Migration Letters

Volume: 21, No: 4, pp. 1632-1644

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)
www.migrationletters.com

Ecological Hydrology Dynamics: Sustaining Household and Industrial Water Needs in Balaraja District, Tangerang Regency, Indonesia

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Abstract

The more rapid development of several areas in Balaraja which is triggered by the development of industrial and housing and settlement activities as well as supporting activities, the need for clean water supply will also increase where the majority of clean water supply is carried out by utilizing ground water even though the development of ground water resources is much more complicated. and more difficult than surface water development. This research aims to in-depth analysis of water needs in the Balaraja Detailed Spatial Planning Development Area (RDTR), separating the two main sectors of use, namely household and industrial. This research uses exploratory qualitative methods. This technique is a research approach that aims to explore and understand certain phenomena or events in depth. In this method, the main focus is the concept of ecogeohydrology through geoelectric estimation to obtain an overview of the characteristics of groundwater conditions in an area, especially in the RDTR Balaraja development area, analysis of water demand forecasts and the resulting impacts based on their interrelationships. The findings of this research in geological and hydrogeological analysis show that this area lacks groundwater, with dynamic system simulations providing a picture of the water deficit associated with changes in the area of green open space. This research is expected to provide a comprehensive view for policy makers in managing water resources in the Balaraja RDTR area in a sustainable manner.

Keywords: *Ground Water, Balaraja, Water Deficit, Eco-Hydrology, Water Exploitation.*

1. Introduction

Communication is the act of establishing a relationship with another person and transmitting a message. It goes beyond verbal expression and uses many mimicry or gestural signals.[1]

The development of communication skills in ordinary children varies from person to person, each at their own pace, they are able to speak and understand what is said to them, they can express what they do and feel and name different actions. [2]

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Generally, from birth, from 3 months of age, neurotypical children begin to startle, blink, cry and point at things.

Between 6 months and 1 year, having explored non-verbal language, the child begins to respond to his first name, babbles, enjoys playing with sound toys and acquires his first words, enabling him to discover verbal communication, although this process may be delayed in a child with autism.

According to the High Authority on Health, autism is a developmental disorder that manifests itself before the age of 3. It is characterized by an autistic triad, which defines a series of qualitative deficiencies in verbal and non-verbal communication.

These qualitative impairments manifest themselves as alterations in social interactions, alterations in nonverbal behaviors, and alterations in the development and maintenance of social or emotional relationships and reciprocity. [3]

2. Literature Reviews

Autism is a developmental disorder that affects various domains, including social communication.

The neuro-functional approach to autism puts forward the idea that the behavioral manifestations specific to this condition originate in a "cerebral modulation insufficiency".

This disorder of the central nervous system causes major disturbances that affect essential neuropsychological functions and erects obstacles in all aspects of the child's development. [4]

The barriers associated with social communication vary from person to person, but cover a wide range of difficulties such as the use of language, both verbal and non-verbal, comprehension, elocution and establishing links with others.

Limitations vary from child to child. Some children do not develop oral language, while others may have language but have difficulty interacting with others, and there are special cases, such as echolalia, where the child regularly repeats words or phrases he or she has heard.

Some children do not develop oral language, others have difficulty interacting with their environment, and there are special cases, such as echolalia, where the child regularly repeats words or phrases he or she has heard.

Many disabled children and adults have difficulty mastering and using speech. To help these children develop their social communication skills, it is essential to discover effective interventions.

Referring them to suitable interventions can help them acquire the skills they need for successful integration into society.

Difficulties in social interaction can lead to feelings of loneliness and isolation [5]. Faced with these situations, individuals may sometimes opt to withdraw temporarily or permanently from relationships [6].

People with autism experience communication barriers that can be rapidly assessed. These people need support and understanding to progress and develop their potential.

People with autism have an atypical perception. To help them express themselves, it is essential to provide them with the means to interact with others and integrate into the community [7].

Many people with autism face challenges that encompass all forms of functional communication, underscoring the importance of augmentative and alternative communication (AAC) for many of them [8].

The development of communication and language skills plays a fundamental role in the social integration, schooling, quality of life and behavior of children with autism. There are several methods for improving communication and language skills. The Picture Exchange Communication Protocol (PECS) is commonly used in the treatment of non-verbal autistic children.

However, there is little empirical evidence of the effectiveness of PECS in treating social communication disorders in people with autism.

PECS represents one of the most renowned and empirically validated methodologies employed worldwide, with a particular focus on Morocco. It is a Picture Exchange Communication System (PECS) designed to empower children with social communication deficits, facilitating their access to language.

The development of the Picture Exchange Communication System (PECS) originated in the United States in the mid-1980s, thanks to the collaborative efforts of psychologist Andy Bondy and speech therapist Lori Frost. This revolutionary approach was specifically designed to help people with speech and communication difficulties, enabling them to express themselves and foster links with their environment [9].

The Symbolization Exchange Program (SIP) introduces an inventive approach to educating students in communication, involving the exchange of images or symbols for the desired elements.

This methodology departs from previous techniques used with children, such as teaching sign systems or focusing on imitating speech by concentrating on sounds or pointing to symbols [10].

Our program aims to competently teach fundamental communication skills and optimize the spontaneous acquisition of communication through the use of behavioral techniques, including modeling, differential reinforcement and transfer of stimulus control across a time delay. We achieve this by using images (ranging from monochrome to colored drawings) as communication references to impart functional communication skills to children [11].

The PECS system has a special feature. The child must initiate an interaction with the listener before transmitting a message. This requirement offers significant advantages for effective communication and understanding between child and listener. This requirement has significant advantages in promoting effective communication and understanding between child and listener.

The protocol is broken down into six distinct training phases, starting with a request for desired objects or activities, then progressing systematically to image/icon discrimination, and the construction and use of simple sentences.

The decision to move from one phase to the next is taken by the speech therapist accompanying the child. The first four stages are generally applied with ease, while the last two are often more complex and may not be used. However, the speech therapist can adapt the protocol according to the child's progress and ability to concentrate and learn. The PECS system is a low-cost system that does not require sophisticated equipment. It takes the form of a binder containing images and photos of everyday objects and actions, which are memorized by the child.

These images are accompanied by the corresponding words. The PECS system is widely used with autistic children, both nationally and internationally. Its simplicity, portability and ease of use in a variety of contexts, as well as its low reliance on complex

movements on the part of the user and the fact that it does not require proficiency in sign language, they make it a popular system [12].

Research findings have indicated the system's potential for relatively rapid teaching [13]. Although the benefits of the PECS are widely recognized, the factors influencing individual progress in its application have not yet been clearly identified [14]. Unfortunately, there is not enough information on this subject [15].

PECS is used as an intervention for non-verbal autistic children [16]. However, empirical studies on the effectiveness of PECS in treating social communication deficits in people with autism are limited [17] some data have shown promising results [18].

In the following sections of this article, we will provide a more detailed analysis of the PECS, explaining its functional mechanisms, reviewing empirical studies concerning its effectiveness in the autism environment and providing practical recommendations for its operation.

Learning technologies play a central role in enhancing communication skills in people with communication disorders, including those with autism [19]. These technologies, such as interactive mobile operations and digital bias, enable the use of visual and interactive tools that can improve the effectiveness of communication methods, such as the Picture Exchange Communication System (PECS) [20].

However, to reap the benefits of learning technologies, acceptable training for practitioners and family awareness of the possibilities offered by these tools are required [21].

3. Purpose of the study:

Grounded on our review of functional communication development approaches, particularly those used in Casablanca, Morocco, it's apparent that PECS is one of the most extensively espoused systems. The main end of our study is to assess differences in the experimental progression of communicative and language chops in children with autism in Casablanca following the perpetration of PECS.
Our exploration sweats aim to answer the following questions:

- At what stage do we start to see advancements in the child's functional language development?
- What are the challenges faced by parents who have espoused this approach?
- Who are the crucial stakeholders contributing to the success of PECS?
- In the course of our disquisition, we will present the compliances made, the methodology employed and the analysis of the results attained.
- Evaluate how the integration of learning technologies complementary to the PECS can optimize the development of communication skills in children with autism.

4. Hypotheses:

- The use of alternative communication methods, such as PECS, can potentially inhibit oral language development in children with autism.
- PECS is a specialized method designed for non-verbal and low-verbal autistic individuals.
- The developmental trajectory of communication in autism varies from child to child

- The combined use of learning technologies with PECS (Picture Exchange Communication System) will accelerate and improve the development of communication skills in autistic children.

5. Research Methodology

As part of my study, I had to do an eight-month internship in an autism integrated class in a school that is based in Morocco, specifically in Casablanca which consists of 19 autistic people, 5 educators, a behavioral psychologist and 2 speech therapists.

According to studies done by several researchers, the PECS has been successfully implemented worldwide with people with autism spectrum disorder of all ages with different language problems. I then chose to test the impact of the PECS system on the communication skills of children with autism.

The children who participated in the study must meet the following criteria: Diagnosis by a physician specializing in autism; verbal and nonverbal children with and without mental retardation, children who are accompanied by educators trained and untrained in PECS, autistic people who use PECS in their homes, and children who have already been videotaped by their parents or educators prior to the use of the alternative and argumentative communication system.

Our sample size was 6 children. It's composed of 3 girls and 3 boys who range in age from 5 years to 12 years. The group of preceptors is composed of 6 people who have entered specific training with 4 times of experience with the tool.

In general, the objective of this scientific article is to measure. the changes in the development of communication and language skills of children with autism after the use of the language skills of children with autism after the use of the Pictogram Exchange Program (PECS) in order to ensure its effectiveness.

Instruments

Questionnaires and Interviews

Two measuring instruments are used to validate the research hypothesis: directive interviews with the behavioral psychologist and the speech therapists who worked with the children and their educators in the class. In addition, an oral questionnaire was carried out with the parents of the children included in the study as part of a focus group. This questionnaire enables us to gather their testimonies on the improvements seen in their children after the application of the PECS, while identifying the difficulties encountered in the process of applying this method.

Observation methods

The other phase of our work focused on observing the video recordings of 6 verbal and non-verbal autistic children of different ages (5 to 8 years old) with mental retardation and without mental retardation before the use of the PECS by comparing them with their current situations and noting the changes in their communication skills after the use of the Picture Exchange Communication System.

he comparative observational study also consists of observing the children over a 12-month period to understand the role of learning technologies in improving the use of the PECS system.

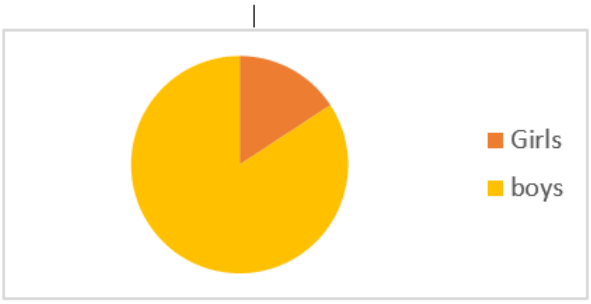
We opted for the same group of children (6 children) who currently use the PECS (Picture Exchange Communication System). Each subgroup consists of 3 children. 1st subgroup participants were exposed to a variety of learning technologies to complement the PECS. These technologies included mobile applications and interactive software designed to

enhance the effectiveness of the PECS, while the 2nd group used the PECS exclusively, with no integration of learning technologies.

This approach enabled us to directly compare the effects of integrating learning technologies with the PECS versus using the PECS alone.

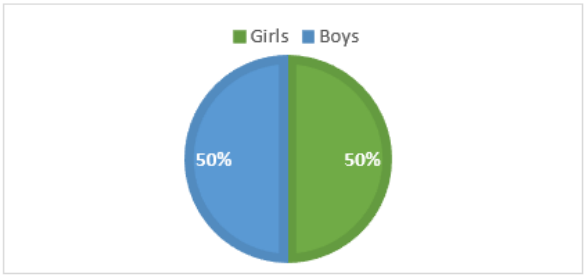
6. Results and Findings with Discussion

Figure1: Number of children with autism in integrated class in a school



This graph illustrates the number of autistic children present in the integrated class in a school. We have 19 autistic children, of which 16 are boys and 3 are girls, which represents a significant difference between the two sexes.

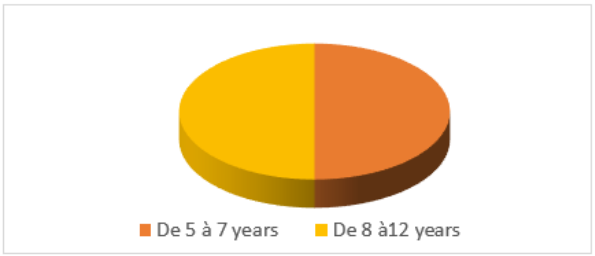
Figure2: Number of children with autism selected by gender



This graph shows the number of children selected for the study by gender. We selected 3 girls and 3 boys.

The choice of 6 participants which is a small group is more manageable and allows us to have a good follow-up

Figure3: Age range of selected children



This graph shows the number of children observed by age group. We selected 3 children between 5 and 7 years old and 3 children between 8 and 12 years because this is the age group of the children in this class

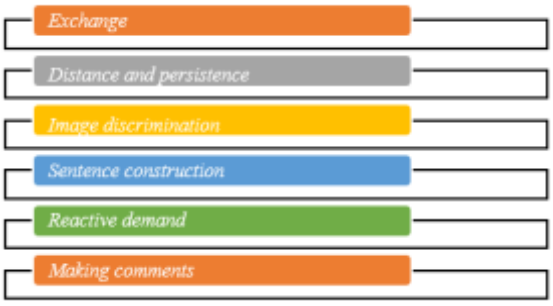


Figure 4: The phases of the PECS

This figure shows the 6 phases of the PECS system.

In phase I, the student learns to use a visual communication system to exchange images for objects or activities that he or she desires. This system is an essential tool for encouraging the expression and communication of needs and wants.

In phase II, we provide students with the ability to communicate across barriers and distances. By using one image at a time, we encourage them to use persistence in their communication, thus improving their communication skills.

In phase III, students learn to choose from two or more pictures to ask which they prefer. These are placed in their communication binder.

In phase IV, students can use a tear-off sentence strip to construct simple sentences. It consists of an "I want" picture followed by a picture of the desired object. This activity allows them to master sentence structure.

In phase IV, students learn how to use PECS to answer questions such as "What do you want?"

In phase VI, students learn to comment in response to questions about what they see, hear, and notice. To give them tools to better express their observations, they learn to form sentences with words such as "I see," "I feel," and "It is."

Table1: Categories of children selected for observation and evaluation.

Children's	Verbal	Not very verbal	Non-verbal
Mental retardation	1 child	1 child	1 child
Without mental retardation	1 child	1 child	1 child

This table shows the number of children selected for the study. 6 children were selected, 3 with mental retardation and 3 without mental retardation. The children were divided into 3 categories: verbal, low verbal and nonverbal. Each of them was diagnosed by a doctor specialized in autism.

Table2: Period of onset of changes in communication development for children accompanied by PECS trained educators.

Children's	Category1	Catégory2	Category 3
Mental retardation	Only 1 year left	Only 1 year left	Only 1 year left
Without mental retardation	From 6 months	From 6 months	From 6 months

This table shows the timing of changes in communicative skills for children accompanied by PECS trained educators.

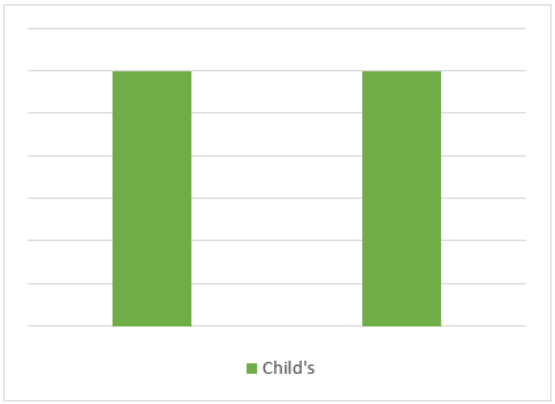
Table3: Learning technologies used to optimize the Picture Exchange Communication System (PECS).

Mobile applications and tablets	**Select images and communicate more easily.**
Dispositifs de communication	Selection and communicator on the aid of pictograms or images.
Technologies of reconnaissance vocale	help children make the transition from pictograms to speech by transforming their selections into words.
Reality Augmentée and Virtuelle	create interactive environments that modify communication and und
Dispositifs de suivi et d'evaluation	to assess the child's progress in using the PECS, helping to adapt the approach to individual needs.

Several learning technologies can be used to reinforce the Picture Exchange Communication System (PECS) and develop communication in children with autism.

The choice of technologies depends on the specific needs of each child and his or her ability to use these tools, so that the benefits of the PECS can be maximized by using these technologies.

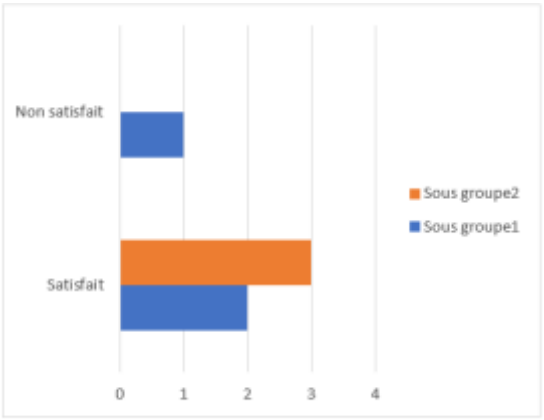
Figure 5: Communication Progress between PECS Alone and PECS with Learning Technologies Groups



Children in the 2 subgroups also showed similar progress in the development of communication skills.

This graph shows that the PECS has a positive impact on the development of communication skills in autistic children

Figure6: Satisfaction rate of parents in 2 subgroups



We note that the satisfaction rate of parents in the 2 sub-groups is equivalent.

Parents in both subgroups expressed satisfaction with the effectiveness of the PECS, noting that their children seemed more confident in their interactions, while parents in the 2nd subgroup emphasized the effectiveness of learning technologies in reinforcing communication skills, noting that their children seemed more engaged in the learning sessions and that positive responses were more realized.

The communicative behaviors of children without mental retardation began to manifest themselves as early as 6 months of age, while those of children with mental retardation did not begin to manifest themselves until they were one year old. This highlights the importance of having a trained educator to accompany these children.

Through our observation of the condition of the 3 children without mental retardation after and before the PECS and based on the responses obtained during the interview with the special educators as well as the speech therapists, we found a remarkable change in communicative behaviors in the children without mental retardation after phase 4 of the PECS. (Sentence structure.)

For the 3 others with mental retardation; we found changes after phase 6 (comments) without forgetting the possibility of not finding them in speech, the other improvements remain related to the child's previous abilities.

The results of the PECS vary from person to person, depending on the child's prior skills in discrimination, imitation, and visual performance.

We concluded that prior ability, age, severity of the disorder, and proper application of the phases by either professionals or parents are major factors that can contribute to the success of the method.

Taken together, these findings show that the use of the PECS leads to positive results in the development of functional language in most autistic children, which ensures the effectiveness of the approach, although according to our results and studies by other specialists, the PECS does not suppress spoken language.

The PECS is appropriate for non-verbal and pre-verbal children because it replaces verbal language.

A non-verbal autistic child can develop speech in 50% of the cases. The PECS could encourage him to speak. Mental retardation can make learning more difficult. But nothing is impossible.

The observation of two subgroups suggests that the integration of learning technologies with PECS can potentially accelerate the acquisition of communication skills in children with autism. The technologies enhance the children's engagement and motivation, which

resulted in faster progress in using the PECS. However, it is crucial to note that children using PECS alone also showed significant improvements. These results may vary from child to child, depending on individual skills.

Learning technologies may offer specific advantages to children sensitive to visual and interactive stimuli, but this does not mean that PECS alone is any less effective. The two approaches are complementary, and each has demonstrated its usefulness and value in the development of communication skills in children with autism.

7. Conclusions

The major problem of people with autism is the difficulty of development of their communication and their language which impacts their social integration and their qualities of life.

The care of people with an autism spectrum disorder has evolved recently. From various interventions, we can observe positive developmental changes and remarkable improvements in the communication and social skills of the autistic child.

There are several interventions that are designed to improve the communication and language skills of these individuals.

The PECS method is an alternative communication system that aims to address the difficulties in teaching, communication and social interaction that prevent functional language development in individuals with autism and other ASDs. It is intended for children, adolescents and adults.

The PECS is an easy tool without complex materials that can be implemented by professionals or educators or anyone who accompanies the autistic person. It requires specific training to respect the different steps to obtain effective results.

By using pictograms and images, non-verbal autistic children with or without delays can develop their verbal language and succeed in expressing their needs and making requests at home and at school.

According to our Morocco-based study and studies done by other researchers around the world, the PECS can stimulate verbal communication and initiate oral language. Research has shown that many autistic people have developed their speech through the PECS.

In conclusion, the PECS is one of the effective methods used by therapists and specialized educators in Morocco and other countries to help autistic people develop their functional communications (vocabulary, syntax, receptive and expressive language).

In addition to PECS, there are several approaches and interventions that can be beneficial in improving communication and language for people with autism, such as the use of augmentative and alternative communication (AAC) to express their thoughts, needs and desires using visual or technological supports.

Behavioral approaches, such as Applied Behavior Analysis (ABA) and language and communication therapy, play a crucial role in strengthening communication skills in individuals with autism, leading to improved comprehension and language skills.

These programs must be adapted and designed by qualified professionals trained to meet the specific needs of each individual with autism, which is crucial to the success of these approaches.

The development of communication skills in individuals with autism is a complex process, requiring a specialized multidimensional approach to encourage their social inclusion and improve their quality of life.

These interventions must be personalized and developed by competent, trained professionals, adapted to the specific needs of each autistic individual, which is essential for the success of these approaches. The development of communication skills in individuals with autism is a complex process that requires a specialized, multidimensional approach, aimed at fostering their social inclusion and improving their quality of life. However, despite the benefits of PECS in developing social communication skills in people with autism, several constraints hinder its use.

These include the lack of professionals trained in the method, insufficient follow-up by educators, and parents' reluctance to adopt it due to the association of images with their children's daily lives. Moreover, for fear of stigmatization, some parents refuse to integrate images into their children's routine, which is also a major constraint. It is imperative to take these constraints into account when implementing the PECS, and to collaborate with families, educators and health professionals to find solutions adapted to each situation.

To achieve the objectives of the PECS approach, it is imperative to provide specialized training and solid support for practitioners. In addition, it is crucial to raise parents' awareness of the benefits of PECS, particularly for non-verbal autistic children. Appropriate training and awareness-raising for professionals plays a vital role in the development of communication in these children.

Evaluating the evolution of communication skills following the use of PECS, as well as adapting the material to the changing needs of the individual, enable adjustments to be made to optimize the benefits of this method.

Together, these recommendations, including specialized training, parent awareness, a supportive environment and regular evaluation, create the optimal conditions for effective PECS use in people with autism, promoting their independence and quality of life.

Overall, this study reinforces the importance of PECS as a valuable tool for improving communication skills in children with autism. The integration of learning technologies can provide a complementary means of optimizing the PECS, notably by stimulating engagement and accelerating the learning procss.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

Acknowledgements

The authors would like to thank the volunteer participants in the experimental phases of this study.

I would like to express my sincere gratitude to the director school that made my study possible, and to all the parents of autistic children who participated in and supported this research. Your commitment and invaluable input have enabled progress to be made in understanding and improving approaches to help these children develop their communication skills and thrive. Your support has been invaluable, and I am grateful for the opportunity to contribute to such an important field. Your actions are making a real

difference in the lives of these children, and that deserves all our appreciation. Once again, thank you from the bottom of my heart.

Notes

- The PECS system is an important tool for improving the communication skills of children with autism.
- The integration of learning technologies may be a complementary means of optimising the effectiveness of this approach, in particular by stimulating engagement and accelerating the learning process.
- There are several important avenues for optimising the use of this alternative communication system, as well as for implementing future interventions and educational programmes to continually improve the quality of life of children with autism spectrum disorders.

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