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LEARNING DIFFICULTY IN MATHEMATICS: A CASE STUDY IN A FEDERAL TECHNOLOGICAL EDUCATION INSTITUTION

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Abstract: Much is discussed about learning difficulties and disorders, but only recently have studies focused on the dysfunctions of numerosity. Dealing with Mathematics learning difficulties is a complex topic, with research still at an early stage, even more so in the context of vocational and technological education (EPT). Therefore, dealing with this topic is essential to better understand this phenomenon and, thus, provide better learning conditions for students. This study aimed to psychopedagogically evaluate, through the case study methodology, the learning conditions of an integrated technical high school student with specific learning difficulties in Mathematics, in a federal educational institution. The student was referred to a psychopedagogical support teaching project. The evaluation was carried out in ten individual sessions, once a week, lasting one hour, in the opposite shift of regular classes. Anamnesis and analysis of school history in relation to Mathematics were carried out. Also, seven assessment instruments were applied, related to cognitive skills for learning Mathematics, mathematical anxiety and dyscalculia. As a result, a picture very close to mathematical anxiety was found, as well as obstacles to mathematical reasoning due to accentuated difficulties in cognitive functions related to mathematical learning, which are reflected in obstacles in the application of mathematical procedures, leading the student to serious difficulties. to solve, in particular, mathematical problems. In view of the results, we can see the importance of psychopedagogical support, in favor of a truly inclusive education.

Keywords: Mathematics learning difficulty. Mathematical anxiety. Professional and technological education. Inclusive education.

INTRODUCTION

It is already common sense that most Brazilian students will have some difficulty in learning some mathematical content. Santos (2017) states that school communities, in general, have insisted on the understanding that learning Mathematics is really difficult, trivializing the issue.

In Brazil, performance in Mathematics has been evaluated since the 1990s, using the Basic Education Assessment System (SAEB), coordinated by the National Institute for Educational Studies and Research Anísio Teixeira (INEP/MEC). Since 2005, the SAEB has been replaced by Prova Brasil, which seeks to monitor education based on a sample of students from the 5th and 9th grades of Elementary School and also from the 3rd grade of high school. The data collected from this instrument generate the IDEB or Basic Education Development Index. The Brazilian performance in Mathematics is low and, according to Araújo (2005), this low performance also appears in international assessments, such as, for example, in the International Student Assessment Program (PISA) test.

Regarding the incidence of specific learning difficulties, Siqueira and Gurgel-Giannetti (2011) point out that the latest epidemiological research shows that in a class of thirty students, there will generally be three subjects who need professional support. That is, in a school with three hundred students, between fifteen and thirty students will face problems in learning. Its incidence, then, is around 15%, data that are valid for the Brazilian educational reality. The incidence of specific learning disorders in Mathematics, on the other hand, has a prevalence that varies from 3% to 6% in most epidemiological studies worldwide (DEVINE *et al.*, 2013). Bastos *et al.* (2016), investigating a sample of Brazilian children, found a prevalence of 7.8%.

In this study, we are dealing with the case study of an integrated technical high school student, with specific learning difficulties in Mathematics, in a teaching institution of the federal education network. Thus, this study aimed to evaluate the learning conditions of this student with specific learning difficulties in Mathematics. The student evaluation and monitoring procedures took place in a teaching project, whose scope of action is to provide psychopedagogical support to students with specific learning difficulties.

The student was referred by the student support sector of the educational institution. The reason for the referral was his problems to learn Mathematics, including pressing issues of school performance, given that the student has failed Mathematics more than once throughout his school life. In conversation with the Mathematics teacher who was carrying out activities to recover content from the previous school year, great difficulties were reported by the student, including in basic exercises, demonstrating difficulties in logical-mathematical reasoning.

From the initial referral and the conversations held with the student support sector, as well as with the Mathematics teacher, it was understood that the student met the criteria to be directed to the teaching project and the student's referral was accepted.

UNDERSTANDING CONCEPTS AND CONTEXT

According to Rotta *et al.* (2006, p. 117), a learning difficulty can be defined as “a heterogeneous group of problems capable of altering the child's possibilities to learn”, regardless of the neurological situation. According to the authors, the difficulty may be associated with other diagnosable conditions, such as intellectual disability, chronic diseases, mathematical anxiety, etc. Also Seabra *et al.* (2014) state that learning

difficulties are the biggest cause of low school performance, which may have physical causes, such as vision problems, psychological causes, such as lack of interest or attention deficit, or environmental causes, such as failures in the pedagogical strategy.

This understanding is quite different from the concept of learning disorder, where neuropsychological issues seem to be involved in a more forceful way. Learning disorders are due to changes in the Central Nervous System (ROTTA *et al.*, 2006). According to Seabra *et al.* (2014, p. 189) “are genetically inheritable, must cause damage and are persistent throughout life”. Rotta *et al.* (2006, p. 127) also state that the suspicion of a specific learning disorder can be raised in that individual who presents “significantly lower than expected results for their level of development, education and intellectual capacity”. Such disorders are known and recognized in international disease codes, such as ICD-11 and DSM-V, and are usually classified as dyslexia (reading disorders), dyscalculia (mathematical disorders) and dysorthography (writing disorder), according to the American Psychiatric Association (2013).

Specifically in relation to low performance in Mathematics, according to Santos (2017), we have learning difficulties in mathematics or secondary dyscalculia, primary dyscalculia and its subtypes: acalculia, oligocalculia, paracalculia, and mathematical anxiety. The question lies in understanding which of these terms are associated with exogenous factors, such as teaching problems, for example, and which are associated with endogenous factors, constituting the dysfunctions inherent to numerosity.

Acting in favor of inclusive education implies providing access and successful permanence to all students, regardless of their characteristics. In the federal network of EPT, however, there is no regulation of

psychopedagogical care. In general, the Federal Institutes have centers called NAPNE (Nucleus for Assistance to People with Specific Educational Needs), responsible for supporting the educational needs of students, favoring their access to knowledge and developing their own skills and abilities. The teaching project presented in this study was developed within a NAPNE.

METHODOLOGY

This study is characterized by the development of a specialized psychopedagogical assessment, aimed at a student with specific difficulties in learning Mathematics, based on the demands and needs experienced by the referred student in the Integrated Technical High School of an institution of the federal public network. The student, male, 18 years old, was in the third year of high school, when the study was carried out, and had failed Mathematics in the previous year. He was studying the mathematics of his school year and the dependence on the contents of the previous year.

The actions were planned and developed together with an educational project that is developed in the educational institution, by a coordinating professor who is specialist in psychopedagogy and special education and by a pedagogue, to assist students of the institution who are presenting specific learning difficulties. The objective of the project is to offer psycho-pedagogical support to these students, seeking, through initial assessment, to develop activities that are carried out individually, offering a space where students can also reflect on their learning and on their difficulties.

The methodology adopted is the case study, enabling the individual and in-depth understanding of the learning framework of each student who is served by the

mentioned teaching project. **Ocase study** is a qualitative method that consists of a way of deepening the analysis of an individual unit (PONTES, 1994). According to Yin (2001), the case study is a research strategy that includes an in-depth analysis of a specific situation, in its context.

This methodological approach is suitable when we seek to understand and describe complex contexts, in which several factors are involved. Yin (2001) states that this approach adapts to research in education, when the researcher is confronted with complex teaching-learning situations. In the specific case of this study, it served as a methodological horizon, for the understanding of demands, planning and execution of specialized actions aimed at the student, in their learning specificities.

The steps of the case study, from the student's referral to the project, were the following: Conversation and 'initial service contract'; Anamnesis and analysis of school history; Application of specific assessment tools (Table 1); Analysis of results found; Presentation of results to the student; Organization of possible institutional referrals; Planning and carrying out individual consultations.

PRESENTATION AND DISCUSSION OF RESULTS

From the initial anamnesis and the analysis of the student's school history in Elementary School, the presence of difficulties in learning Mathematics from the beginning of schooling became clear, counting, including, with a failure during Elementary School and another already in High School.. What was observed was a minimum performance for approval, throughout schooling, initially compatible with a situation of learning difficulty in Mathematics, since despite the performance difficulties, the student did not present a deficit compatible with that expected for dyscalculia.

primary.

From the initial anamnesis and the analysis of the student's school history in Elementary School, other instruments were used, with the objective of evaluating more specifically the supposed learning difficulty, its characteristics and level of difficulty. Below, in Chart 1, the instruments used are summarized, with their main results.

Instruments	Results
Test Educa Mais de Dyscalculia – Online (EDUCAMAIS, 2018)	44% presence of dyscalculia indicators
School Achievement Test, Arithmetic Subtest (STEIN, 1994)	Excellent Performance (activities without solving math problems)
Activities for the identification and recognition of characteristic features of Dyscalculia (VILLAR, 2017)	Identification of difficulties in interpreting statements and with attentional skills. Too many activities with good performance.
Neuropsychopedagogical Protocol for Cognitive Assessment of Mathematical Skills (FONSECA, 2013)	Low to reasonable result, with an average of 5 out of 10 – compatible with the historical average of student performance. Difficulties in cognitive functions related to learning mathematics – attention and memorization.
Questionnaire of Attitudes towards Mathematics – adapted (SILVA, 2012)	Low interest and perceived competence in Mathematics; high anxiety, and negative feelings about mathematics.
Mathematical Problem Solving (prepared by the author)	02 hits out of 10
Mathematical Anxiety Scale (CARMO, 2011)	Moderate to High Anxiety

Table 1 – Evaluative instruments used and their specific results.

Source: Research data.

From the analysis of the results obtained in each of the evaluation instruments used, it was possible to reach the understanding that the student has difficulty with the mathematical content, especially when it involves the interpretation of statements and

the resolution of mathematical problems. During the consultations, he showed moderate anxiety in relation to Mathematics, until he was exposed to a real situation of content evaluation, at which time his score on the Mathematical Anxiety Scale increased considerably, compatible with high anxiety, demonstrating a picture of Mathematical Anxiety. Mathematical anxiety refers to a negative emotional reaction to Mathematics, which can impair performance in situations that require the use of cognitive skills related to mathematical learning (SANTOS, 2017).

Still, evaluating the beginning of the difficulty reported by the student, it was observed that it had an early onset, as demonstrated by his Certificate of Completion of Elementary School. It is observed that mathematics has always been among the subjects with the lowest student performance, for which the minimum performance to be approved was always obtained, as shown by studies on secondary dyscalculia that demonstrate that such students are not affected in all systems. of numerical cognition, having a capacity close to the group with typical performance, except for more complex contents (SANTOS, 2017). The student reported adverse situations during schooling, which generated extreme anxiety and nervousness, which could be configured as traumatic situations in relation to learning Mathematics. It has even been failed in two circumstances in this curricular component. The first time in Elementary School (5th grade) and the second time in High School (2nd year).

This situation, associated with basic difficulties in cognitive functions (emotion, sensation, perception, attention, memory and cognitive flexibility) involved in learning Mathematics may explain the great difficulty in solving mathematical problems, suggesting a condition of great learning difficulty. mathematics, accentuated by the presence

of mathematical anxiety, which activates the circuit of negative emotions from brain dysfunctions in the connectivity of the amygdaloid complex and its projections to the parietal cortex, according to Santos (2017).

From the end of the evaluation stage, which suggests a condition of secondary dyscalculia, some institutional referrals were taken, among them:

- The presentation of the evaluation results for the student and his family, with the subsequent dialogue about the next actions with the teaching project.
- The presentation of the results and referral of the need for curricular adaptations in the curricular component of Mathematics, together with the teachers of the regular classroom.
- The planning of psycho-pedagogical support service for the student, after regular classes, together with the teaching project.

FINAL CONSIDERATIONS

This study sought to broaden the debate about the specific difficulties of learning Mathematics in the school reality, based on a real case. In search of the constitutional principle of everyone's right to education, we consider that including does not only mean guaranteeing admission, but also, and mainly, guaranteeing the permanence of these students, through the realization of real learning.

In relation to the specific case studied, it was concluded, after a specialized evaluation, that the student's condition is responsible for a secondary dyscalculia or a specific learning difficulty in mathematics, since the student had preserved the primary knowledge of mathematics, having real and serious in matters involving especially mathematical problems. The hypothesis was that such

difficulty was due to teaching problems, especially from the 4th year of elementary school. Attention was drawn to the fact that the student had never been evaluated before, throughout his school life, for issues related to learning difficulties, having lived, year after year, with his difficulty, without specialized help. The result of this situation, perhaps, is the verified presence of mathematical anxiety, which can intensify the difficulty presented by the student.

After all the effort to understand this case, there is the certainty of the need to deepen the studies on this theme, still unknown in the EPT. If we want to overcome the sad statistics and the ills arising from the suffering that a process of non-learning at school implies, we need to be aware of the consequences of this process. Moysés (2014, p. 29) defines well what we mean when he asks: "How does the child who is said not to learn at school react?" The author herself answers her question: these students embody disability!

REFERENCES

- AMERICAN PSYCHIATRIC ASSOCIATION. **Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V)**. Arlington, VA: American Psychiatric Association, 2013.
- ARAÚJO, I. C. **A disciplina de Matemática e o fracasso escolar na 5ª série do ensino fundamental de uma escola da rede municipal de ensino de Campo Grande/MS**. Dissertação (Mestrado em Educação) – Programa de Pós-Graduação em Educação, Universidade Federal de Mato Grosso do Sul, Campo Grande, 2005.
- BASTOS, J. A.; CECATO, A. M. T.; MARTINS, M. R. I.; GRECCA, K. R. R.; PIERINI, R. The prevalence of developmental dyscalculia in Brazilian public school system. **Arquivos de Neuropsiquiatria**, v. 74, n. 3, 2016.
- CARMO, J. S. Ansiedade à matemática: identificação, descrição operacional e estratégias de reversão. In: CAPOVILLA, F. (Org.). **Transtornos de aprendizagem: progressos em avaliação e intervenção preventiva e remediativa**. São Paulo: Memnon, 2011.
- DEVINE, A.; SOLTÉSZ, F.; NOBES, A.; GOSWAMI, U.; SZUCS, D. Genderdiferences in developmentaldyscalculiadepend on diagnosticcriteria. **Learning and Instruction**, v. 27, p. 31-39, 2013.
- EDUCAMAIS. **Teste de Discalculia Online**. Disponível em: <<http://educamais.com/teste-discalculia/>>. Acesso em: 20 maio 2018.
- FONSECA, L. **Protocolo Neuropsicopedagógico de Avaliação Cognitiva das Habilidades Matemáticas**. Rio de Janeiro: Wak Editora, 2013.
- MOYSÉS, M. A. A. **A InstitucionalizaçãoInvisível: crianças que não-aprendem-na-escola**. 2. ed., Campinas: Mercado das Letras, 2014.
- PONTES, J. P. O estudo de caso nainvestigação em educação matemática. **Quadrante**, v. 3, n. 1, 1994.
- ROTTA, N. T.; OHLWEILER, L.; RIESGO, R. S. **Transtornos da Aprendizagem**. Abordagem Neurobiológica e Multidisciplinar. Porto Alegre: Artmed, 2006.
- SANTOS, F. H. **Discalculia do Desenvolvimento**. São Paulo: Pearson Clinical Brasil, 2017.
- SEABRA, A. G.; DIAS, N. M.; ESTANISLAU, G. M.; TREVISAN, B. T. Transtornos de Aprendizagem. In: ESTANISLAU, G. M.; BRESSAN, R. A. (Orgs.). **Saúde Mental na Escola**. O que os educadores devem saber. Porto Alegre: Artmed, 2014.
- SILVA, S. Questionário de AtitudesFace à Matemática (QAFM). Desenvolvimento, construção e estudo psicométrico comcrianças e jovens do 2º e 3º ciclos do ensino básico português. In: CANDEIAS, A. **Assessment of socio-emotional and academiccompetences: Development and validationstudieswithchildren and youthfrom Portuguese Elementary Education**. Simpósioconduzido no I Congresso Internacional Envolvimento dos Alunos na Escola: Perspectivas da Psicologia e Educação. Instituto de Educação da Universidade de Lisboa, Lisboa. 2012.
- SIQUEIRA, C. M.; GURGEL-GIANNETTI, J. Mau desempenho escolar: umavisãoatual. **Revista da Associação Médica Brasileira**, São Paulo, v. 57, n. 1, 2011.
- STEIN, L. M. **TDE - Teste de Desempenho Escolar: manual para aplicação e interpretação**. São Paulo, SP: Casa do Psicólogo, 1994.
- VILLAR, J. M. G. **Discalculia na sala de aula de Matemática: umestudo de caso comdoisestudantes**. Dissertação (Mestrado Profissional em Educação Matemática) – Universidade Federal de Juiz de Fora, Juiz de Fora, 2017.
- YIN, R. K. **Estudo de caso: planejamento e métodos**. Trad. GRASSI, D., 2. ed. Porto Alegre: Bookman, 2001.