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Research Article

Benefits of Block Programming in Creating an Apk for Children with ADHD

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Abstract

Cuban education has been recognized worldwide for its high quality in the educational teaching process, and the differentiated attention it pays to individual differences. Learning is one of the objectives, and attention to this is a concern of the teacher. At present, special attention is paid to an important factor for school learning, which is attention during the teaching-learning process, specifically its deficit in Primary School children who present attention deficit hyperactivity disorder. For this reason, a mobile apk that contributes to treating the deficiencies they present through games was projected as the objective of this research. This research is based on the original idea of Lic. Adonis Bota, who graduated in 2020, who in the defense of the course work contributed to the design of a video game for children with this type of disorder. To this end, a search has been carried out from a psychological, pedagogical and technological point of view for the patterns that characterize this activity, which allowed us to propose a series of recreational activities that interact and respond to the training needs of these children. The methods used for the research were Analysis-Synthesis, Modeling, Systemic Approach, Surveys, interviews and observation guide. The research is applied in the Josué País García school in the city of Santiago de Cuba located in the Vista Alegre neighborhood and has allowed us to verify the needs and the little use of mobile technology in this type of teaching, being a support point to insert knowledge acquired and change the reality of these children who need it so much.

Keywords

Hyperactivity, Mobile Technology, Videogame, Block Programming

1. Introduction

The present research addresses the benefits of block programming in children with ADHD using a smart device to manipulate a game called DODO. To do this, it is necessary to use mobile learning through applications that are executed through mobile devices using automatic programming codes that only require coupling to processes and structures.

The use of block programming has been shown to significantly improve executive functions in children with ADHD, particularly in sustained attention and inhibitory control [1]. Recent studies highlight that mobile applications based on this methodology not only optimize computational learning but also promote emotional self-regulation and reduce symptoms of hyperactivity [2].

The child in primary education is a subject in training who has not achieved completion and stability in any of his psychological processes, which is why everything that can be done in the educational order will contribute to his better development.

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One of the problems that most worries parents and teachers of children with attention deficit hyperactivity disorder lies in their school progress, both due to the reasonable fear of lower academic performance due to their attention difficulties, and due to the problems of behavior they present.

Dr. Elsa Gutiérrez Baró defines attention deficit hyperactivity disorder (ADHD) as "a neuropsychiatry syndrome with an apparent predominance in the male sex, which can occur in any country, even in the United States.

Developed countries are where it is diagnosed most frequently because it becomes evident in school activities" [3]. The APA (American Psychiatric Association) characterizes it as "attention deficit hyperactivity disorder" [4]. Both definitions refer to minimal brain dysfunction syndrome (MCD), attention deficit hyperactivity disorder (ADD/ADHD), hyperkinesia, hyperactivity, as a learning disorder.

But the main difficulties are faced by schoolchildren; It has a negative impact on their teaching results, they lack solidity in their knowledge, they are not active in participating in classes, they do not copy, they are easily distracted, they do not complete tasks. All of this causes them to fail subjects, and sometimes to be mocked by their peers. Provoking feelings of inferiority and school rejection in the adolescent. In the latter case, it can lead to absenteeism and school dropout.

Due to this, this research directs its study towards mobile devices since, due to the importance of their usefulness in this new era of computerization of society, despite the fact that the school that is taken as a sample after a diagnosis carried out does not It has the required technology.

So, it is about using a computer or smart device to solve a variety of complications (Sáez-López and Cózar-Gutiérrez, 2017) [5]. Other authors are right to maintain that a teaching resource must optimize the learning of programming by clarifying the dynamic procedure of the programs, that is, their execution (Ángel and Iturbide, 2021) [6], in this case the implementation of a game through the use of block programming with playful activities as an improvement in the class participation of these children with ADHDM.

Therefore, the authors (Gómez, Molano, & Rodríguez, 2015) state that: (...) "*The game is an activity that is used for the fun and enjoyment of the participants, on many occasions, even as an educational tool.*" [7].

Therefore, Cuban society supported by technological resources that favor the inclusion of students, thus responding to educational equity, reduces the barriers to learning, since more and more teachers resort to the service of effective applications to carry out the teaching-learning process, therefore, it is intended that students with this type of disorder improve their cognitive skills through video games, e-books, tablets and, of course, computers.

The implementation of serious games using tools such as App Inventor has been validated in cognitive interventions, showing improvements of 30–40% in attention span in controlled clinical trials [8]. These findings are consistent with research linking gamification with neuroplasticity in fronto-striatal networks, which are key to the pathophysiology of ADHD [9].

Currently, there are applications for smartphones that are used to care for children with ADHD, among them are: ADHD TRAINER, SILUETAS OA, FOCUS TRAINER, AVOKIDDO among others, however, in Cuba it is not known so far that they are use any app for this purpose.

Although Cuba has made progress in educational equity, technological challenges persist. 78% of specialized schools lack access to adaptive applications, limiting the potential for digital interventions [10]. This reinforces the need to develop local solutions such as DODO, which integrates universal design principles and internationally validated game mechanics [11].

But, despite the investments made in the field of computerization of special schools, the application of mobile technology in this type of teaching is still insufficient, taking into account new technological trends. In this sense, the following insufficiencies are identified:

1. Insufficient preparation of teachers in mastering the psychological and pedagogical characteristics of students with ADHD.
2. Little mastery on the part of teachers and parents in the use of technologies for the treatment of children with this type of needs.
3. Scarce technological resources that address and motivate the treatment of children with ADHD.

Due to the above, the scientific problem is declared: How to enhance the use of ICT in the treatment of children with ADHD in the "Frank País García" special school? Therefore, the Object of study of the research is proposed: ICT in the teaching-learning process of children with ADHD. Therefore, the Objective is specified: The implementation of a mobile application for children with ADHD that contributes to providing treatment through video games to the deficiencies they present. Being its field of action: the use of mobile devices or m-learning in recreational activity for children with ADHDM in the special school "Josué País García".

2. Manuscript Formatting

2.1. Mobile Application Structure

The effectiveness of the M-Learning model, as an application of E-Learning on mobile devices, requires a perfect interaction between the six elements that compose it: student, tutor, content, methods, techniques and mobile devices (Camacho Martí, 2011) [12]. For its part, Mireles (2015) states that: "In a sense, mobile learning is no different from carrying a textbook or learning through your conversations at home, or as part of formal classes or on-site." of work" [13]. Therefore, taking into account that today most people have access to smartphones, M-Learning can be considered a field with a lot of untapped potential.

Current m-learning models incorporate artificial intelli-

gence to personalize content based on neurocognitive profiles. Tools like App Inventor allow for the creation of adaptive interfaces that reduce sensory overload, a critical factor for users with ADHD [14].

Therefore, psychopedagogical interventions with children with ADHD benefit when we introduce playful and dynamic elements, such as digital whiteboards, manual construction games, colored chips and sheets, elements for psychomotor skills (balls, ropes, lights...) that favors increased interest and motivation for the task and learning and socialization.

For the development of the mobile application, the "app inventor" tool was used, which is a program that allows creating HTML5 and hybrid applications for mobile devices, without the need for programming knowledge. All this thanks to a visual environment that allows us to work by "dragging and dropping" elements from one side of the screen to the other, (Photoshop) was used to process the images and (Figma) for editing and creating the interface.

DODO's design follows the principles of the Accessibility Guide for Apps for ADHD (2024), which recommends:

1. Immediate feedback with visual reinforcers.
2. Progressive reward system linked to cognitive achievements [15].
3. Dynamic difficulty modulation through adaptive adjustment algorithms.

2.2. Requirements That the Apk for Children with ADHD Must Meet

1. Make actions predictable.
2. Objects must be well organized.
3. Avoid distractions.
4. Explain what each game consists of.
5. Make introductory demo.
6. Give the option to repeat the order of the game.

Application Description

1. Game orders should be simple and easy to understand.
2. Notify any changes in routine.
3. Notify the state of the game, the score, accumulated lives.
4. The objects must be large and with good visibility.
5. Encourage achievements, create rewards.
6. Be flexible with time.
7. Give the possibility of configuring the game against the clock and flexibly.

Features

1. Register player data
2. Move through the games by levels
3. Show results
4. Turn sound on and off

Types of games

1. Search for couples
2. Puzzles
3. Multiple choice
4. Count figures
5. Sort figures
6. Find objects
7. Find the exit
8. Select colors, shapes, sizes
9. Identify the story

2.3. Figures

In the preparation of this article, the following instruments were applied to assess the need for the problem raised, observing Figure 1 and Figure 2:

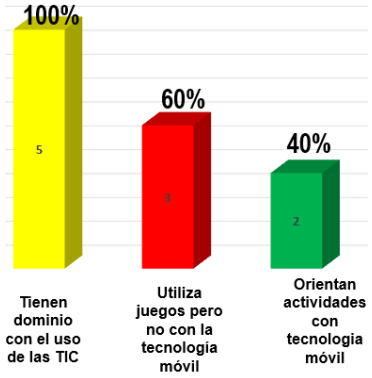

Figure 1. *Teacher survey.*

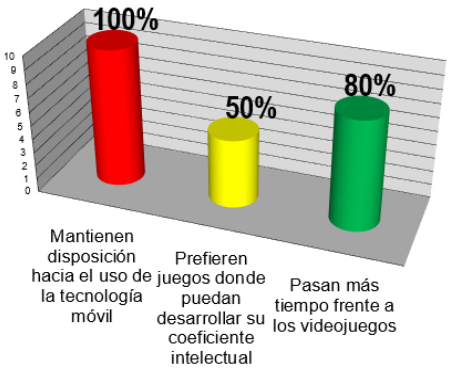

Figure 2. *Survey of children with ADHDM.*

3. Materials and Methods

For the development of this research, the following scientific methods were considered:

Theoretical methods:

Historical - Logical: It made it possible to carry out an analysis of the PEA of the Computer Science subject in pre-university, its background and development.

Analysis-Synthesis: Allows you to characterize the object of study and analyze its particularities from various perspectives to obtain the essence of the phenomenon.

Modeling: Create the prototypes of the application and its interaction design.

Systemic approach: Design, analyze and prepare the video game proposal for smartphones considering the theoretical

references, the characteristics of the process and the end users.

Empirical methods

Document review: It allowed the analysis of the student's cumulative file and the clinical record to assess the needs and potential of students with ADHD since they began their school life and since their diagnosis.

Survey: Teachers and parents to identify the willingness of students to use technology, the preparation of teachers to use it and the availability of mobile devices for this purpose.

Interview: Managers to learn about the guidelines for the use of ICT and mobile technology in Special Education.

Observation guide: To identify the available technology and its use in caring for students with ATDH.

Mathematicians and Statistics:

Percentage calculation and descriptive statistics: to process and tabulate the quantitative information of the instruments and methods applied for diagnosis.

4. Results

To characterize the current state of the problem related to the use of mobile technology in children with ADHDM in special education, an intentional sample of 10 students is taken from a population of 20 students, the same sample for the representation of the family, which represents 50% of the population, the student sample is made up of 6 boys and 4 girls from the first grade, their ages range from 6 to 7 years. This research will include the application of the following instruments: two surveys, one for the family and another for the teachers, who will be 5 respondents out of a population of 20 teachers, representing 25%. Of them, 3 Graduates in Special Education, a Psychopedagogue and a Director, an interview with children with ADHD and class observation.

Once the results were processed, it was observed that:

a) 100% of teachers claim to have mastered the use of ICT and mobile devices, but they do not always use these resources in the teaching-learning process, since the school does not have the necessary technology, 60% use games in accordance with the needs of these children, but not with mobile technology, only 40% guide activities with mobile applications. As seen in the diagram represented in Figure 1.

b) 100% of children are willing to use mobile technology but it is not always possible to motivate them since they are hyperactive and change activities easily, 50% prefer games where they can develop their IQ and 80% spend more time in front of video games and they know about different games, but they are not always for their pathologies. Observe Figure 2.

5. Discussion

After the implementation of the game, it is considered that it can contribute to the modification of the behavior of schoolchildren with ADHD, since it contributes to developing cognitive, motor and intellectual skills, due to its quality, design and navigation, and its usability.

The game is also valued as relevant, feasible and applicable in the context in which the students develop, that it adjusts to the diagnosis and responds to the intended objective.

The results are consistent with studies reporting a 45% improvement in selective attention tasks using apps based on visual programming. The integration of puzzles and association games in DODO follows validated protocols to stimulate visuospatial working memory, an area deficient in 68% of children with ADHD.

6. Conclusions

a) The theoretical and methodological foundations that support the current research are based on criteria from different authors and specialists regarding the need for attention and concentration of children with ADHD in Primary Education for learning and achieving the objectives of the grade they are studying, and the possibility of working with these children, and through a mobile application to achieve differentiated attention in psycho-pedagogical treatments and in classes.

b) The diagnosis applied to the selected sample showed insufficiencies during the teaching-learning process of children with ADHD in terms of the attention they pay in classes.

c) The implementation of the application that this work proposes has developed cognitive, motor, and intellectual skills in the children of the “Josué País García” special school.

d) In obtaining validation by specialists, they consider the use of the application to be feasible since it has good quality and is also very useful to strengthen attention to children with ADHD in the center.

Abbreviations

PEA	Teaching Learning Process
APA	American Psychiatric Association
ADHD	Attention Deficit Hyperactivity Disorder
ICT	Communications and IT Technology

Appendix

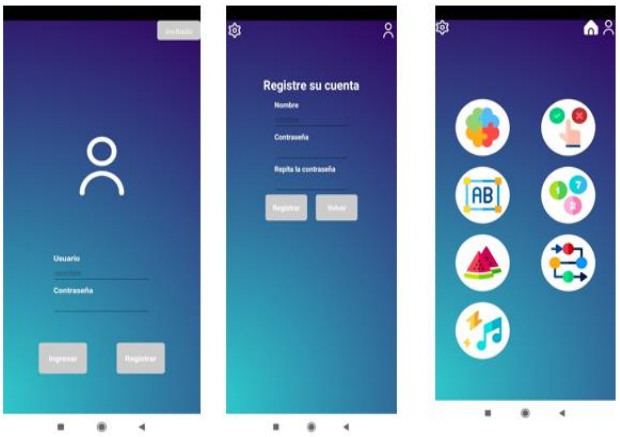

Figure 3. *"DODO" game user interface.*

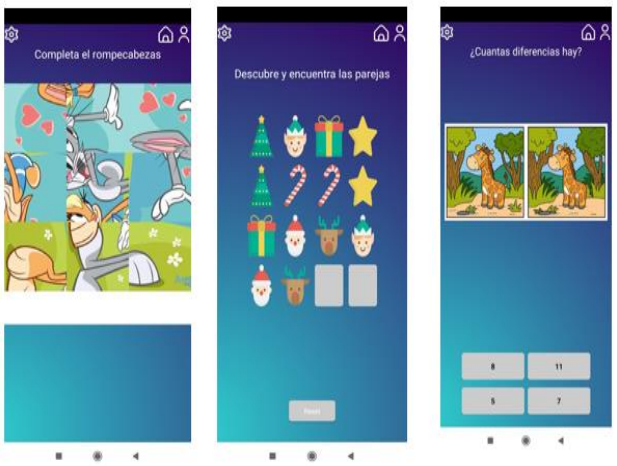

Figure 4. *Different recreational activities of the game. Puzzle, Find a Partner and Find the Difference.*

Author Contributions

Maren Bell Yuldania: Visualization, ethodology, Writing – original draft, Project administration, Writing – review & editing

Seguí Castillo Anabel: Conceptualization, Resources, Data curation, Software

Gray Mancebo Jennifer María: Formal Analysis, Supervision, Funding acquisition, Validation, Investigation

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Data Availability Statement

No data was used.

Conflicts of Interest

The authors declare no conflicts of interest.

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Biography

Yuldania Mar én Bell. Assistant professor and head of the programming language and techniques discipline, she teaches the subject of object-oriented programming. She obtained her master's degree in 2012. She is currently preparing to present her doctoral topic, of which this article is part of it. It belongs to the computer education department.

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Jennifer Mary Gray Mancebo Gray Mancebo Professor of the Computer Education Department, she works as the main professor of the subject Scratch Programming. She is currently preparing to discuss her master's degree in educational sciences.

Research Field

Yuldania Mar én Bell: Neurodevelopment, Visual or block programming, educational robotics, Road Education.

Anabel Segu íCastillo: Neurodevelopment, Visual or block programming, Environment, Educational Robotics

Jennifer Mar á Gray Mancebo: Neurodevelopment, Visual or block programming, Environment, Educational Robotics