people with a virtual reality-based social skills training platform that enables them to practice and generalize social interactions. These technologies provide customized treatments to maximize cognitive development and enhance overall functioning in children with a variety of requirements by modifying their platforms to address specific cognitive goals. In summary, each game contributes differently to educational games and AI for people with disabilities. These platforms aim to empower people with disabilities by putting an emphasis on accessibility, engagement, learning outcomes, and specialized goals.

References

1. BrainPower web-site, available at <https://brain-power.com/>
2. Cognoa web-site, available at <https://cognoa.com/>
3. Abilitations web-site, available at <https://www.schoolspecialty.com/abilitations>
4. Floreo web-site, available at <https://floreovr.com/>
5. Tracey, D. H. (2018). Assistive technology for children with disabilities. *Pediatrics in Review*, 39(5), 219-229