

Innovative Framework for Enhanced Gamification in Autism Therapy (PIETI)

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ABSTRACT

Autism Spectrum Disorder (ASD) presents unique challenges that necessitate specialized and deliberate approaches to learning and therapy. With the growing acceptance of gamification as a powerful tool in educational and therapeutic settings, its use in autism interventions has become a focus of innovation. [1]

The PIETI Framework is introduced in this paper, a nuanced approach to using gamification to improve interaction skills in people with ASD. The PIETI Framework is based on five main components: therapeutic, immersive, personalization, interactivity, and an aspect of ethics and accessibility.

Personalization ensures adaptive content that is tailored to each child's unique learning journey, with adaptable user interfaces and content tailored to individual learning pace, interests, and challenges.

Immersive: By leveraging virtual and augmented reality technologies, it encourages the creation of realistic and engaging environments that significantly improve the learning experience and keep students' attention.

Ethics and Accessibility: With a focus on protecting children's rights and well-being, this pillar addresses data protection, the emotional and psychological effects of gamification, and includes caregivers and professionals in the design process. It also includes economic considerations, such as ensuring that the strategies are cost-effective, accessible, and long-term.

Therapeutic: This component prioritizes alignment with individual therapeutic goals and incorporates strategies such as feedback, rewards, and difficulty adjustments to meet diverse needs, encourage independence, and improve learning outcomes.

Interactivity: This element promotes active learning and social interaction by involving children in the learning process through dynamic feedback, interactive storytelling, and multiplayer capabilities.

One unique aspect of the PIETI Framework is the thoroughness with which it addresses the various needs of autistic people in gamified learning settings. It aims to pave the way for more inclusive, effective, and responsible applications of gamification in autism support and intervention by addressing ethical, practical, and economic implications. This framework not only adds to current understanding and methodology in autism therapy, but it also opens new avenues for future research, development, and practice.

KEYWORDS

Autism Spectrum Disorder (ASD), Gamification Applications, Measurable Therapeutic Outcomes, Evidence-Based Design, Framework Critique, Strategy Implementation, Intervention Efficacy, Therapeutic Goals, ASD Engagement, Behavioral Metrics

1 Introduction

Within the ever-evolving domain of therapeutic interventions, the recent emergence of gamification has represented a paradigm shift, specifically in its capacity to augment the cognitive and social maturation of individuals diagnosed with ASD. The concept of leveraging games' engaging, and interactive nature has been a focus of research, with the goal of fostering learning, communication, and essential social skills. Serious games, a specific category designed with the dual purpose of entertainment and targeted learning, have shown promising results in improving social behavior among individuals with ASD over the last two decades in this emerging domain.

The development of serious games adds a new dimension to the treatment of people with ASD, focusing on the critical aspects of social interaction and communication. A substantial body of research shows that these games are effective in targeting children with high-functioning ASD or Asperger syndrome, with a particular emphasis on emotion recognition and production. These games are not just for fun; they are meticulously designed to be educational tools that address the unique challenges that people with ASD face.

Individuals with ASD frequently exhibit distinct learning patterns and behavioral characteristics, such as repetitive behaviors and restricted interests, which can have a significant impact on their social and communicative development, according to researchers. Traditional teaching and behavioral intervention methods may not fully meet their learning needs, necessitating

innovative approaches that can effectively engage and teach these individuals. With their interactive and immersive nature, serious games emerge as a compelling solution to this challenge.

While these games have enormous potential, the current landscape of serious game design for ASD therapy suggests that more rigorous development and evaluation is required. According to the literature, many of these games require larger sample sizes, robust clinical validation, and regular follow-ups to ensure that they are not only engaging but also result in measurable and long-term improvements. To maintain engagement and ensure the relevance and efficacy of the intervention, the design and implementation of these games must consider the individual's interests, challenges, and developmental level, with an emphasis on personalization.

Furthermore, as the field develops, it becomes increasingly important to address the various approaches, scopes, and efficacy of these frameworks. Some researchers have attempted to create more immersive and tailored learning environments by integrating advanced technologies such as virtual reality (VR) and augmented reality (AR) [2]. These technologies provide a controlled yet flexible environment in which people with ASD can safely explore and practice social interactions and behaviors, reducing the anxiety and stress associated with real-world social situations.

Furthermore, adaptive learning technologies are gaining popularity, with some frameworks incorporating systems that adjust the game's difficulty and content in real-time based on the user's performance and engagement. This adaptability ensures that the game remains challenging and beneficial while accommodating the user's changing needs and abilities.

Despite the potential and growth of serious games in autism therapy, a more comprehensive and integrated approach is still urgently needed. Current models frequently overlook the ethical, interactive, and economic aspects of gamification, which are critical for ensuring these interventions' widespread applicability and acceptance. As researchers and practitioners in the field continue to innovate and refine these games, it is critical to take these multifaceted dimensions into account in order to create a holistic and effective framework for gamification in autism therapy.

Finally, the intersection of gamification and autism therapy represents a frontier of enormous opportunities and challenges. The potential to transform the therapeutic landscape for individuals with ASD is unprecedented as the body of research grows and technology evolves. The future of serious games in autism therapy can be as impactful as it is promising by addressing current gaps and building on the insights provided by extensive studies and evaluations. It is a collaborative journey toward more inclusive, effective, and engaging therapeutic interventions that requires not only technical and clinical expertise but also a deep understanding of the nuanced needs and experiences of individuals with ASD.

The paper is organized as follows: the following section will introduce the framework elements, the section on framework testing will follow, and finally, the paper will include future work.

2 Our Framework

The incorporation of gamification into therapeutic interventions has shown considerable promise in recent years, particularly in the context of ASD." Researchers and therapists hope to foster skill development, improve learning, and improve quality of life for people with ASD by leveraging the motivating and engaging properties of games. Creating effective, accessible, and financially viable solutions, on the other hand, presents its own set of challenges. The framework presented here is based on a thorough review of current research and best practices in the field. It is tailored to the ASD population's specific needs and characteristics, incorporating a multifaceted approach that emphasizes therapeutic alignment, immersive technology, personalized content, interactive engagement, and ethical and economic considerations. Each component of the framework is based on a commitment to accessibility, efficacy, compassionate care, and cost-effectiveness, paving the way for more engaging, effective, and economically viable interventions.

2.1 Personalization

We advocate for adaptive content that caters to the specific requirements of each child. This includes user interfaces that can be customized and content that can adjust accommodate individual differences in learning pace, interests, and difficulties. We stress permitting modifications to the color scheme, graphics size, layout arrangement, and information display based on the needs and tastes of everyone. Our efforts for personalization also include the use of multimedia options, which include text, audio, and video, to cater to the specific interests and preferences of everyone with ASD. [3,5,6,7,8,9,10,11,12,13]

2.2 Interactivity and Engagement

By engaging the child through dynamic feedback, interactive narrative, and multiplayer features, our framework fosters active learning and social connection. We use a variety of media types, including text, images, sounds, animations, and video, to inspire students to build their own narratives, so improving their communication skills and symbolic function. We also prioritize the customization of learning outcomes and parental control tactics, which is frequently accomplished through the synchronization of child-parent or child-teacher devices or the use of various interface profiles. [6,7,8,9,12,13]

2.3 Ethics and Accessibility

We focus on protecting children's rights and well-being throughout the gamification process, including data privacy, emotional and psychological difficulties, and involving caregivers and professionals into the design process. Our research and development teams are committed to creating effective autism treatments while establishing their feasibility on a productive,

financial, and corporate level. This includes ensuring that the interventions are not only clinically useful, but also economically viable, by providing cost-effective options that can be widely implemented and sustained. We advocate for cost-effective, scalable, and accessible gamification strategies that maximize impact while cutting costs and making these technologies more accessible to diverse communities. We also emphasize the need of scientific rigor and integrity in ASD-specific software development, as well as ongoing efforts to increase accessibility, effective learning, social inclusion, and economic feasibility. [6,7,9,12,13]

2.4 Therapeutic Approach:

By incorporating various therapeutic training assignments with gaming components to make them more attractive for individuals with ASD, we ensure that the gamified activities are matched with specific therapy goals. To accommodate a range of objectives while fostering independence and increasing learning outcomes, this strategy employs motivational methods, feedback loops, rewards, and variable difficulty levels. We also intend to use early intervention and intensive therapy interventions to improve daily behaviors by employing techniques such as vocalization, cooperation, turn-taking, core emotion awareness, and imitation. This strategy is backed up by the significant use of feedback systems and rewarding mechanisms in ASD-specific therapy, which are usually used shortly after task completion to reinforce certain behavioral patterns. [6,9,10,11]

2.5 Immersive Technology:

We create realistic and engaging environments by utilizing technologies such as virtual and augmented reality to significantly enhance the learning experience and keep attention. Immersive technologies, such as Virtual Reality (VR), establish an environment that allows for greater control over interventions while also encouraging engagement. We strive to blend mid-term and long-term goals into these immersive environments to boost motivation and interest in using the program.[2]

3 Initial Testing

We prioritized stakeholder engagement as a foundational step in the initial phase of testing our gamification framework designed for autism therapy." Recognizing the unique needs and experiences of people with ASD, we actively included them in our review process, along with caregivers, therapists, and educators. This collaborative approach was critical in acquiring a comprehensive knowledge of the framework's applicability and impact. We acquired vital thoughts and input from individuals who are most touched by and familiar with the problems and subtleties of ASD through formal interviews, focus groups, and interactive workshops. This input not only provided a real-world perspective on our framework's usability and effectiveness, but it also built a sense of community and co-ownership among stakeholders. Their input was critical in identifying possible areas for improvement, ensuring that our framework is not only

theoretically sound, but also connects with the real-world experiences and demands of its intended users. This stakeholder-centric approach laid a solid foundation for the following stages of development and testing, ensuring that our framework is personalized to genuinely improve treatment outcomes for people with ASD.

4 Future Work

Continuing from the initial step of stakeholder involvement, we acknowledge that, while important, this phase does not suffice as full testing of our gamification system. It is a preparatory process that provides preliminary insights and guiding concepts for the construction of a more refined prototype. Collecting feedback from people with ASD, caregivers, therapists, and educators gives a comprehensive grasp of end-user needs and preferences, allowing the framework to be more user centric. However, this is only the beginning. Following that, we will conduct a series of more rigorous, iterative testing phases that will include prototype creation, controlled trials, and user testing to confirm the framework's effectiveness, usability, and therapeutic effects. Each testing step will build on the previous one, with stakeholder feedback used to continuously enhance and modify the framework. This iterative process guarantees that the final product is not just based on theoretical ideas and early input, but is also tested and proved in real-world settings, improving its reliability and efficacy.

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