

Original Article

Development of Educational Web Software to Enhance Learning Outcomes for Children and Adolescents with Autism Spectrum Disorder in Lima, Peru

Lida Asencios-Trujillo¹, Lucia Asencios-Trujillo², Carlos La-Rosa-Longobardi³, Djamila Gallegos-Espinoza⁴

^{1, 2, 3, 4}Graduate School, Enrique Guzmán y Valle National University of Education, Lima, Peru.

¹Corresponding Author : asenciostrujillolida@gmail.com

Received: 21 February 2024

Revised: 10 May 2024

Accepted: 06 July 2024

Published: 28 August 2024

Abstract - Currently, it is clear that many children and adolescents, whether in face-to-face or virtual classrooms, face learning difficulties. In some cases, this is attributed to Autism Spectrum Disorder (ASD). To tackle this issue, the creation of web-based software is proposed to support the education of these children and adolescents. This software aims to offer crucial assistance, such as helping students recognize gestures shown by their teachers and peers. Numerous instances can be found in Peru of ASD. In contrast to other nations, Peru has opted to implement software to aid these students, demonstrating promising outcomes such as enhanced comprehension of educational material and better recognition and expression of emotions. By effectively utilizing technology in the education of children and adolescents with ASD, significant improvements in learning outcomes can be achieved.

Keywords - Learning, Youth, Children, Software, Autism Spectrum Disorder, ASD.

1. Introduction

The global pandemic we are currently experiencing has significantly disrupted traditional classroom settings, necessitating a shift to virtual platforms. This transition has made learning more challenging for children and adolescents, especially those with Autism Spectrum Disorder (ASD). Children with ASD often face difficulties in paying attention because they are not fully Conscious of what is happening around them, as they tend to remain in their own world. Additionally, they may struggle to distinguish the emotions expressed by teachers and peers, which are key indicators of ASD. This project aims to study the behavior of children with ASD through interviews, behavior monitoring, and other diagnostic tools to detect the disorder [1]. Currently, there is no definitive cure for Autism Spectrum Disorder (ASD). Nevertheless, various methods are available to enhance a child's imagination and capabilities. Early intervention significantly increases the likelihood of achieving positive outcomes in the patient's abilities and symptoms. Typical treatments include communication therapies to stimulate and develop skills, as well as medications to better manage symptoms. Children with ASD attending national or private schools benefit from observing the emotions and behaviors of their peers, providing better stimulation [2]. However, the current pandemic has made in-person school attendance difficult, particularly in Peru, leading to school closures and a shift to virtual classes. This situation poses additional

challenges for children with ASD in receiving the necessary support and interaction.

In 1943, psychiatrist Leo Kanner initiated investigations into Autism Spectrum Disorder (ASD) when he identified the syndrome through studies conducted on an 11-year-old child. This child exhibited specific behaviors, such as becoming upset for seemingly trivial reasons, adhering to strict routines, and meticulously organizing toys. Additionally, the child showed indifference when interacting with other children. ASD is a neurodevelopmental disorder that affects brain development, typically beginning in childhood, leading to abnormal brain growth.

In 2013, the Centers for Disease Control and Prevention (CDC) reported that ASD is more prevalent in males than females. This disparity is attributed to the brain structure of most ASD patients, which tends to be more male-oriented, with higher testosterone levels during embryonic development. Consequently, There is a higher prevalence of Autism Spectrum Disorder among males than in females [3]. To enhance the education of children with Autism Spectrum Disorder (ASD), software focused on multimedia programs will be developed. This software will utilize videos to help children recognize and manage emotions, thereby improving their interaction with their environment. The aim is to assist children in better understanding their studies and reducing



stress at home. Given the current health emergency, where children remain at home to avoid virus exposure, this software will provide valuable support to teachers, parents, and children or adolescents. By developing this website, children can stay engaged and entertained, mitigating the stress associated with prolonged home confinement [4].

2. Methodology

2.1. Analysis of Autistic Spectrum

The examination of ASD is crucial as it enhances understanding of the condition, allowing parents and relatives to recognize symptoms early and seek appropriate treatment through comprehensive family interviews [5]. In Figure 1, some deficiencies in the child's behavior are illustrated, highlighting various symptoms associated with ASD [6]. In this part, we will outline the procedures for developing our web application designed for children with Autism Spectrum Disorder (ASD); employing the SCRUM approach is particularly beneficial for web development projects due to its well-defined rules and structured process, which facilitate effective teamwork and adaptability to alterations that could arise throughout the duration of the project [7]. Within this agile framework, time periods are used for delivering project progress. Each of these periods, known as Sprints, culminates

in a presentation of the completed work to the clients. Additionally, regular and consistent meetings are held throughout the project's development to ensure alignment and make necessary adjustments. This iterative process allows for continuous improvement and client feedback integration. For the development of the software, iterations known as Sprints will be conducted, each lasting approximately 30 days. The results of each Sprint will be presented to the client. One of the key aspects of this process is the daily 15-minute meetings, which aim to enhance team integration and coordination [8]. Therefore, the emphasis must be placed on the pace that this development method necessitates. Given the time constraints, team members need to adjust their work to adhere to the predefined schedule. This process is reinforced through regular meetings, which facilitate constant communication, enabling the identification of problems and errors in the project's development. This approach allows for quick solutions and ensures the project remains on track. Taking into account the aforementioned points, each Sprint's delivery is conceptualized as a lifecycle of deliverables, complemented by a continuous routine of daily stand-ups. This process is depicted in Figure 2, demonstrating how project requirements enter the Sprint cycle and progress until they are either completed or the deadline is met [7].



Fig. 1 5-Warning signs of autism

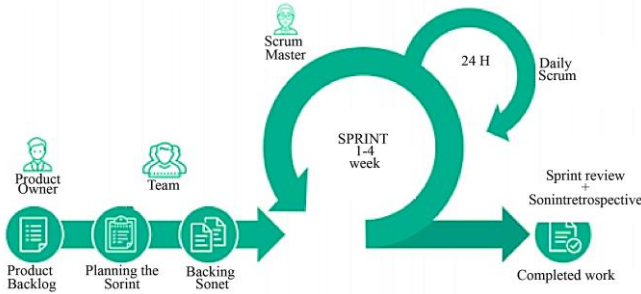


Fig. 2 SCRUM Roles

Table 1. Sprint duration

Time	#Sprint
2 Months	
2 weeks	1
4 weeks	1
3 weeks	2

2.2. Start Stage

This section outlines the individuals involved in developing web software aimed at children and adolescents with Autism Spectrum Disorder (ASD) and learning difficulties. Considering the points mentioned earlier, the key participants will be the developers responsible for creating this software. They will maintain continuous communication,

adhering to the principles of the Scrum Framework as outlined.

2.3. Planning Stage

In this part, the project's timeline can be observed in Table 1.

2.4. System Flow

This section outlines the construction of a web page designed to assist children with Autism Spectrum Disorder (ASD). It also includes the planning of Sprints with time estimates for each Sprint in the project's development. Next, Figure 3 provides a visual representation of the page development process to better understand the workflow.

3. Results and Discussions

Within this segment, you will find an overview of the project's web page, featuring visuals of the completed web page along with the results of a user satisfaction survey. Additionally, this section provides insights into the difficulties encountered during the project's development. Figure 4 illustrates the primary cover of the web page that has been created. This cover features a button labeled "WHO WE ARE" that directs users to a section providing a brief overview of us. Additionally, there is a button that returns users to the home page, which is the cover currently being observed.

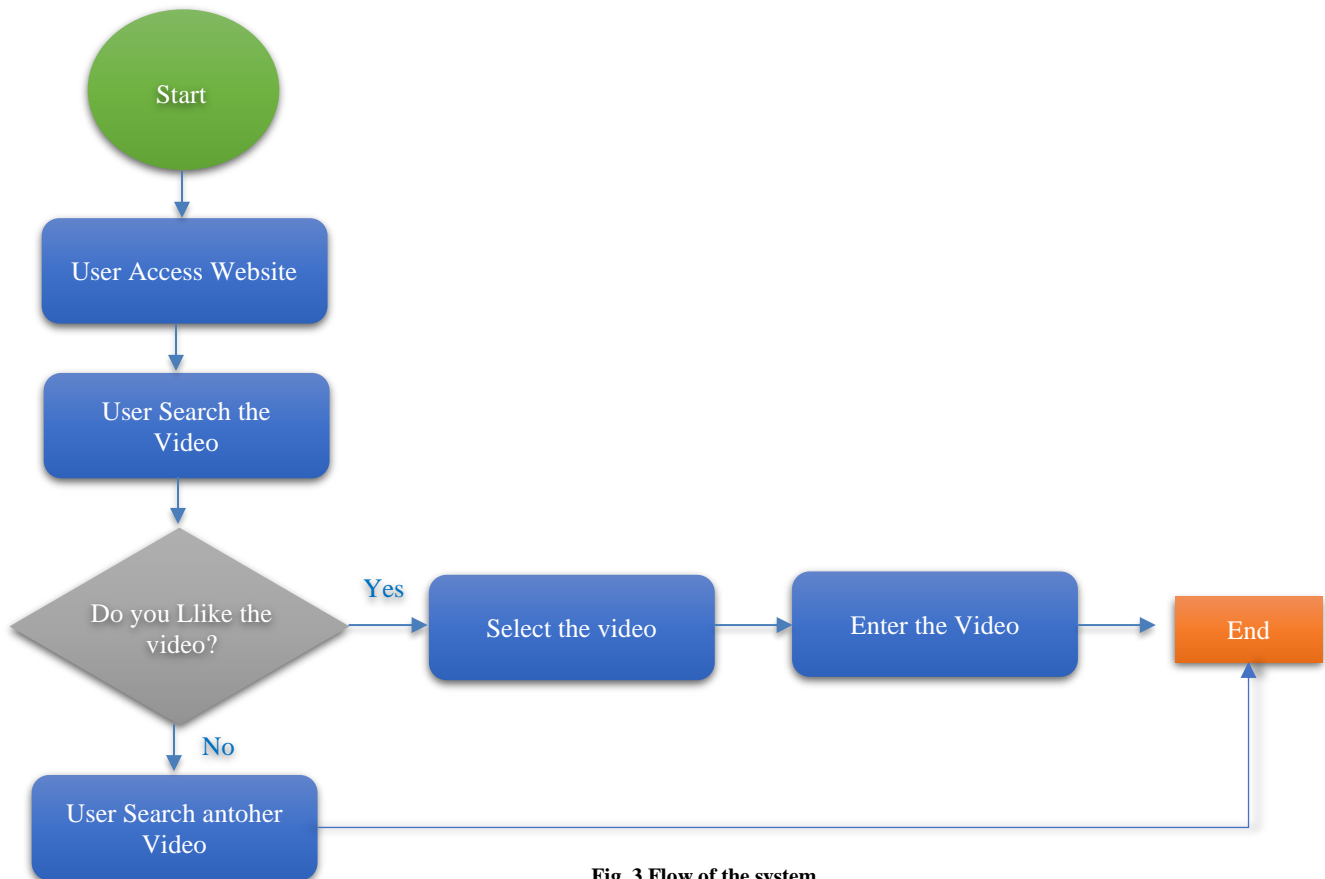


Fig. 3 Flow of the system

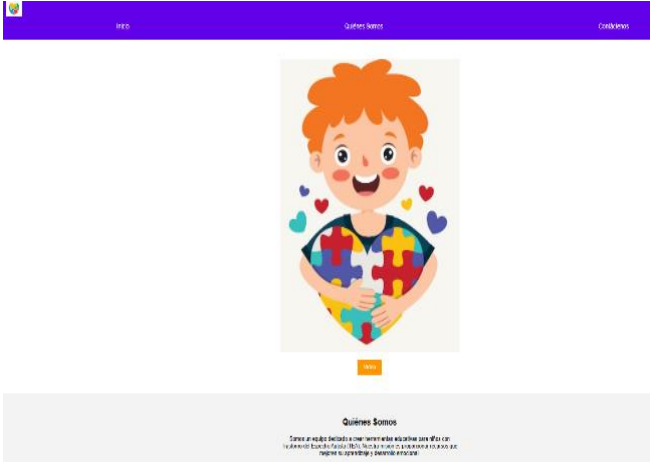


Fig. 4 Homepage of the website



Fig. 7 Website



Fig. 5 About Us section on the website



Fig. 8 Website partner



Fig. 6 Emotions displayed on the web page

Next, in Figure 5, a brief description of who we are is provided. Subsequently, Figure 6 displays small images accompanied by corresponding names that represent various emotions. Figure 7 highlights the section housing the leisure videos displayed. Each video includes a small circle indicating its duration. This section has been named Videolandia.

Figure 8 shows the section that lists the names "of the website developers. In the final figure, Figure 9 highlights a small section where users can obtain additional information about the page by providing their email address, allowing the page to contact them as soon as possible.

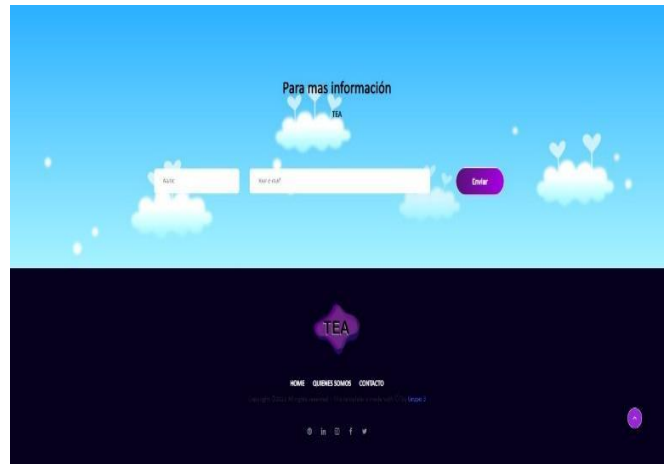


Fig. 9 For more information about the website

In the last figure, Figure 9, there is a small section where users can get more information about the page by providing their email address, enabling prompt contact. In Figure 10, users can select from various emoticons based on the question and their level of satisfaction. Figure 11 presents the questions designed for the children, which they can respond to with their parents' assistance.

Satisfaction Form

Select the face according to your satisfaction level:



Fig. 10 Emoticons based on your preference

Que tema te gustaría que agregáramos a Videolandia ? *

Dinosaurios

Planetas

Animales

¿ Que tan satisfecho esta con nuestra pagina ? *

😊

😐

😞

¿ Consideras que la pagina cubre tus expectativas ? *

😊

😐

😞

¿ Crees que los videos utilizados en la pagina facilitan tu aprendizaje ? *

😊

😐

😞

Enviar Borrar formulario

Fig. 11 Website survey

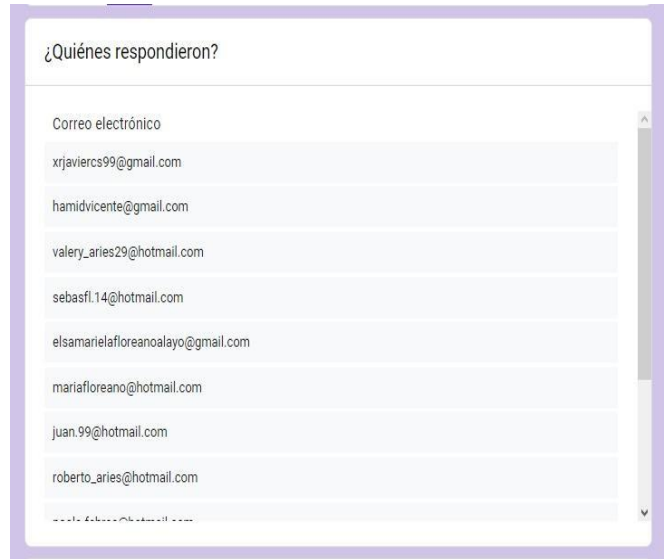


Fig. 12 Participants who completed the survey conducted on the website

The satisfaction questionnaire was distributed to several individuals to gather feedback, which will be invaluable for improving the page in the future and implementing user suggestions effectively. Next, in Figure 12, you can view the email addresses of the survey respondent, totaling 13 respondents.

In Figure 13, the graph illustrates the responses to the initial question: 'Which theme would you like us to include in Videolandia?' The graph shows that 46.2% of respondents, indicated in red, would like to see the theme of planets added to the page. Additionally, 38.5% of respondents indicated in blue would like a dinosaur theme, while 15.4% of respondents indicated in orange would prefer the theme of animals.

In Figure 14, the chart illustrates the responses to the second question: "How satisfied are you with our website?" The graph shows that 92.3% of respondents, indicated in blue, are satisfied with the web. Additionally, 7.7% of respondents, indicated in red, are moderately satisfied and may have suggestions for improvement.

In Figure 15, the chart illustrates the responses to the third question: "Do you feel that the page meets your expectations?" The graph reveals that 76.9% of respondents, shown in blue, believe that the page meets their expectations, while 23.1% of respondents, shown in red, think that the page does not fully meet their expectations.

In Figure 16, the chart displays the responses to the final question of the survey: "Do you believe that the videos on the page help facilitate your learning?" The graph indicates that 84.6% of respondents, represented in blue, believe the videos on the page enhance their learning experience, while 7.7% of respondents, represented in orange and red, have differing opinions.

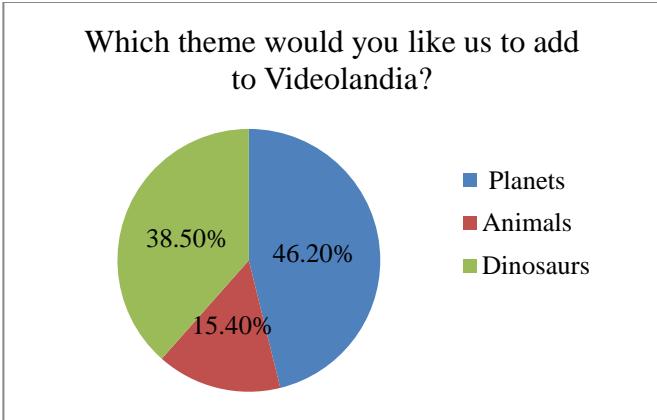


Fig. 13 Answers to the first question of the survey

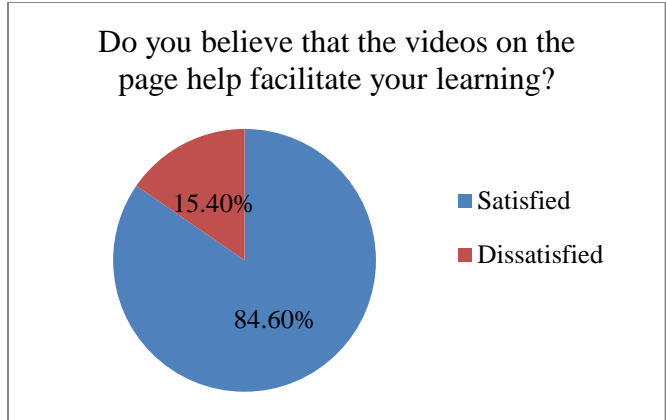


Fig. 16 Responses to the fourth question of the survey

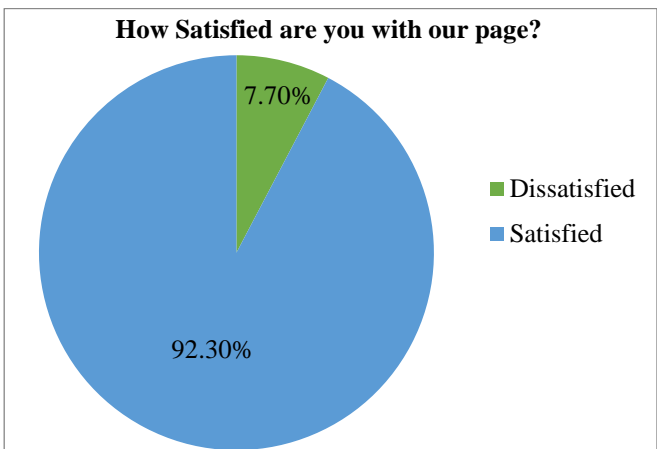


Fig. 14 Answers to the second question of the survey

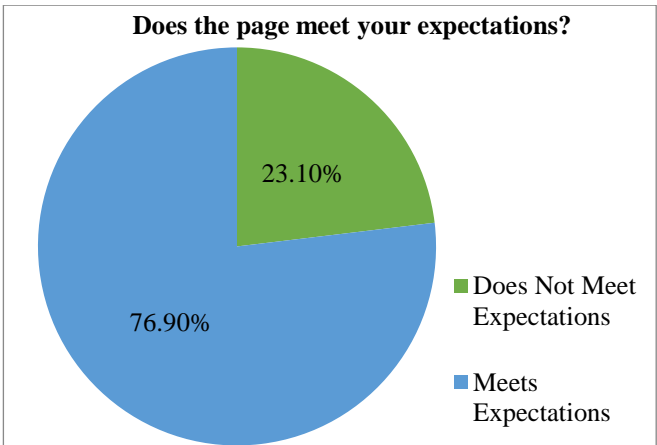


Fig. 15 Responses to the third question of the survey

Unlike the thesis [9], our web page does not support user registration and is freely accessible. Additionally, it lacks a games section for children but includes recreational videos that can aid in their development. The thesis [10] features a section with exercises covering options such as routines, expressions, dangers, and socializing. These sections have been incorporated into our web page as open sections.

In the thesis [11], the page allows children to choose a character they identify with. It also includes a memory aid section with games and object identification, along with a word association section. In contrast, our web page focuses on recognizing emotions globally and offers recreational videos. Our project results have demonstrated improvements in the behavior and education of children and adolescents with Autism Spectrum Disorder (ASD). This represents a significant advancement for science, as it facilitates learning and helps control emotions remotely from the comfort of their homes via a website.

During the project's development, we encountered some minor issues, especially when searching for videos due to insufficient information. After completing the page development, we conducted a brainstorming session and progressed according to the estimated timeline. We also surveyed to gather feedback on potential improvements and additions. After finalizing the page, we agreed as a group to enhance it in the future by adding interactive video games to further support children with autism.

4. Conclusion

Children and adolescents with Autism Spectrum Disorder (ASD) can experience significant improvements, and potentially even cures, through the use of virtual games provided by well-developed web software. An example of such software is TEA KID'S, which is specifically created for children and adolescents with ASD and/or learning difficulties in their school years. Properly developed web software can be highly beneficial for these children, aiding their learning and development during this critical stage. Modern technology enables us to achieve remarkable advancements in various fields, including health and daily life. Proper utilization of contemporary technology allows us to create productive tools that simplify our daily routines and enhance our well-being. These technological advancements benefit not only our current generation but also future generations, including our children, grandchildren, nephews, and others.

References

- [1] Fátima Suárez, Berta Mata, and Manuel Peralbo, "Assessment of an Intervention Program for Children with ASD Based on ICT," *Journal of Studies and Research in Psychology and Education*, vol. 9, pp. 94-98, 2015. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [2] Antonella Luaces, "Inclusion of Children with ASD in Regular Schools in Montevideo: The Experience of Teachers," University of the Republic (Uruguay), Faculty of Psychology, pp. 1-25, 2016. [[Google Scholar](#)] [[Publisher Link](#)]
- [3] Elena Díaz Mosquera, and Ivonne Andrade Zúñiga, "Autism Spectrum Disorder (ASD) in Regular Education: A Study Conducted in Educational Institutions in Quito - Ecuador," *Intercontinental Journal of Psychology and Education*, vol. 17, no. 1, pp. 163-181, 2015. [[Google Scholar](#)] [[Publisher Link](#)]
- [4] Miguel Terrazas Acedo, Susana Sánchez Herrera, and María Teresa Becerra Traver, "ICT as a Support Tool for People with Autism Spectrum Disorder (ASD)," *Inclusive Education Magazine*, vol. 9, no. 2, pp. 102-136, 2016. [[Google Scholar](#)] [[Publisher Link](#)]
- [5] M. Araceli Sánchez-Raya et al., "Early Intervention in Autism Spectrum Disorders (ASD)," *Educational Psychology*, vol. 21, no. 1, pp. 55-63, 2015. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [6] Yadira María González Mercado, Luz Briseida Rivera Martínez, and y María Guadalupe Domínguez González, "Autism and Evaluation," *CIMAH Hospital*, vol. 12, no. 6, pp. 525-533, 2016. [[CrossRef](#)] [[Google Scholar](#)] [[Publisher Link](#)]
- [7] F.E.L. Sanmartín, "Development of a Web Platform for the Evaluation of Software Based on the Scrum Methodology," UTMACH, Faculty of Civil Engineering, Machala, Ecuador, pp. 1-65, 2020. [[Google Scholar](#)] [[Publisher Link](#)]
- [8] Sandra Anabel Palacios Abad, "Development of a Web Application for the Evaluation of Software Processes Based on the Scrum Methodology," UTMACH, Academic Unit of Civil Engineering, Machala, Ecuador, pp. 1-52, 2017. [[Google Scholar](#)] [[Publisher Link](#)]
- [9] D.A. Altamirano Solorzano, "Design of a Mobile Application for the Diagnosis of Autism Spectrum Disorder in Students from 6 to 10 Years Old," Graduation Thesis, Institutional Repository Central University Of Ecuador, 1-167, 2022. [[Publisher Link](#)]
- [10] Alain Alberto Villegas Pazmiño, "Development of a Mobile Application as an Aid for the Social Inclusion of Children with Autism at the Child and Family Rehabilitation Specialty Center of the City of Manta in 2015," Santiago de Guayaquil Catholic University, 2015. [[Publisher Link](#)]
- [11] L.Y. Moreira Rodríguez, and K.D. Pesántez Flores, "Development of a Mobile Application as a Support Tool in the Teaching-Learning Process for Basic Education in Children with Autism Problems," Computer Systems Engineer Degree Project, University of Guayaquil, Faculty of Mathematical and Physical Sciences, Computer Systems Engineering Career, 2018. [[Google Scholar](#)]