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International Journal of Combinatorial Optimization Problems and Informatics, 15(5), Dec 2024, 254-268. ISSN: 2007-1558. https://doi.org/10.61467/2007.1558.2024.v15i5.585

Technological Management of the Barriers to Learning and Participation in Basic Education Students by Using a Methodological Approach

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Abstract. This work proposes a methodological approach to manage technologically the barriers to learning and participation that prevent students from accessing knowledge effectively. The aim is to allow their inclusion both in the educational environment and society. This approach is based on various methodological resources - Constructivism, the Social Model of Disability, the Ecological Model, and Differentiated Pedagogy— provided by the regular education support services unit. This assistance helps students with special educational needs, such as those with a disability, outstanding abilities, and aptitudes, or difficulties in developing competencies in the training fields of the curriculum. Additionally, it helps students with other conditions, such as Autism Spectrum Disorder, Attention Deficit and Hyperactivity Disorder, language problems, learning, and behavioral problems. Furthermore, user-centered design methodologies like Design Thinking, and agile development such as SCRUM, are integrated into this approach. Finally, the ADARA technological platform is created to test the feasibility of the proposed approach.

Keywords: Barriers to Learning and Participación, Technological Management, Methodological Approach, Basic Education, Student

Article Info
Received May 10,2024.
Accepted Nov 20, 2024.

1 Introduction

The Secretariat of Public Education (SEP, *Secretaría de Educación Pública*) [1] implemented Special Education to attend to students, who have a condition disability, outstanding abilities and aptitudes, or severe learning, communication, and behavioral difficulties in situations of vulnerability and educational risk to improve and increase their participation and learning within school. Favoring the comprehensive development of students and prevailing the minimization or elimination of Barriers to Learning and Participation (BAPs, *Barreras para el Aprendizaje y la Participación*); in such a way that the educational lag is reduced [1, 2, 3]. This sort of education is managed in the SEP by Multiple Care Center (CAM, *Centro de Atención Múltiple*) — it provides comprehensive school care to children and young people with disabilities, multiple disabilities or serious developmental disorders, conditions that make it difficult for them to enter regular schools, and the Regular Education Support Services Unit (USAER, Unidad de Servicios de Apoyo a la Educación Regular), —

which is a technical-operational instance of Special Education, located in regular education schools that supplies a set of human, technical, and methodological resources by advice and support to help in the development of inclusive environments that minimize the BAPs faced by students with severe learning, communication, and behavioral difficulties in situations of vulnerability and educational risk to improve and increase their participation and learning within the school [4, 5].

Furthermore, the National Institute of Statistics and Geography (INEGI, *Instituto Nacional de Estadística y Geografía*) [6] carried out the National Demographic Dynamics Survey (ENADID, *Encuesta Nacional de la Dinámica Demográfica*) [4] in 2014 and 2018, in which percentages of the population with disabilities were obtained. As shown in Figure 1, the disability in 2018 related to learning, remembering, or concentrating is 19.1%.; listening 18.4%; speaking or communicating 10.5% and emotional problems 11.9%. These percentages negatively influence the learning process in basic education students; mainly, they affect correctly carrying out the reading-writing processes, which are conceived as the most complex form of communication that man possesses, as well as the communication vehicle par excellence for registering the cultural and technical variations of humanity [7, 8]. In addition, dyslexia and emotional intelligence also are addressed in this paper, since they are shown in Figure 1.

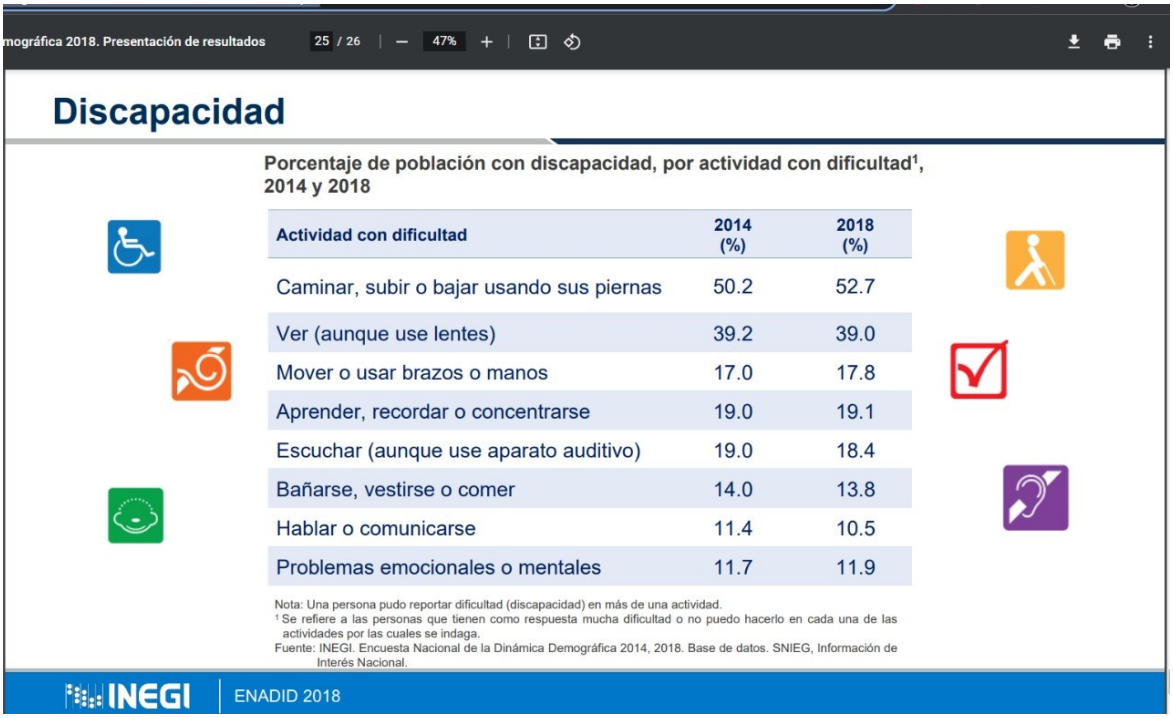

Figure 1. Percentage of the population with disabilities [4].

Although the USAER presents mechanisms and instruments to address the problems of reading-writing, dyslexia, and emotional intelligence; putting them into practice is too complicated for a teacher, due to the diversity of processes carried out he/she, the styles and disabilities that students present, as well as other administrative issues.

Therefore, on the one hand, a technological management platform—ADARA— to reduce the mentioned problems above at the basic level, is presented in this work. The development of ADARA is based on Design Thinking and SCRUM, methodologies widely used in the creation of technology.

On the other hand, a methodological approach to reduce the BAPs of basic education students related to problems of dyslexia, reading, writing, and emotional intelligence. is proposed. This approach is based on USAER methodological resources, such as *Constructivism* —which establishes what should be used and how to reduce or solve a specific problem; the *Social Model of Disability* —which refers to providing an environment

that eliminates or reduces students' limitations, in this case of mentioned problems above; *the Ecological Model* —which aims for people to be open to changes and introduce them into their environment so that they relate appropriately, that is, they are willing, even, to technological changes; and *the Differentiated Pedagogy* — which tries to reduce human differences (students with or without a disability) and environmental, so that appropriate treatment is provided for each one, achieving better learning results.

The paper is organized as follows: Section 2 presents a brief theoretical framework. Section 3 describes the methodological approach, as well as its application to manage barriers to learning and participation in primary school. Section 4 explains the results. Finally, section 5 details the conclusions and future work.

2 Background

The concepts that support the proposal of this research work are established below.

2.1 Special Education

In order to try the special education in México, two organisms were implanted by SEP [5, 9]:

- **CAM.** It provides comprehensive school care to children and young people with disabilities, multiple disabilities, or serious developmental disorders, conditions that make it difficult for them to enter regular schools. In such a way that the educational practice of its professionals is framed in the current Plan and Study Programs of Initial Education and Basic Education (Preschool, Primary, and Secondary), which serves the population from 43 days of birth to 18 years of age.
- **USAER.** A technical-operational instance of Special Education located in regular education schools. It provides a set of human, technical, and methodological resources through advice and support, helping to develop inclusive environments and minimizing BAPs. USAER support services are based on theoretical references: Constructivism —a theory that brings together what and how in the teaching-learning process so that students assimilate significant and contextualized topics; Social Model of Disability—humanistic care model, where disability does not arise from the physical limitations of the students, but from their interaction with their context [10, 11]; Ecological Model—focuses attention on lasting changes in the way a person perceives and relates to their environment [12, 33]; and Differentiated Pedagogy —science that studies pedagogical issues based on the impact that human and environmental differences have on the educational process and that allow a certain typification of its treatment [14].

This paper is focused on USAER as well as its methodological resources since this organism is oriented to manage the BAPs.

2.2 Methodologies Agile and Design

SCRUM [15], agile methodology that defines an empirical, iterative, and incremental process for the creation of complex and large software projects; through the phases:

- **Initiate.** It is composed of six processes: Create project vision, identify scrum master and stakeholders, form scrum team, develop epics, create prioritized product backlog, and conduct release planning;
- **Plan and Estimate.** This contains six processes: Create user stories, estimate user stories, commit user stories, identify tasks, estimate tasks, and create sprint backlog.
- **Implement.** Which comprises three processes: Create deliverables, conduct daily standup and groom prioritized product backlog.
- **Review and Retrospect.** It encompasses two processes: Demonstrate and validate sprint, and retrospect sprint.
- **Release.** It includes two processes: Ship deliverables, and project retrospect.

Design Thinking is an iterative process focused on users, which innovatively solves problems, through collaborative work and reducing risks. This methodology has five stages [16, 17]:

- **Empathize.** In this stage, a representation of the problem is provided in an empathetic, accurate, and user-centered way, through ethnographic interviews, field studies, contextual research, user diary, and empathy maps.
- **Ideate**. This stage assesses what adds value and leads to the achievement of new perspectives, identifying problems that are stated as statements, expressing the user's needs in a relevant context, as well as understanding their experiences, behaviors, and objectives.
- **Prototype**. This stage makes and delivers project prototypes to users and clients for refining it, therefore rapid feedback cycles are carried out, in such a way that the cost of experimenting is minimized, and failures are detected early to be successful as soon as possible.
- **Test**. In this stage, the prototype that best adapts to the user experience and does not present errors is verified and validated.

2.3 Problems to Minimize with the Methodological Approach

This approach is focused on the BAPs management related to reading-writing, dyslexia, and emotional intelligence of basic education students to allow their participation and facilitate their learning in the school.

2.3.1 Reading-Writing

The ability to read and write is a cognitive process that humans acquire. It involves interpreting texts and is the second link in the communication [7, 18] between individuals —the first being speech. Reading and writing require both thinking and language skills, which are considered higher cognitive processes. However, it's important to note that basic cognitive processes play a fundamental role in the performance of the first. This cognitive process is made up of two factors:

- **Written Expression.** It consists of the ability to communicate through graphemes, which can be seen as:
  - A process that has a lot in common with writing and that at the same time is distinguished from it in many aspects.
  - A deciphering actor by which graphic signs are transformed into phonetic ones. Relating these graphemes and associating them with phonemes has been the objective of all methods for teaching reading.
  - The interpretation of the meaning of a text through a process of visual perception and recognition of it.
  - The decoding of a written or printed text, pronouncing or not the value of the sounds represented.

- **Reading Comprehension.** In turn, it is subdivided into speaking and listening, which
  - It goes from the representation of the expression that needs to be written down, goes through a sonic analysis, and ends in the deciphering of the sounds (phonemes) into letters (graphemes). Reading begins with the perception of the set of letters, goes through reencryption into sounds, and ends with the identification of the meaning of the word.
  - It is the representation of ideas by signs and more especially spoken language through letters, figures, and conversational signs.

In literature, the reading-writing process involves carrying out diagnostic tests using appropriate instruments that allow evaluation and, helping to improve this process to solve the problems that the child presents in basic education. The evaluation of reading-writing considers two guidelines or levels of evaluation; Writing Levels and Reading Levels. The former, the concrete, pre-syllabic, syllabic, and alphabetic part of writing is evaluated. The latter, the evaluation focuses on the pre-syllabic, syllabic, and alphabetic parts of reading. That is, Written Expression and Reading Comprehension must be evaluated (considering Oral Expression—speaking— and Oral Comprehension —listening). Therefore, based on these guidelines, the evaluation instrument that is used in technological management to support the basic education of children in reading and writing is generated.
Regarding technologicals platforms to manage reading-writing, these were found in the literature were found in the literature, only apps such as *Beereaders* [19] improves the reading comprehension skills of students from 6 to 18 years of age, however, requires payment for some evaluation instruments. *Speaking with Julis* [20]

provides 6 pedagogical levels with exercises, activities, games, and videos; all activities apply to daily life to advance in all communicative and learning areas, however; it has a cost. *Learning to Read with Syllables* [21] is a didactic educational game for tablets and smartphones that is dedicated to the development of children's reading-writing, but, to access the full version you must pay. *First Read* [22] provides various educational games to develop reading acquisition skills, such as phonological awareness, letter learning, and word and text reading practice. *Leo with Grin: Learn to Read* [23] based on the Educaplanet method, has 30 Lessons, divided into 6 challenges. Each lesson contains 14 games with 3 sections: syllables, words, and phrases. *Oxbooks* [24] encourages reading through short and attractive stories —these contain text marking tools, audiobooks, and comprehension challenges such as multiple-choice questions and word searches, which have different difficulties in terms of comprehension and associated vocabulary. *ReadUp: helps you read better* [25] and improves children's reading and reading comprehension through the Glifing method—to benefit children (6 and 12 years old) with reading difficulties and who are learning to read or who want to improve or perfect their level. *MyABCKit* [26] teaches reading and writing through play with the option of creating two independent profiles so that each child learns independently and based on their level, as well as with access to thousands of words, videos, stories, exercises, different activities, and themes, in each one you can carry out different activities: listen to words, find, match, complete, order, listen to phrases and create sentences. Although the apps reviewed support reading-writing, a payment must be made and only two are in an educational setting. Consequently, a methodological approach is presented, which supports basic education students to improve their reading-writing educationally and based on the principles as well as instruments used by the USAER.

2.3.2 Dyslexia

As expressed in the definition agreed upon by the International Dyslexia Association, this is considered a Specific Learning Difficulty (DEA, Dificultad Específica de Aprendizaje) of neurobiological origin, characterized by the presence of difficulties in accuracy and fluency in word recognition (written) and a deficit in decoding (reading) and spelling skills [27, 28. 29, 30]. Dyslexia is a DEA, a general term that refers to a heterogeneous group of disorders that manifest themselves in difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or calculation skills. These disorders are intrinsic to individuals because they have a neurobiological origin [31]. The person with dyslexia has it throughout their entire life, although it manifests itself in different ways. In addition, this disease can considerably hinder a student's academic success and even the completion of their studies, becoming a key factor in academic failure within the educational system. Research in recent years speaks of dyslexia as a syndrome that manifests itself in multiple forms or types. The majority of dyslexic people present some type of auditory/phonological, visuospatial, or psychomotor deficit [32, 33].

Various studies have been carried out related to dyslexia. Most of these have focused on learning the alphabetic principle, word recognition, and reading fluency since these aspects have proven to be the main obstacles faced by children with reading difficulties [34, 35, 36]. These studies can be divided [37] into Preventive Interventions —carried out in children aged 5 to 7 years who have difficulties in phonological skills and in learning the alphabetic principle [38, 39, 40, 41]— and Remedial Interventions —proposed for children aged 8 to 11 years and focused exclusively on remedying the reading deficit [42, 43, 44, 45]. These intervention programs have allowed us to obtain important conclusions:

- The produces very important and favorable changes in reading accuracy and comprehension.
- A significant percentage of participants do not maintain their level of performance two years later.
- Children fail to improve their level of reading fluency.

Therefore, an intensive intervention period can be carried out by a technological platform, in such a way a student learns or repeats many times those required exercises to overcome her/his reading problems, even these exercises can adapt to the need he/she has. Concerning technological tools to reduce dyslexia, these were not found in the literature; only apps: *Dytective* [46] improves skills related to reading-writing, for people with or without reading-writing difficulties; each dytective challenge or session lasts 10 to 20 minutes in 4 weeks to do systematic use. *Relexia* [47] is a personalized exercise routine, created by experts in learning processes and designed for any child with reading difficulties, including dyslexia; furthermore, it adapts the level of difficulty of the exercises to each child. *Visual Attention Therapy Lite* [48] helps brain injury and stroke survivors, as well

as struggling students, improve exploration skills; It also helps rehabilitation professionals evaluate neglect and provide more efficient and effective therapy for attention deficits. *Diseggxia* [49] It is a game with three levels that reduces children's language problems, specifically those related to dyslexia.

2.3.2 Intelligence Emotional

This concept of intelligence emotional (IE) has its origin in the “law of effect” formulated by Thorndike in 1988 [13] when proposing an explanatory principle of animal learning in his doctoral thesis. Although it was proposed by Salovey and Mayer in 1990, based on Gardner's guidelines in his theory of Multiple Intelligences (MI) [50], mainly, intrapersonal and interpersonal intelligences. It was Goleman in 1995, who spread it through his work aimed at the business world, where he introduced the study of IE, its scope, and benefits [51]. The concept of IE emerged to answer the question: why are there people who adapt better than others to different situations in daily life? It is made up of meta-skills that can be categorized into five competencies: knowledge of one's own emotions, ability to control emotions, ability to motivate oneself, recognition of other people's emotions, and control of relationships [52]. In the educational field, research has been done regarding:

- **Psychological adjustment.** A high IE indicates better quality in relationships and a positive response to stressful or complex relationships;
- **School performance.** A high IE reveals better academic performance; and
- **Disruptive behaviors.** A high IE is related to non-aggressive behavior and non-self-destructive behaviors.

That is, when a student presents emotional well-being, his or her way of acting, relating, behaving, and performing academically is conducive.

Regarding technological tools to manage emotional intelligence, these were not found in the literature There are various apps, chatbots, and games focused on supporting emotional intelligence; some are presented in this section. Yana [53] is a Chatbot (Automated Conversational Agent) that helps strengthen emotional well-being during the COVID-19 quarantine; it accompanies people in this process; but it has a cost and does not focus on education. Daylo [54] is a virtual diary, that supports and monitors mental, physical, and emotional health, however, it is not suitable for the educational field and presents invasive advertisements. iFeel™ [55] helps express needs, emotions, or feelings through pictograms with the voice recorded on the tablet, although it is not focused on the educational field and has a cost. Learn Emotions [56] is an educational game for children, included in "The Game Tree", but it contains ads that are annoying to the user. Jenny [57] helps people know themselves better and better manage their emotions using artificial intelligence, however, it does not focus on primary education and presents invasive ads. *Super emotions* [58] helps in the emotional education of the little ones; a task that is carried out through an interactive game that reinforces their intrapersonal and interpersonal intelligence; identifying emotions in different social situations and recognizing their feelings and those of others. *Gominis* [59] is a space adventure in which, while children have fun, aspects related to emotional and social intelligence such as impulsivity, self-control, or recognition of emotions are evaluated. *Breathe, think, act* [60] research-based, bilingual (English and Spanish) app helps children learn Sesame's problem-solving strategy, and provides the tools to help children develop emotional strength skills, and overcome daily challenges, stressful situations, and transitions. *Smiling Mind: Meditation app* [61] is supported by mindfulness and positive psychology strategies, designed to build mental fitness and resilience; support good sleep, study, and sports training; reduce stress and improve relationships; as well as promote the development of new social and emotional skills.

Concerning the apps analyzed, only one focuses on the educational field, but contains advertisements; The others are not focused on the educational field and several have a cost or present advertisements that are annoying to the user. Therefore, this work presents a methodological approach that allows the development of ADARA, a platform without ads and focused on primary education for the management of reading-writing, dyslexia, and emotional intelligence; as well as taking into account the guidelines of special education established in Mexico and, in particular, of the USAER.

3 Methodological Approach

The approach proposed in this work is derived from combining and adapting the methodologies of Design Thinking (DT) —which establishes the problem of the GAP of reading-writing, dyslexia, and emotional intelligence in primary school— and SCRUM —to build, control, and supervise the project—with the objectives of achieving USAER theoretical references. Next, the methodological proposal is briefly presented, and later its application.

3.1 The methodology

The methodological approach focuses on the development of educational platforms and is made up of the phases of Inspection, Schematization, Implementation, and Validation (as shown in Figure 1), which are explained below:

1. **Inspection**. This phase is based on the USAER methodological resource called *constructivism*, which establishes what should be used and how to reduce or solve a specific problem; therefore, the *Empathize* stage of DT and *Initiate* stage of SCRUM, are adapted and applied. This phase contains the following processes:
   a. *Empathic Vision.* An empathetic representation of the problem is established based on the project vision and the user's experience. So, this work focuses on overcoming the BAPS related to reading writing, dyslexia, and emotional intelligence. In addition, the objectives of the project are defined.
   b. *Statements and Team*. Subsequently, the statements in the form of user stories are established, identifying the elements and users required for the development of the educative technological platform. Including the procedure involved for the creation, application, monitoring, and adaptation of the educational instruments to be used; as well as the development team both technical and educational parts.
   c. *Backlog*. Finally, a list of activities to be performed is defined to take an account the mentioned processes above.

2. **Schematization**. It focuses on the methodological resources named *Social Model of Disability,* which refers to providing an environment that eliminates or reduces students' limitations. Thus, the *Ideate* stage of DT and the *Plan and Estimate* stage of SCRUM, are considered and adopted. This phase is composed of two processes:
   a. *Planning*. Considering the emphatic vision, statements, team, and backlog the costs, times, responsible parties, and deliverables are established for each established project activity, as well as the risks of each one are indicated. The planning must also include the processing of educative instruments and, obviously, the sprints that comprise the software development life cycle. Consequently, a planning general and complete is elaborated.
   b. *Educative Instrument***.** This process requires executing the following tasks (as shown in Figure 2):
      – Conception. This proposes a strategy to develop educational instruments for BAPs related to reading, writing, dyslexia, and emotional intelligence. Afterward, the team is defined, considering who carries out the research and fieldwork, and the integration of the instruments into an educational platform. In this project, the team is made up of primary school teachers, and professionals in educational processes, psychology, social anthropology, communication, design, and computing. Subsequently, the instruments to be developed are defined. Finally, the levels to which such instruments will be applied are specified. In this work, the first and second grades make up level 1, the third and fourth grades correspond to level 2, and the fifth and sixth grades correspond to level 3.

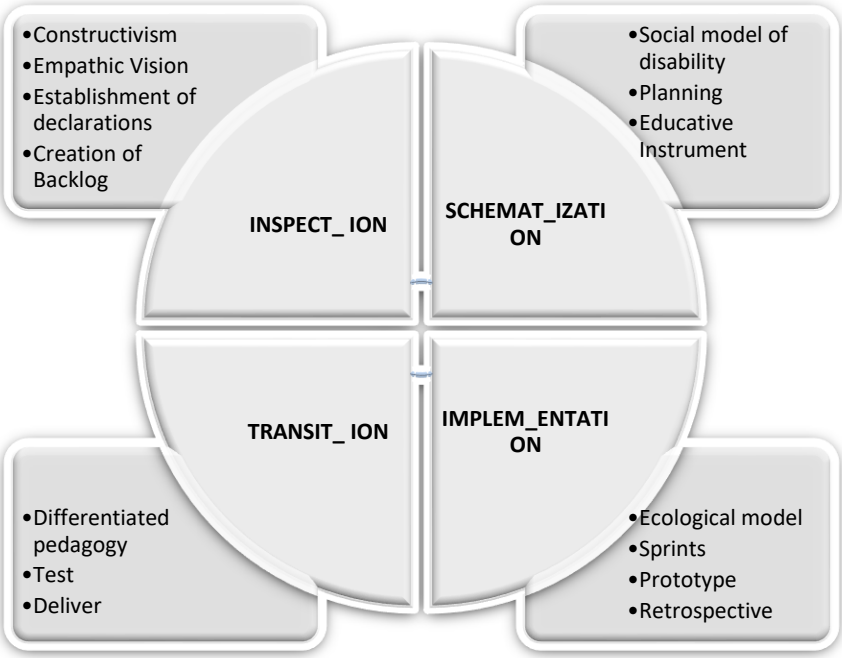

Figure 1. Block diagram of the methodological approach.

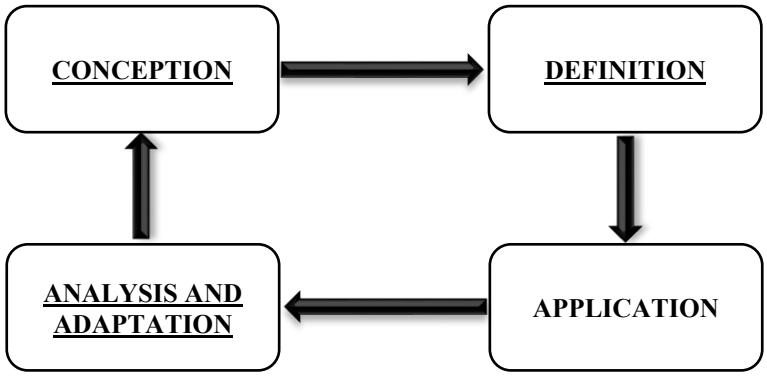

Figure 2. Block diagram of the educative instrument processing.

– Definition. This determines the instruments of the diagnostic test related to reading writing, dyslexia, and emotional intelligence. Therefore, the indications for the handling of materials, systematization, and analysis of the data obtained are established. For this work, the "Manual Exploration of Basic Skills in Reading, Written Text Production and Mental Calculation" is used. Tool for school prepared by the Undersecretariat of Basic Education through the General Directorate of Development of Educational Management. Subsequently, the analysis of the diagnostic test is carried out, establishing the purpose of said instrument, the components to observe, and the materials to create for its evaluation. Finally, the goal to be achieved is defined, which in this work is to evaluate the student's progress in reading-writing, dyslexia, and emotional intelligence, to promptly identify those who require support and sustain a timely teaching intervention. As an example in Figure 3 and Figure 4 a writing and reading exercise are presented.

– Application. This defines the primary school(s) where the diagnostic test will be applied. In this case, the work was carried out at the "Profesor Jorge Murad Macluf" primary school – located at 72307, Av. Laureles 8618, Bosques de Manzanilla, Puebla – is presented, agreeing to attend for 1 month, on Tuesdays, Thursdays, and Fridays from 08:00 to 10:00 a.m. to work with third parties A and B.; After a month she went every day at the same time.

– Analysis, and Adaptation. This analyzes the results obtained to determine the adaptation of the instruments created, in such a way that these allow students to improve in reading-writing, dyslexia, and emotional intelligence. So, they can integrate into his/her educative environment and society in a way normal.

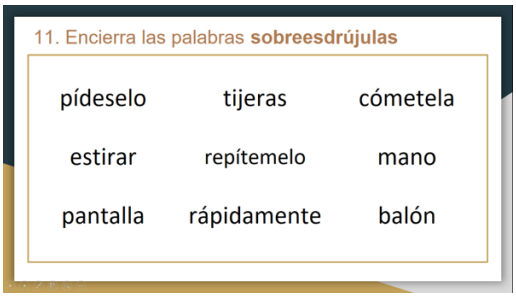

Figure 3. Exercise of writing in Spanish.

3. **Implementation**. This phase is based on the USAER methodological resource called *the Ecological Model*,—which aims for people to be open to changes and introduce them into their environment so that they relate appropriately, that is, they are willing, even, to technological changes. Hence, the *Prototype* stage of DT and the Implement, *Review, and Retrospect* stages of SCRUM, are adapted and applied. It is guided in the programming of Sprints. If there are new user needs or contexts, the first two stages are modified so that they are reflected in the coding. Diagnostic tests can even be adapted or new exercises added to reduce the BAPs mentioned above. In this phase, the development of a technological platform to manage the BAPS is carried out.

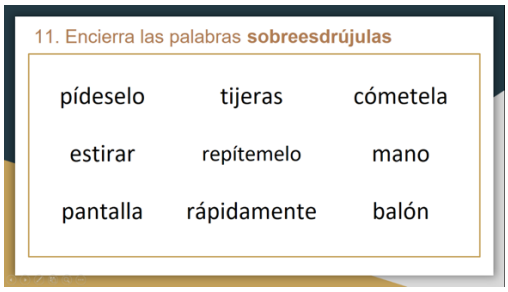

Figure 4. Exercise of reading in Spanish.

4. **Transition**. It focuses on the methodological resources named *Differentiated Pedagogy*, which tries to reduce human differences (students with or without a disability) and environmental so that appropriate treatment is provided for each one, achieving better learning results, which refers to providing an environment that eliminates or reduces students' limitations. So, the *Test* stage of DT and the *Release* stage of SCRUM, are considered and adapted. The final version is delivered to the users, without errors and according to the user experience, and a retrospective document is prepared where all the problems found and their solutions are reflected.

3.2 The Application of the Methodological Approach

The proposed methodological approach is applied to develop the ADARA platform, which seeks to reduce BAPs related to dyslexia, reading, writing, and emotional intelligence problems. So, a workgroup with diverse specialists —psychologists, sociologists, teachers, communicators, and computer scientists— was integrated for rising ADARA. The first four specialists focus on the phases of inspection and schematization. Computer scientists are oriented to the implementation phase, considering all information obtained by other specialists; as well as consulting with them for this development. Finally, computer scientists send ADARA to users in the transition phase.

1. **Inspection**. A review of the literature is carried out (including from the USAER) about how these BAPs are addressed and the existing platforms to confront each one. From this, the objectives, statements —in the form of user stories—and the instruments to be generated to reduce BAPs, are defined. Finally, the processes that will be carried out in the development of the project are established.
2. **Schematization**. Diagnostic tests are established for the three levels —level 1 corresponds to first and second grade, level 2 to third and fourth grade, level 3 to fifth and sixth grade— and the BAPs to be treated —dyslexia, reading-writing, and emotional intelligence. These tests are based on the "Manual Exploration of basic skills in reading, production of written texts, and mental calculation. These tests are evaluated with rubrics and learning by level is defined based on the results. If a student requires reinforcement of a specific topic, the content is adapted, offering personalized attention. Finally, planning is carried out using a Gantt chart.
3. **Implementation**. As mentioned above, in the phase de Inspection, the information for determining the user histories —which represents statements— is obtained. Then, tests are generated and validated according to data collected by the first specialist group, as well as Sprint's prioritized backlog is provided. Consequently, in this phase the Sprints are coded; each Sprint prototype is tested and delivered for all requirements. In such a way, the errors found were eliminated and with the acceptance tests, they were adjusted and adapted to the needs of the users —administrator, teacher, student, and tutor— obtaining user interfaces that were easy to use, robust, and secure. Figure 5 shows where each exercise can be configured and Figure 6 creates lists of exercises with those that have already been generated.
4. **Transition**. The platform was delivered to users along with a user and technical manual that contributed to facilitating its use and simplifying the management of dyslexia, reading-writing, and emotional intelligence.

4 Results

The methodological approach presented in the previous section allowed us to simplify, monitor, and control the development of ADARA —an educational platform to manage BAPs related to dyslexia, reading, writing, and emotional intelligence. The proposal turns out to be very intuitive as it is based on two widely used methodologies Design Thinking and SCRUM. It should be noted empirically that it was easier for the development team to use this approach compared to the classic Cascade or Spiral methodologies and the agile SCRUM. Also, the fact that this approach includes the material and the theoretical references—constructivism, social model of disability, ecological model, and differentiated pedagogy— make it ideal to apply it in the generation of technological platforms focused on educational contexts and, in particular, in those that require evaluation instruments or tests that measure student performance to reduce various difficulties in the learning process.

Figure 5. Exercise settings.

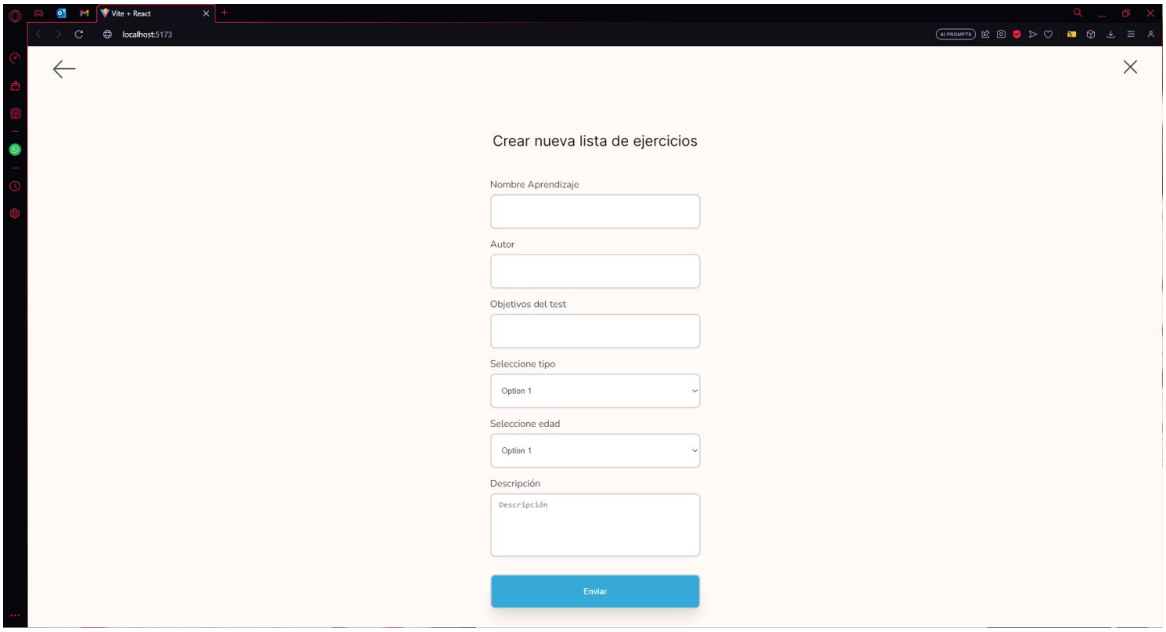

Figure 6. Creation of exercise list.

Also, for reasons of space, only the results concerning the BAP of writing are presented. Figure 7 shows the final results of five students. Figure 8 shows the total results per student after applying ADARA, indicating a significant increase in scores in comparison with Figure 9, which presents the total results per student when the work with them began —i.e., before applying ADARA; going from a level of "Requires support" (9 points or less) to "In development". Since the majority of students obtained a score between 10 at 14 points. Except for the case of student Oscar, who has a diagnosis of intellectual disability, however, progress was also achieved.

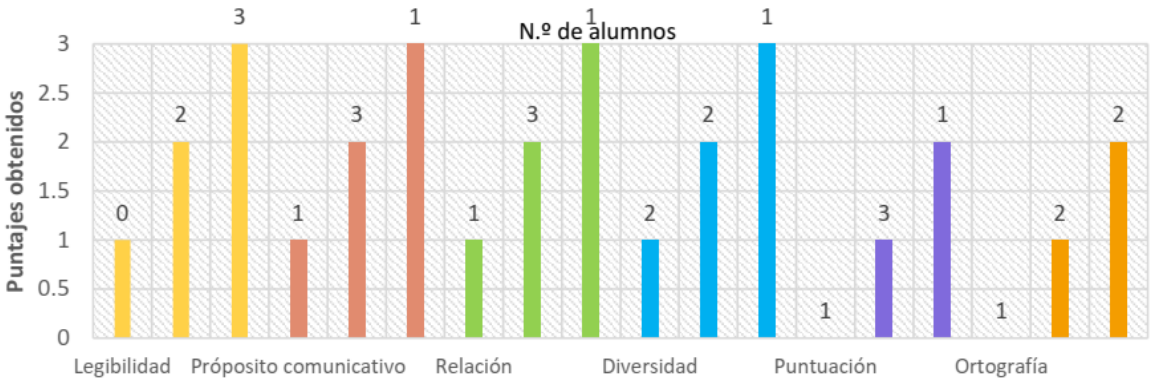

Figure 7. Final writing results.

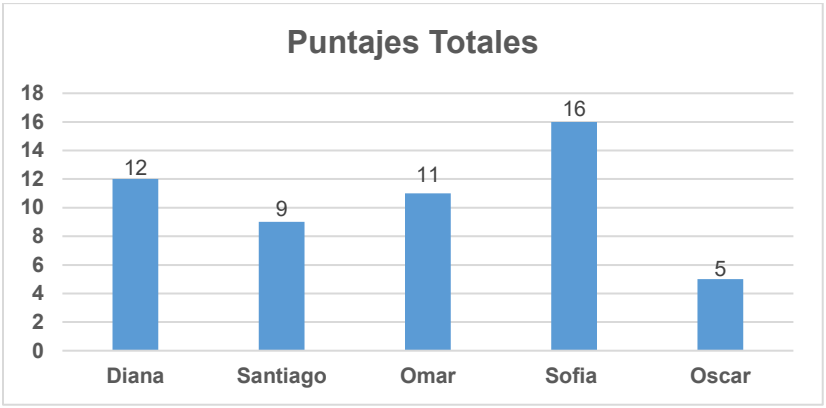

Figure 8. Final writing score per student.

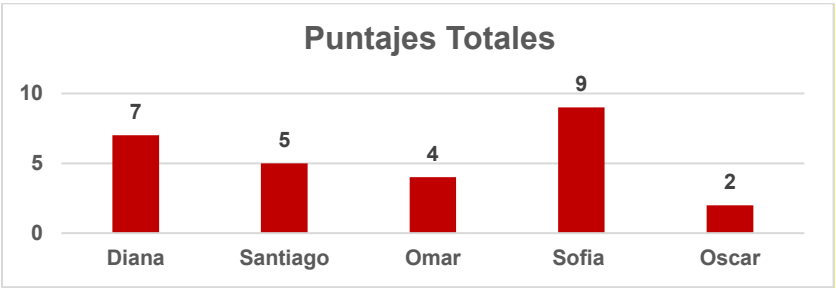

Figure 9. Initial writing score per student.

5 Conclusions and Future Work

In this work, a methodological approach has been proposed in order to manage the barriers to learning and participation that are related to reading, writing, dyslexia, or emotional intelligence in basic education students. These problems were selected since reading and writing are the two most important forms of communication between persons; furthermore, dyslexia is associated with them. So, when students present any of these problems, they find it difficult to integrate with their educational and social environment, which can lead to a decrease in their self-esteem. Therefore, it is necessary to manage emotional intelligence. This approach consists of four phases: Inspection, Schematization, Implementation, and Transition, allowing the development of technological platforms to manage the BAPs. This methodology is based on the USAER methodological resources, which are constructivism, the social model of disability, the ecological model, and the differentiated

pedagogy. Design Thinking and SCRUM methodologies are also used, which allow this approach to be applied to any educational problem that can be managed technologically. In addition, a process for developing educational instruments has been proposed, which can be adapted to any educational difficulty that needs to be resolved. Future work focuses on automating the personalization of the student's knowledge reinforcement exercises based on the results obtained in the diagnostic test.

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