

Memory Strengthening Tool for Autism Kids

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ABSTRACT : Children diagnosed with Autism Spectrum Disorders (ASD) tend to have challenges related to memory, attention, sequence, and cognitive processing. The Memory Strengthening tools for Autism Kids project is intended as an interactive educational game application that assists in enhancing cognitive abilities as well as memory capabilities for autistic children. The application is intended as a secure, visually stimulating, and sensory-friendly environment where autistic children can engage in memory-strengthening activities in a fun way.

The system comprises various game modules including memory games involving visualization of memory, pattern matching, sequencing, and counting. These games have been implemented with a simple interface, colorful graphics, and sound effects to engage the user in a fun environment. Additionally, the application comprises a user login module to record a child's basic information. Hence, parents or educators can monitor the development of their children over time.

The project incorporates various gamification techniques combined with cognitive development techniques to help children with autism develop memory skills, concentration abilities, and problem-solving skills. The application has a simple interface with a user-friendly environment and can be easily extended with additional game modules in the future. Hence, the project demonstrates the use of technology as an assistive tool in the cognitive development of children with special needs.

Keywords :

Autism Spectrum Disorder (ASD), Memory Training Games, Educational Games, Cognitive Development in Children with Autism, Assistive Technology for Child Development, Child-Focused Interactive Games, Gamification of Autism Treatment, Autism Treatment Games.

INTRODUCTION

This is because Autism Spectrum Disorder (ASD) is a disorder that will always impact the way children communicate, behave, learn, and interact socially. There are children who have autism and therefore face challenges in attention, memory, and cognitive processing. This means that learning will not be effective for them. Therefore, it is essential to use special learning strategies and tools that will assist them in improving their cognitive skills in an enjoyable and comfortable way.

Technology is an essential tool that has been integrated into modern learning strategies. This is especially important for children who have special needs. Interactive games and learning tools have

been developed to assist children in creating an enjoyable learning environment that will encourage them to learn. Games have been identified as an essential tool for children who have autism .

The Memory Strengthening tool for Autism Kids project is an interactive game-based application that will assist children who have autism in improving their memory and cognitive skills. The application will be composed of various types of games that will assist children in improving their memory. The games will include visual memory games, pattern matching games, sequencing games, and counting games. The creation of these learning games provides an enjoyable atmosphere

with easy-to-use navigation, bright colours and positive reinforcement to engage students while reducing stress and encouraging them to participate more fully in their educational experience and, therefore, will assist in their learning.

This project is meant to help children with autism develop their cognitive abilities through the provision of an easy-to-use, structured learning system that combines educational principles with gamification techniques to provide an engaging and motivating way for children to practice their memory skills. The system can also be used as a means of tracking a child's progress for teachers and parents, making this an effective method of monitoring cognitive growth as well as aiding in the cognitive growth of the child.

The Memory Strengthening Tool for Autism Kids application aims to provide an appropriate and distraction-free learning environment for children with autism while they improve their memory skills. In most cases, children with ASD respond positively to structured and predictable activities; therefore, all games have clearly defined rules, incremental levels of difficulty and simple interactions. This will allow children to feel confident when completing their tasks, thus allowing them the opportunity to practice more often.

All in all, the Memory Strengthening Tool for Autism Kids is an example of how technology can support inclusive education; by integrating educational games with cognitive training techniques. This is a valuable resource for children with autism when attempting to learn.

LITERATURE REVIEW

[1] Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that affects communication, behaviour, and cognitive functioning in children. Many children with ASD experience difficulties in attention, memory, and executive functioning, which can affect their learning ability. [2] Researchers have explored various technology-based interventions to support cognitive development in autistic children. Computer-based educational games have emerged as an effective method because they provide structured, interactive, and engaging environments

that match the learning preferences of many children with autism.

[3] Several studies have investigated the effectiveness of game-based interventions for improving cognitive skills such as memory, attention, and problem-solving in children with autism. For example, research on smartphone-based working memory training games designed specifically for children with ASD showed that children who actively engaged with the games demonstrated improvements in working memory skills. [4] The study suggested that longer and consistent use of such digital training games could further enhance cognitive development.

Serious games developed for educational or therapeutic purposes have also been widely studied in autism research. [5] A systematic review analyzing multiple studies found that many serious games produced measurable improvements in areas such as social interaction, learning engagement, and cognitive skills among autistic individuals. [6] The findings highlight that game-based learning environments can be an effective tool for supporting developmental skills when compared to traditional teaching approaches.

Interactive digital games are particularly beneficial because they combine learning with play. Studies show that structured memory-training games can improve both memory and concentration in children by providing repetitive and engaging activities. [7] In one study involving a digital memory game intervention, children showed significant improvements in their ability to maintain attention and recall information after regularly playing the game. This demonstrates the potential of gamified tools in enhancing cognitive abilities in children with developmental disorders.

[8] Recent research has also explored advanced technologies such as virtual reality, augmented reality, and personalized learning systems to support children with autism. For example, a virtual reality hide-and-seek game was developed to improve gaze fixation and attention skills in autistic children, and the results showed improved performance compared to traditional methods. [9] These innovative technologies demonstrate how digital platforms can create immersive learning experiences that improve engagement and skill development.

[10] Another area of research focuses on the role of visual learning tools in supporting children with autism. Studies show that many autistic children respond better to visual stimuli such as images, colours, and symbols rather than text-based instructions.[11] Educational applications that incorporate visual cues, picture-based tasks, and interactive graphics help children understand concepts more easily and improve memory retention.[12] Therefore, visual-based digital games are widely recommended as effective learning tools for children with ASD.

In addition, researchers emphasize the importance of gamification and reward systems in educational applications for autistic children. [13] Stars, levels, badges, and sounds that motivate children to continue to play the game and learn (through a rewards mechanism) help to reinforce positive behaviour and increase levels of engagement during learning activities, and previous research supports the idea that computer games and interactive education have great potential in fostering cognitive growth in autistic children; therefore, many educational software products use gamification methods to improve the success of memory training and cognitive development programs in these children.

Additionally, B Leelavathi et al. [15] proposed a system for detecting network worms by analysing multiple, distinct features of executables to identify malicious behaviour, aiming for a high detection rate with low false positives.

METHODOLOGY

The Memory Strengthening tool for children with Autism Project uses a systematic process to create an interactive educational game app that helps to improve memory and cognitive skills in children on the autism spectrum (ASD). The development of the methodology consists of six phases: requirement analysis; system design; development; testing; and evaluation. The purpose of each phase is to ensure that the application will be easy for users, effective, and appropriate for the educational needs of children with autism.

The initial phase of this methodology is requirement analysis. This involves conducting research into the needs of children with autism

through an analysis of journal articles of the autism field, research on special education resources, and existing educational materials. The main goal of this phase is to identify the cognitive obstacles associated with autism; for example, memory difficulties, problems paying attention to things, and having trouble keeping things in the correct order.

After conducting the requirement analysis phase, features and functionality of the application will be established by developing game types, visual designs, sound feedback, and difficulty level. The next stage is designing the system, where the overall layout and user interface of the application are created. The system will feature a colourful, easy-to-use interface so children can easily play games. The design will have many modules such as Login; Enter Information; Game Selection; Multiple Levels of Games; Tracking Progress. Flow charts and layouts will be created to ensure easy navigation through applications.

Once the design has been completed, the next stage is to develop the application. To do so, appropriate programming technologies (e.g. Python with Tkinter or web technologies such as HTML, CSS, and JavaScript) will be used to create the applications. Some of the different types of memory games created will include; visual memory, pattern matching, counting/matching, fruit collecting and word puzzles. Various sound effects, animations and reward systems (i.e. stars) will help create an entertaining and stimulating application for children.

The following stage in the process of developing an application is to test and debug the application. This testing process ensures that all parts of the application are functioning correctly and that the application is easy for the user to navigate. There will be a functional test of each level of the game and for each button and navigation button in the application. Because the target users of the application are children, usability testing is considered as very important. Any errors or technical problems discovered while testing the system will be corrected in order to improve the performance and reliability of the system.

The final step of this process is to conduct an evaluation of the application and how well it has achieved its goals. The application will be

evaluated according to user engagement and ease of use and by how much the application has improved the user's ability to complete memory-type tasks. Teachers, parents, and other users can provide feedback on areas where improvement is needed.

The results of this evaluation will provide information to determine if the application has provided an effective means of supporting memory training and cognitive development for children diagnosed with autism and provide information that can be used for future updates to the application.

The methodology includes another critical component related to level advancement through difficulty for game-play and difficulty for game-play. Children can steadily improve their memory abilities by advancing through multiple levels of a game.

The games increase difficulty as players progress through the game by making it more challenging for the player to complete tasks: There will be more items to remember (i.e., more objects to remember), more complex patterns to match (i.e., more complex patterns to match), and more words in puzzles to identify (i.e., more words in puzzles to identify). Each level will enable the child to advance at their own pace, allowing the child to develop their self-esteem while preventing frustration in completing tasks. Level progression occurs sequentially, thereby providing an incentive for the child to continue practicing their skills until they succeed in completing a level.

Also included in the application is a tracking and feedback mechanism. Performance by children will be recorded against several games and quizzes. This recording system will provide immediate feedback to the child following the completion of each task. After children successfully complete a level, they will receive stars, sound rewards, and written praise for their efforts.

This feature helps children stay motivated and provides parents and teachers with the ability to see the change of the child's memory and cognitive capabilities over time. As time progresses, the tracking of a child's performance will also help identify areas where the child may need additional assistance.

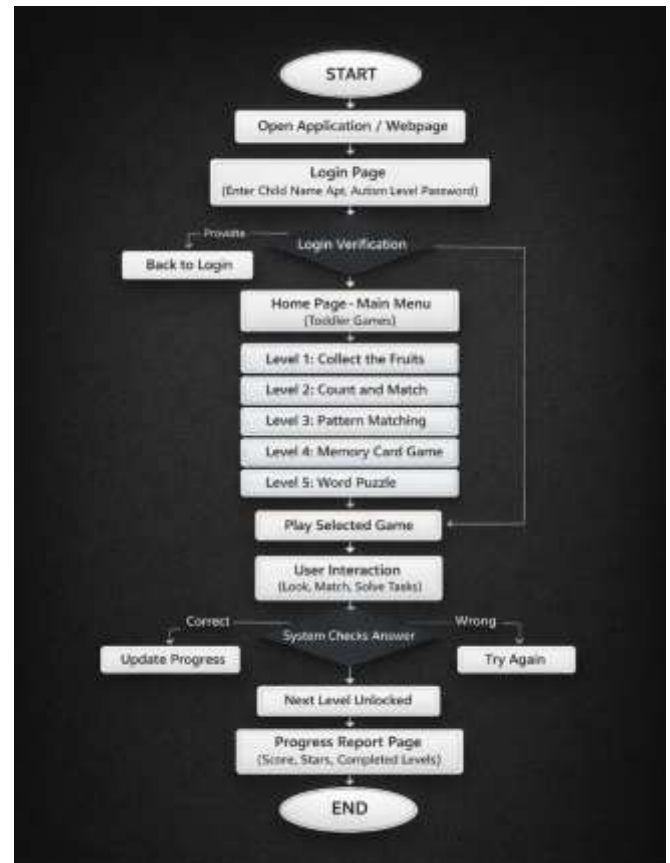


Figure 1: Workflow of Proposed Methodology

When opening the Memory Strengthening Tool for Autism Kids application (or webpage), the user's first interaction with the system is the login page, which requires the user to input basic information that includes their child's name, age, autism level, and password as necessary details for user information storage and for personalizing each child's learning environment.

Once all the appropriate information has been completed, the system will perform a login verification process. If any of the values given are not valid, the system will present an error message and will redirect the user back to the login screen so that they can enter all the proper verification types. If the entered values are valid, the user will have successfully logged into the application and be redirected to the Home/Master Menu of the application.

Once on the Home Page, the user can start accessing the games for toddlers section of the

application, which includes many different game levels. The levels of games include Level 1 - Collect the Fruit, Level 2 - Count and Match, Level 3 - Pattern Match, Level 4 - Memory Card, and Level 5 - Use Letters to Form Words. The child may select from any of the currently available levels and begin to play.

For instance, if the child answers correctly, then the system will provide positive feedback. The child may receive stars, sound effects, or some other type of reward as a form of motivation to continue playing. On the other hand, if the child answers incorrectly, the system will encourage him/her to keep trying until he/she finds the correct answer. This feedback will assist with reinforcing learning and building self-confidence for the child.

When the child completes a level, then the system will record his/her progress and unlock the next level for the child to advance. It also tracks their performance by tracking data on a report card page, which will display how many points they received for completing the level; the number of stars they received for that level; and what levels they have completed so that a parent/teacher can monitor the child's progress over a period of time.

Once the user has viewed their progress report or completed the game session, the workflow will terminate. At this point, the system will allow the user to exit the application or return to the main menu to continue playing additional levels of the game. This structured workflow helps to create a smooth, engaging education experience for children with autism in a game-like manner.

Upon receiving the shortlist of candidates for consideration the recruiter will review the candidates and make a final decision based on the recommendations of the system-generated score as well as all of the other assessment methods utilized as part of the assessment process. Automating the resume screening, scoring and ranking of candidates as described above has improved the efficiency of the recruitment process by minimizing the time recruiters spend on these activities and maximizing the accuracy of their hiring decisions.

CONCLUSION

The Memory Strengthening tool for Autism Kids project was developed to support children with autism in improving their memory, concentration, and cognitive abilities through interactive and engaging activities. The application integrates simple games, visual elements, and structured tasks that are designed specifically to suit the learning patterns of children on the autism spectrum. By providing a calm and controlled digital environment, the system helps children practice memory-related skills in a way that is both enjoyable and educational. The project demonstrates how technology can be effectively used as a supportive learning tool for children with special needs. Through activities such as pattern recognition, matching, counting, and sequencing, the application encourages children to actively engage with learning tasks while gradually strengthening their memory and attention skills. The use of colourful visuals, easy navigation, and reward systems like stars and progress tracking also helps maintain motivation and positive reinforcement.

Another important outcome of this project is that it provides parents, teachers, and therapists with a simple platform to assist children in their cognitive development. The progress tracking and level-based learning structure make it possible to monitor improvement over time and adjust activities according to the child's ability level. In conclusion, the Memory Strengthening tool for Autism Kids application shows that interactive digital games can play a valuable role in enhancing memory and cognitive skills in children with autism. With further improvements such as additional games, personalized difficulty levels, and data analytics for progress evaluation, the system can become an even more effective educational support tool for special education environments.

In addition, the project highlights the importance of designing technology that is inclusive and accessible for children with different learning needs. The simple user interface, clear instructions, and visually engaging elements make the application easy for children to understand and interact with independently. By reducing distractions and focusing on structured activities, the system helps children remain focused while gradually improving their short-term memory, problem-solving ability, and learning confidence.

Overall, the Memory Strengthening tool for Autism Kids project serves as a foundation for future research and development in assistive educational technology. With the integration of more advanced features such as adaptive difficulty levels, voice guidance, personalized learning paths, and therapist feedback systems, the application can

further enhance the learning experience for children with autism. This project demonstrates that thoughtful software design can contribute significantly to supporting cognitive development and improving the educational opportunities available to children with special needs.

REFERENCES

1. Bennetto, L., Pennington, B. F., & Rogers, S. J. (1996). *Intact and impaired memory functions in autism*. Child Development, 67(4), 1816–1835.
2. Helwig, C. C., & Boucher, J. (1999). *Metamemory in children with autism*. Child Development, 70(1), 107–131.
3. Williams, D. L., Goldstein, G., & Minshew, N. J. (2006). *The profile of memory function in children with autism*. Neuropsychology, 20(1), 21–29.
4. Chan, A. S., Han, Y. M. Y., Sze, S. L., & Lau, E. M. (2015). Frontiers in Psychology, 6, Article 1893.
5. Bebko, J. M., Rhee, T., McMorris, C. A., & Ncube, B. L. (2015). *Spontaneous strategy use in children with autism spectrum disorder*. Frontiers in Psychology, 6, Article 182.
6. Fantasia, V., Markant, D. B., Valeri, G., Perri, N., & Ruggeri, A. (2020). *Memory enhancements from active control of learning in children with autism spectrum disorder*. Autism, 24(8), 1995–2007.
7. Semino, S., Zanobini, M., & Usai, M. C. (2021). *Visual memory profile in children with high-functioning autism*. Applied Neuropsychology: Child, 10(1), 26–36.
8. Bebko, J. M., Dahary, H., Goldstein, G., & Porthukaran, A. (2021). *Organizational memory strategy training with children with autism spectrum disorder*. Canadian Journal of Behavioural Science, 53(1), 1–11.
9. Goswami, T., Arora, T., & Ranade, P. (2021). *Enhancing memory skills of autism spectrum disorder children using gamification*. Journal of Pharmaceutical Research International, 33(34B), 125–132.
10. Maurya, R., & Khan, M. F. (2022). *Effect of cognitive training program in children with autism spectrum disorder*. International Journal of Special Education, 37(1), 75–84.
11. Chen, Y. (2023). *The impact of autism on children's memory*. Journal of Education, Humanities and Social Sciences, 8, 85–90.
12. Zheng, Q., & Shum, K. K. (2024). *Digital working memory intervention for preschoolers*. Journal of Autism and Developmental Disorders, 54, 1–10.
13. Ameli, R., Courchesne, E., Lincoln, A., Kaufman, A., & Grillon, C. (1988). *Visual memory processes in high-functioning individuals with autism*. Journal of Autism and Developmental Disorders, 18(4), 601–615.
14. Ozonoff, S., Pennington, B., & Rogers, S. (1991). *Executive function deficits in high-functioning autistic individuals*. Journal of Child Psychology and Psychiatry, 32(7), 1081–1105.
15. B. Leelavathi, "An Efficient Worm Detection System Using Multi Feature Analysis and Classification Techniques," Springer Nature Link, vol. pp 1054–1064, 2019.