Propósitos y Representaciones
ISSN 2307-7999
e-ISSN 2310-4635

Jan. - Apr. 2019, Vol. 7, N° 1: pp. 165 - 184
Monographic: Advances on qualitative research in education
http://dx.doi.org/10.20511/pyr2019.v7n1.273

RESEARCH ARTICLE

Characterization of Mathematical Reasoning Skills in Children with ADHD

Caracterización de las habilidades del razonamiento matemático en niños con TDAH

Ángel Salvatierra Melgar*
Universidad César Vallejo, Lima, Perú
ORCID: https://orcid.org/0000-0003-2817-630X

Santiago Aquiles Gallarday Morales
Universidad César Vallejo, Lima, Perú
ORCID: https://orcid.org/0000-0002-0452-5862

Yolvi Ocaña-Fernández
Universidad Nacional Mayor de San Marcos, Lima, Perú
ORCID: https://orcid.org/0000-0002-2566-6875

Jessica Paola Palacios Garay de Rodríguez
Universidad Nacional Federico Villarreal, Lima, Perú
ORCID: http://orcid.org/0000-0002-2315-1683

Received on 07-07-18 **Revised on** 08-12-18 **Approved on** 12-15-18 **Online on** 01-04-19

***Correspondence**

Email: smelgara@ucv.edu.pe

Cite as:

Salvatierra, A., Gallarday, S., Ocaña-Fernández, Y., & Palacios, J. (2019). Characterization of Mathematical Reasoning Skills in Children with ADHD. Propósitos y Representaciones, 7(1), 165-184. Doi: http://dx.doi.org/10.20511/pyr2019.v7n1.273

Summary

The objective of the present research was to characterize the mathematical reasoning skills in children with ADHD between 7 and 9 years old. The study begins with the conception of children with special needs and an anthropological research is carried out in perspectives of the actor on mathematical reasoning skills and interviews of their three teachers about their difficulties, alterations and disorders. The research method is an ethnographic fieldwork. The results show lack of mathematical skills specifically in numerical calculation; observing disorder, combination of simultaneous operation between addition and subtraction, attention deficit during the reading of a problem so they fail to systematize, identify data for algorithmic operations

Keywords: Skills; Mathematical Reasoning; Children with ADHD.

Resumen

El objetivo de la presente investigación fue caracterizar las habilidades del razonamiento matemático en niños con TDAH entre 7 a 9 años, el estudio inicia de la concepción de niños con necesidades especiales y se realiza una indagación antropológica en perspectivas del actor sobre las habilidades del razonamiento matemático y las entrevista a sus tres docentes acerca de sus dificultades, alteraciones y trastornos. El método de la investigación es el trabajo de campo etnográfico. Los resultados muestran carencia de habilidades matemáticas específicamente en cálculo numérico; apreciándose desorden, combinación de operación simultáneamente entre adición y sustracción, déficit de atención durante la lectura de un problema por lo que no logran sistematizar, identificar los datos para las operaciones algorítmica

Palabras clave: Habilidades, razonamiento matemático, niños con TDAH.

Introduction

A skill has different definitions depending on the lens it is viewed through, with regard to problem-solving, at work, in communication, in the use of technology, in sport, in social behavior, in political participation, in psychosocial operations, etc. Therefore, the skill constitutes a social construct where the theoretical is transferred to the practical according to Rigby and Sanchis (2006). Taking into account this position, the skill is identified as the technical or practical knowledge, involving the application of the theoretical knowledge to specific situations within a context.

Taking into account the position of the World Health Organization (WHO), which defines skills in human terms as people's ability to behave positively, adapt to others' behavior and to be part of the daily challenges (WHO 1997). Therefore, the path to a good education based on skills contributes to a new way and culture of learning, which is aimed at the preparation for life (UNESCO 2004). Along these lines, Portillo (2017) stated: "Every student makes progress at different rates in the mastery of a skill, which involves knowing how to timely meet their needs and the personalization of school trajectories" (p.10). That is the role of the educational actors, where every student is an individual being with varied learning processes. If necessary, adopting changes in the teaching practice that meets the multiple needs of the student, affecting an educational reorganization.

Skills and Mathematical Reasoning

Mathematical reasoning involves conscious formal reasoning, allowing problem-solving and generation of relevant conclusions. In this regard, Chevallard, Bosch and Gascón (1997) state that mathematics is present in our daily life, in daily work through technical objects, in daily purchases, service payments, casino games, in the delivery of products to the table, in rough length calculations, the weight of objects, etc. Mathematical knowledge is one of the disciplines that

strengthens the ability to reason, in terms of abstraction, decision-making, analysis, synthesis, prediction, systematization and solving of logical or heuristic problems. This allows a basic training at a cultural level for daily development. Likewise, Defaz (2017) says that thanks to thinking, observation and intuition leading to mental representation and imagination of logical reasoning to establish deduction relations, apply meaning to symbolic situations and infer, it also allows the development of didactic processes, such as induction from specific cases or data, deduction from the general to specific processes. These arguments are key to heuristic thinking.

In terms of education, the mathematical reasoning skill is understood as how to make practical use of numbers in situations during the development of basic operations by using symbols, and interpreting and solving work and daily life problems (Calzada 2014). Likewise, the expression of reasoning is linked to the vocalization of symbols, to the transposition of the abstract world to verbal statements for its communication according to the purpose and the nature of situations. However, interpretation is based on the understanding of the graphical format. The meaning of symbolic and numerical information leads to problem-solving, which turns into real and specific situations, targeting the understanding and interpretation towards selecting appropriate strategies and procedures based on the heuristic sequence during coping.

Children with Special Educational Needs

Institutions in the Peruvian educational system are represented in both private and public entities by a group of people with specific roles. The Peruvian Ministry of Education – MINEDU (2018) states that school is a place of learning and participation opportunities for children, regardless of their personal, social or cultural conditions. They are valued in their personal differences. It is the teacher's job to make children feel part of the group by interacting professionally with the children through orientation and follow-up, guiding and evaluating the learning process. Fernández and Sarramona (1985) point out that teachers, in their professional practice, usually share learning experiences with children who show or are at the beginning of some type of learning problems which hinder their normal academic development and social coexistence. Moriña and Almudena (2017) reported that many teachers are not sufficiently trained to meet the needs of students with some special needs. Thus, it is necessary that they receive a specialization training or include it in the higher education curriculum. For his part, Warnock (1987) identified four major teachers' needs in their teaching practice: (a) children with hearing, vision, or mobility problems, (b) educational disadvantages, (c) learning difficulties, and (d) emotional and behavioral difficulties.

Due to the multiple and varied special educational needs in our context, the National Institute of Statistics and Informatics (INEI, by its Spanish initials) (2014) detected a frequent recurrence of cases of Attention Deficit Hyperactivity Disorder (ADHD) or attention disorder in children. According to Fernández, Arjona, Arjona, and Cisneros (2011), an average of 5 percent of children in the world has this disorder, which is more common in boys than girls (one girl out of every three boys). Likewise, Fernádez (2011) states that ADHD occurs before the age of seven and is maintained over time, causing poor academic performance and deficient development of social skills, and daily and emotional activities.

Attention deficit and hyperactivity, according to Portela, Carbonell, Hechavarría, and Jacas (2016), are due primarily to hereditary factors, represented by 80% of cases; biological factors acquired during the prenatal, perinatal and postnatal periods; neurophysiological factors, including brain activations, metabolism reduction, blood flow activation and electrical activity in the sensorimotor cortex. Secondly, they are due to genetic factors as observed in concordance rates for fraternal twins (dizygotic twins) and identical twins (monozygotic twins), as well as psychosocial and environmental factors, marked by the psychopathology of the parents, psychosocial stress of the family, poor diet, alcoholism, and video games. Thirdly, the neurochemical factor, generated by brain flow through photon tomography, a deficit of regulation of neurotransmitters such as dopamine and norepinephrine in the frontal cortex, serotonin in the control of impulses. As it is noted, they are children that need specialized treatments due to their

multiple causes. However, this study aims to describe and characterize how children with ADHD learn. This characterization is addressed so they need more time and to be controlled so that they can finish their task.

Skills and Mathematical Reasoning in Children with SEN

The components identified in the mathematical reasoning skills according to the Functional Mathematics Curricula for Students with SEN in Chile, and developed by the Ministry of Education (2016) which organized and characterized the needs of children in four specific categories: Solve problems, argument and communicate, model and represent. These curriculum components are specifically designed for children with SEN, and presented by organizers with practical activities aimed at developing and enhancing their innate skills. Children with ADHD show deficiencies in the acquisition of linguistic and mathematical skills compared to normal children since they do not achieve their performance according to their age and their intellectual coefficient (Zentall 2007), due to their executive functions (EFs) deficit associated with organized search, flexibility of actions, and thinking, and thus, logical reasoning. According to Gratch (2009), specific situations such as numbering and calculation reflect a lack of accuracy or precision in making arithmetic calculations due to the confusion of signs. As for problem- solving, they cannot systematize the implicit data and present the sequence to solve the problem. They have difficulties with ordering digits, reading, mathematical language and sequences of the mental processes to determine the problem. All these and other aspects are explained by the lack of mature counting strategies, producing conglomerations or bottlenecks in the working memory due to poor attention and concentration leading to serious consequences in mathematics learning (Barkley 1997), as well as poor, discouraging results or achievements for both the students' teacher and their parents.

In order to maintain or focus the attention of children with ADHD, it is suggested to manipulate specific educational materials with a large number of incentives or texts with clear and guiding sentences, avoiding distraction, and generate significant incentives (Miranda, Alba and Taverner (2009) since the main characteristic of these children is the loss of attention and concentration to the entrusted tasks. They have difficulties in solving problems. Although they read very well, for the most part, they do not understand or identify the implicit data. They cannot identify the arithmetic operations leading to confusion among operators, generating three types of knowledge: The concept statement consists of operations and resolution strategies. The procedural knowledge includes the application of declarative knowledge and the coordination of cognitive processes, and the conditional knowledge which entails the selection of more appropriate strategies.

Method

This study used the ethnographic qualitative methodology to know the direct behavior of the subjects (Hernández, Fernández, and Baptista 2014). The children with ADHD were identified using the DSM_IV checklist, who were subjects of observation. Then, semi-structured interviews were conducted with three teachers, followed by individualized interactions coded for identification with the same teachers, after receiving their prior informed consents (Izcara 2014). Likewise, the teachers informed about the behaviors and experiences of the children with ADHD in the classroom, and the inclusive education training courses they attended. A specialist was interviewed. The observation technique was used to record the children's behaviors, such as when they noticed the presence of the researcher (an unplanned situation) while leaving the classroom. Such behavior occurred due to the innate curiosity of the children (Aragon, Natalia, Marcia, and Juan 2016). They were asked the following questions when they voluntarily approached: Which is your favorite show? Which is the latest virtual game? Who are the attentive students? The hard-studying ones? The playful ones? And the athletic ones? These data were carefully collected, in an organized manner through codes, which contributed to identifying the subcategories and categories to analyze and interpret the data. The multiple triangulation technique was used

(Aguilar and Barroso 2015). In turn, they were organized in hermeneutic units through the Atlas.ti software, and the semantic networks were obtained.

Procedure

Once the subjects of study were identified, the data were gradually collected, prior agreement with the female teachers. Participation in the classroom was subtle in three moments without any participation during the learning sessions, since we wanted to identify the most natural, particular and specific actions around the behaviors of the children under observation. The role of the researcher was eminently as an observer during the teachers' explanation in the development of class activities worked with the children, in the construction of the groups of students for their specific tasks, in the behaviors among the members of their group and among the other members, in the mathematics learning actions, in the participation for the sentence requested by the teacher, before and after the end of her activity.

The observed behaviors were recorded in the field notebook only at the end of each session. The semi-structured interviews with the classroom teachers were made in 10 to 15 minutes. They were concerned about lack of attention and concentration, excessive hyperactivity, easy distraction, lack of social skills, and use of differentiated materials.

Finally, the fieldwork concluded with an interview with the child behavior specialist. These inputs were systematized and organized using the triangulation technique, and two categorical aspects with their respective components were detected: a) Children with special educational needs ADHD, with components: a.1) cognitive processes, a.2) Attention, a.3) Concentration, a.4) Learning, and a.5) Logical thinking. b) Mathematical skills and reasoning in children with ADHD, with components: b.1) Arithmetic operations, b.2) Problem-solving, b.3) Means and materials, b.4) Specific materials, and b.5) Worksheets with special designs.

Results

The processing of the data reported by the Atlas.ti_V_7.5.4 software program from the systematization of interviews with the female teachers and specialists, the data from the researcher's field notebook, and the theoretical approaches indicated in the introduction section of this study show the main nodes in the semantic networks according to the categories and the connections of the fragments defined by colors to then identify the guiding connections with respect to the results of the characteristics and needs, as well as the cognitive characteristics of the children with ADHD in mathematics learning.

Propósitos y Representaciones
Jan. - Apr. 2019, Vol. 7, N° 1: pp. 165 - 184
http://dx.doi.org/10.20511/pyr2019.v7n1.273

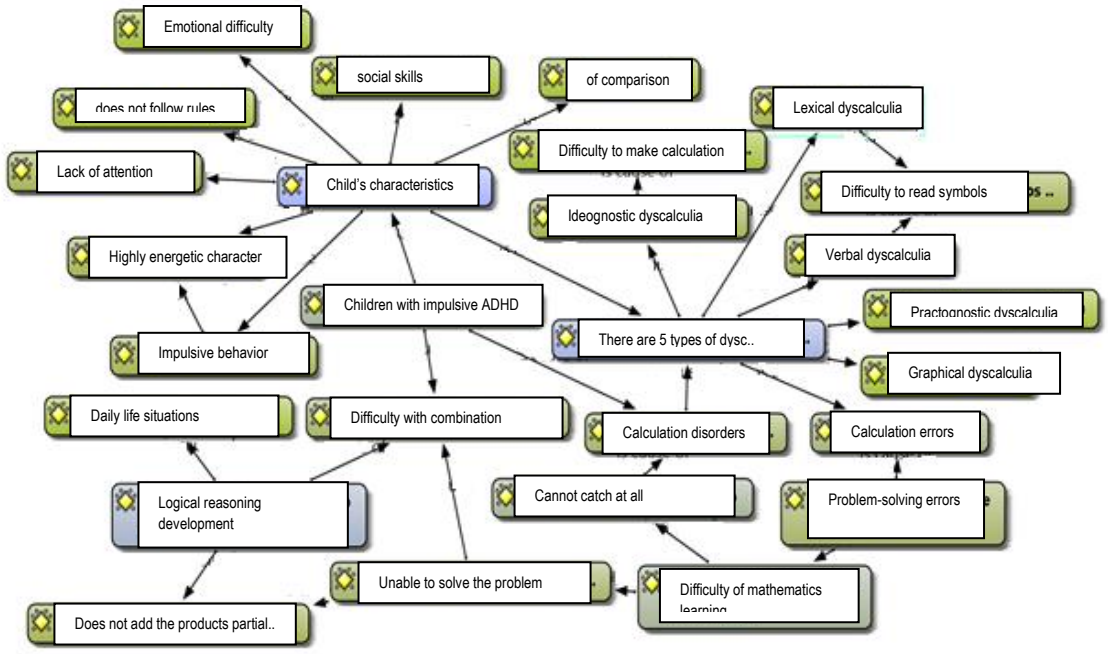

Figure 1. Characteristics and needs of children with ADHD in the mathematics learning process

The semantic network in figure 1 shows the node centralized in the characteristics of the child with ADHD, identified by the position of the female teachers associated by the researcher's observation. One of the characteristics that attracted attention, despite the fact that they lack social skills as they are not accepted into the group by their behavior (Fernandez 2011), is that during recess and free play children show solidarity, cooperation, participation, and even are able to share their lunch with whoever asks for it. This is contrary to what happens in the classroom as their classmates reject them because of their behaviors, such as yelling, moving from one place to another, simulating with sound and movements of their hands when remembering a game.

During the agreements given for teamwork by the female teacher, the children hold their attention an average of 5 to 7 seconds, and their first reaction is to look at their classmate next to them and draw attention to some object shown on the board. They missed the rules given by the teacher (Portela, Carbonell, Hechavarría, & Jacas, 2016), causing discomfort among the members of their group who always get easily distracted and show a highly energetic character. Although their classmates try to regulate their behavior, they continue to be unable to concentrate. With respect to mathematics learning, it was noted that they are good at comparative actions with specific materials. However, they have difficulty with the structures of change, when replacing an object by a dozen, positioning quantities, and forming other numerical structures. In the process of triangulation, lack of some arithmetic skills in elementary calculation operations was detected, such as those present in dyscalculia (Martínez, Calzadilla, & Cruz, 2017). This implies the impossibility of understanding the meaning of numbers and quantities, generating common errors in acquiring the basic skills of addition, subtraction, multiplication and division. The study shows us that the most common errors made by children in the basic operations of addition and subtraction are associated with ideognostic dyscalculia (García, Santana, Soria & Vila, 2016). They do not consider the number they carry for the next operation and forget the borrowed number (exchanged) of the figure of the subsequent minuend. Also, the presence of lexical dyscalculia (Martínez, Calzadilla, & Cruz, 2017) was detected. They showed difficulty or confusion to read and identify the symbols of mathematical operators in combined operations, affecting the level of understanding of verbal problems. By contrast, with respect to practognostic dyscalculia, not much variation was observed among their classmates. They even master the manipulation of objects in the comparison of size and shape, mentioning the characteristics among them. For the learning of children with ADHD, the manipulation of specific materials is recommended. The

most adequate strategies should be selected to hold their attention (Miranda, Alba, & Taverner, 2009).

Taking into account these arguments, ADHD-identified children have difficulties in learning mathematics, in the cases of literal mathematical problems, the fact that they do not catch or finish and to understand the statement of the problem due to distraction and inattention. They are unable to formulate, deal with and solve the problem. Therefore, in the problem-solving process, they cannot combine the data with the implicit statements of the problem. According to Bravo and Urquizo (2016), logical reasoning is the ability to use numbers effectively, analyze problems logically and investigate solutions. In that connection, children with ADHD has limitations in their logical reasoning, leading them to have problems to deal with logical situations of daily life as mathematics is part of people's cultural, natural and social world. Therefore, it is necessary to assume mathematical literacy transversally (MINEDU, 2015).

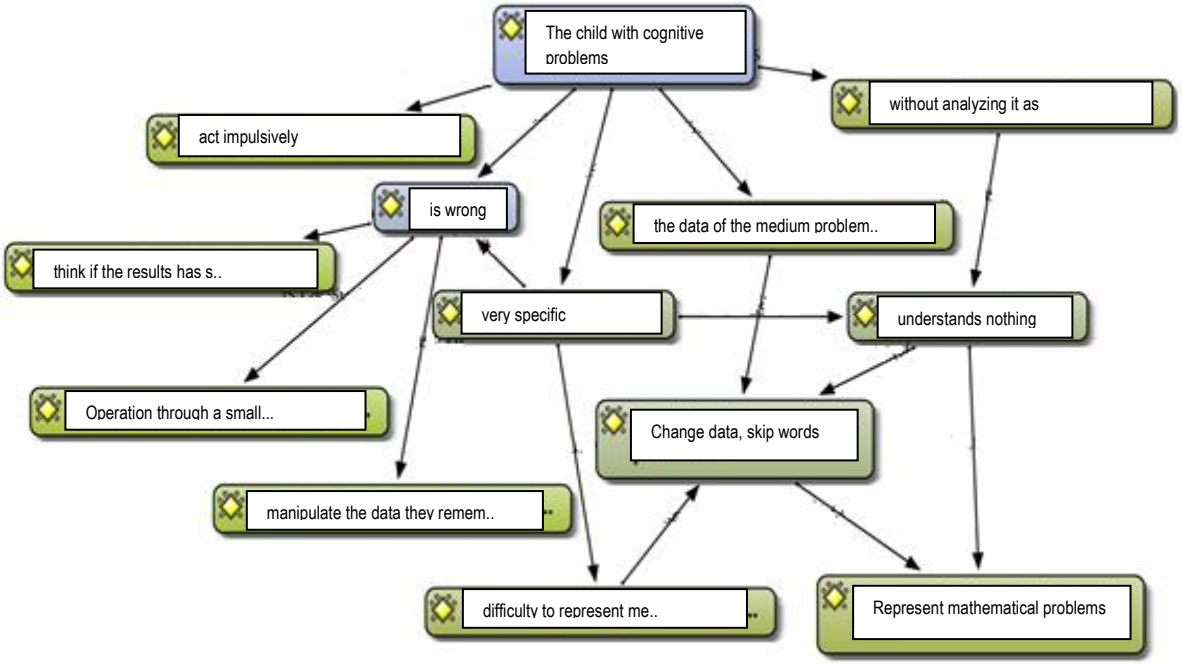

Figure 2. Cognitive characterization of children with ADHD in mathematics learning.

With respect to cognitive problems in children with ADHD, neurodevelopmental disorders are revealed, leading to attention deficit in the learning process (Alvarez and Pinel 2015). It was observed that children with attention disorder, when initiating an activity, they initiate other activities and leave aside their previous activity and thus another activity. They only complete an activity after being pushed or requested by the female teacher, or in any case they perform their operations incorrectly, since in the arithmetic operations they make mistakes in the addition, get the subtraction procedure wrong or combine both operations. According to Granados, Figueroa and Valásquez (2016), attention is one of the cognitive and behavioral processes of selectively focusing and concentrating on an object, which will determine the quality of answer. Under this position, children with ADHD lack attention in learning mathematics. Without having finished first the indicated sentence, they start, in an exploratory way, another activity impulsively. This action causes the child to make mistakes and present results quickly without having reflected first on his/her answer (sometimes, he/she gets it right). This is the case when they subtract from a smaller number to a larger one. Likewise, they are unable to organize the text of a problem. Therefore, they cannot identify an algorithm and solve it under certain sequences according to the operations of addition (carrying) and subtraction, exchanging, as well as problems of change and transposition of objects.

Propósitos y Representaciones
Jan. - Apr. 2019, Vol. 7, N° 1: pp. 165 - 184
http://dx.doi.org/10.20511/pyr2019.v7n1.273

Because of their characteristics, these children are very specific. They need learning materials that they can manipulate, or guided cards with colorful specific data to activate their attention through drawings, guides, procedure sequences to reach the end, such as magic squares and triangles, sudokus, displacement of figures, among others. Despite the fact that they read problem situations well, they seem to not understand what they read. When asked to systematize the implicit data of the problem, they constantly change for others or one sentence for another. They do not distinguish the type of arithmetic operation to be performed. After identifying the operator, they color it and recolor it with other colors, or remark it, trying to understand the problem. This is due to the inability to represent it mentally. But, as we read to them the same problem slowly and in a contextualized manner, they show promptness and ability to interpret the problem and solve it, and even they relate it with the real life, producing some references or events. In this regard, Ríos & López (2017) state that the disorder is a difficulty in the ability to read, write and perform arithmetic calculations, and that its varied and differentiated manifestation in children occurs mainly in the education sphere.

Discussion

The study shows the analysis of one of the components of the special educational needs in children with Attention Deficit and Hyperactivity Disorders – ADHD, which are present in 2 to 3 children on average per classroom. As shown by INEI (2014) and Fernandez, Arjona, Arjona, and Cisneros (2011), an average of 5 percent of children have this disorder that hinders learning due to lack of attention. According to Portela, Carbonell, Hechavarría and Jacas (2016), it is due to multiple factors such as hereditary, biological or pre- or post-partum period. A child develops in a normal way in the first years of life. As the child is given instructions, he/she shows a certain exhaustion in the case of tasks, arithmetic operations, tracing activities, cutting. At the same time, he/she does not hold his/her attention to an activity. As the instructions are given in a logical way, approximately between the age of 6 and 7, the cognitive actions of children with ADHD are reflected in a selective way as compared to their other classmates, such as they look around while the teacher is explaining, they do not finish copying what is on the board, their coloring is misaligned and incomplete. According to Zentall (2007), it is due to their deficient executive functions, affecting specific situations such as numbering.

According to Gratch (2009), these children get confused when performing the operations of addition and subtraction because they cannot identify the type of arithmetic operation, thus affecting their other educational levels and consequently their academic development. Faced with this latent, observable need, from teachers to entities such as the World Health Organization (WHO), Ministries and Organizations, priority should be given to investment and the provision of specialized professional service to children with these types of disorders and other disorders that may be the problems that cause poor academic performance.

We corroborate the study of Moriña and Almudena (2017) indicating that teachers are not sufficiently trained and prepared to deal with these needs. As for the learning of the subject areas, specifically mathematics, children with these characteristics need great support to achieve skills and competencies. Because of their peculiarity, these children easily lose concentration because they always get distracted and confused or easily forget when performing operations or instructions. In this regard, Gratch (2009) states that it is a matter of concern to see how children with this disorder show difficulties in numbering and calculation. It was observed in-situ because these children usually ask their classmates for help, but it is difficult for them to understand their classmates' explanation during the group work and the teacher's explanation. They are unable to integrate the statements or mathematical situations, or identify the data and the type of operations to be performed. Faced with this situation, it is necessary to provide professional assistance and designed materials, such as workbooks, educational videos, among others, which we corroborated with the findings of Ríos and López (2017), children with disorders have difficulty in their ability to read, write and perform arithmetic calculations. It is also necessary to implement the psychopedagogical area to address multiple learning needs and behaviors in each Educational

Institution as other countries do.

References

Aguilar, S., & Barroso, J. (2015). La triangulación de datos como estrategia en investigación educativa. *Pixel-Bit. Revista de Medios y Educación, 17*(47), 73-88. Doi: https://doi.org/10.12795/pixelbit.2015.i47.05

Alvárez, S., & Pinel, A. (2015). Transtorno por déficit de atención con hiperactividad en mi aula de infancia. *Reop. Revista Española de Orientación y Psicopedagogía, 26*(3), 141-152 Doi: https://doi.org/10.5944/reop.vol.26.num.3.2015.16406

Aragón, L., Natalia, J., Marcia, E., & Juan, V. (2016). Acercar la ciencia a la etapa de infantil: experiencias educativas en torno a talleres desde el Grado de Maestro en Educación infantil. *Revista Iberoamericana de Educación, 72,* 105-128. Recuperado de: http://hdl.handle.net/10498/20057

Barkley, R. (1997). *ADHD and the nature of self-control.* New York: Guilford Press.

Bravo, P., & Urquizo, M. (2016). Razonamiento lógico abstracto e inteligencia emocional: trayectorias en la formación de estudiantes universitarios. *Sophia, Colección de Filosofía de la Educación, 21*, 179-208. Doi: https://doi.org/10.17163/soph.n21.2016.08

Calzada, A. (2014). *Guía de Evaluación de la competencia básica en razonamiento matemático*. Sevilla: Junta de Andalucía

Chevallard, Y., Bosch, M., & Gascón, J. (1997). *Yves Chevallard et al. Estudiar matemáticas. El eslabón perdido entre enseñanza y aprendizaje. Cuadernos de educación. Para profesores, padres y alumnos* (vol. 22). España: Horsori.

Defaz, G. (2017). El desarrollo de habilidades cognitivas mediante la resolución de problemas matemáticos. *Journal of Science and Research, 2*(5), 14-17. Doi: https://doi.org/10.26910/issn.2528-8083vol2iss5.2017pp14-17

Fernádez, C. (2011). *Determinación de las necesidades educativas especiales*. Mexico D.F: Trillas.

Fernández, A., & Sarramona, J. (1985). *La educación Constantes y problémicas actuales* (12 ed.). Barcelona: CEAC.

Fernández, A., Arjona, P., Arjona, T., & Cisneros, A. (2011). *Determinación de las Necesidades Educativas Especiales.* Mexico: Trillas.

García, N., Santana, A., Soria, B. H., & Vila, M. (2016). Neuropsicología y bases neuronales de la discalculia. Tercer Congreso virtual de Ciencias Morfológicas. Cuba. Recuperado de: http://www.morfovirtual2016.sld.cu/index.php/Morfovirtual/2016/paper/viewFile/110/147

Granados, D., Figueroa, S., & Valásquez, A. (2016). Dificultad de atención y competencias de investigación en estudiantes universitarios de psicología. *CNEIP. Enseñanza e investigación en psicología, 21*(2), 11. Recuperado de: http://www.redalyc.org/articulo.oa?id=29248181003

Gratch, L. (2009). *El trastorno por déficit de atención (ADD_ADHT). Clínica, diagnóstico y tratamiento en la infancia, la adolescencia, y la adultez.* Buenos Aires: Médica Panamericana.

Hernández, R., Fernández, C., & Baptista, M. (2014). *Metodología de la Investigación* (6 ed.). México: McgrawHill.

INEI. (2014). *Primera encuesta nacional especializada sobre discapacidad 2012.* Lima: INEI

Izcara, S. (2014). *Manual de Investigación Cualitativa* (1 ed.). Mexico: Fontamara.

Martínez, M., Calzadilla, O., & Cruz, M. (2017). La discalculia: Un reto para la enseñanza de la matemática. En Memorias Compumat 2017, 127. La Habana: Cujae.

Ministerio de Educación. (2015). Alfabetización en Matemáticas y Ciencia. En E. P. Resultados. Perú. Recuperado de: http://repositorio.minedu.gob.pe/bitstream/handle/123456789/44/024.%20Una%20aproximaci%C3%B3n%20a%20la%20alfabetizaci%C3%B3n%20matem%C3%A1tica%20y%20cient%C3%ADfica%20de%20los%20estudiantes%20peruanos%20de%2015%20a%C3%B1os%20Resultados%20del%20Per%C3%BA%20en%20la%20evaluaci%C3%

B3n%20internacional%20PISA.pdf?sequence=1

Ministerio de Educación. (2018). Educación Inclusiva. Perú. Recuperado de: http://www.minedu.gob.pe/educacioninclusiva/

Ministerio de Educación. (2016). Bases Curriculares. Matemática Funcional para Estudiantes que presentan Necesidades Educativas Especiales. Chile: Reforma Educacional. Recuperado de: http://especial.mineduc.cl/wp-content/uploads/sites/31/2016/10/Manual_Docente_-Matematica-2016-1.pdf

Miranda, A., Alba, M., & Taverner, M. (2009). Habilidades matemáticas y funcionamiento ejecutivo de niños con trastorno por déficit de atención con hiperactividad y dificultades del aprendizaje de las matemáticas. *Psicothema*, *21*(1), 63-69. Recuperado de: http://www.psicothema.es/pdf/3596.pdf

Moriña, A., & Almudena, C. (2017). Educación Inclusiva y Enseñanza Superior desde la mirada de estudiantes con Diversidad Funcional. RIDU Revista Digital de Investigación en Docencia Universitaria, 11(1), 20-37. Doi: http://dx.doi.org/10.19083/ridu.11.528

Portela, A., Carbonell, M., Hechavarría, M., & Jacas, C. (2016). Trastorno por déficit de atención e hiperactividad: algunas consideraciones sobre su etiopatogenia y tratamiento. Revista Médica de Santiago de Cuba, 20(4). Recuperado de: http://www.medisan.sld.cu/index.php/san/article/view/813

Portillo, M. (2017). Educación por habilidades: Perspectivas y retos para el sistema educativo. *Educación, 41*(2). Doi: http://dx.doi.org/10.15517/revedu.v41i2.21719

Rigby, M., & Sanchis, E. (2006). The concept of skills and its social construction. *European Journal of Vocational Training*, *37*(1), 22-33. Recuperado de: http://aei.pitt.edu/44901/1/37-2006.pdf#page=24

Ríos J. A., & López C. R. (2017). Neurobiología de los trastornos del aprendizaje y sus implicaciones en el desarrollo infantil: propuesta de una nueva perspectiva conceptual. *Psicoespacios, 11*(19), 174-192. Doi: https://doi.org/10.25057/21452776.942

UNESCO. (2004). *Grupo Inter-Agencias sobre habilidades para la vida en EFA*. Paris: UNESCO

Warnock, M. (1987*). Special Educational Needs. Report of the Committee of Enquiry into the Education ofHandicapped Children and Young People*. London: HMSO.

WHO. (1997). *Conclusions from a United Nations Inter-Agency Meeting*. Geneva: World Health Organization

Zentall, S. S. (2007). Math performance of students with ADHD: Cognitive and behavioral contributors and interventions. In D. B. Berch & M. M. M. Mazzocco (Eds.), Why is math so hard for some children? The nature and origins of mathematical learning difficulties and disabilities (pp. 219-243). Baltimore, MD, US: Paul H Brookes Publishing.