

GIFTEDNESS INDICATIVES AT OBMEP MEDALIST STUDENTS

INDICATIVOS DE DOTAÇÃO EM ESTUDANTES MEDALHISTAS DA OBMEP

INDICATIVOS DE DOTACIÓN EN ESTUDIANTES MEDALLISTAS DE LA OBMEP

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ABSTRACT: This study investigated indications of giftedness in medalist students of the Brazilian Mathematics Olympiad of Public Schools (OBMEP). The research was configured as a Case Study. Two OBMEP medalist students and four teachers participated. A giftedness instrument was applied to two teachers from each medalist student. It was noticed that the students presented indications of Giftedness, and in the comparison of the ten (10) cases, common indications were found, which resemble the characteristics of Giftedness and Talent in mathematics; described in the specialized literature. Considering the scope of the OBMEP, in Brazil, the number of award winners and the underreporting of the enrollments of gifted students in the school census, the results suggest to consider the medalists in processes of identification of Giftedness in the school system.

KEYWORDS: Special education. Giftedness. Medalists. OBMEP.

RESUMO: Este estudo investigou indicativos de dotação em estudantes medalhistas da Olimpíada Brasileira de Matemática das Escolas Públicas (OBMEP). A pesquisa configurou-se como Estudo de Caso. Participaram dois estudantes medalhistas da OBMEP e quatro professores. Foi aplicado um instrumento de sinalização de Dotação em dois professores de cada estudante medalhista. Percebeu-se, que eles apresentaram indicativos de Dotação, e, na comparação dos casos, foram encontrados dez (10) indicativos em comum, que se assemelham às características de Dotação e Talento na matemática; descritas na literatura especializada. Considerando a abrangência da OBMEP, no Brasil, o número de premiados e a subnotificação das matrículas de estudantes com Dotação e Talento no censo escolar, sugere-se, considerar os medalhistas em processos de identificação de Dotação e Talento no sistema escolar.

PALAVRAS-CHAVE: Educação especial. Dotação. Medalhistas. OBMEP.

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RESUMEN: Este estudio investigó las indicaciones de Dotación en estudiantes medallistas de la Olimpiada Brasileña de Matemáticas de las Escuelas Públicas (OBMEP). La investigación se configuró como Estudio de Caso. Participaron dos estudiantes medallistas de la OBMEP y cuatro maestros. Se aplicó un instrumento de señalización de dotación a dos maestros de cada estudiante medallista. Se observó que los estudiantes presentaron indicaciones de dotación y en la comparación de los casos se encontraron diez (10) indicaciones en común, que son similares a las características de Dotación y Talento en matemáticas; descritas en la literatura especializada. Considerando el alcance del OBMEP en Brasil, el número de ganadores y el subregistro en la inscripción de estudiantes con Dotación y Talento en el censo escolar se sugiere considerar a los medallistas en procesos de identificación de Dotación y Talento en el sistema escolar.

PALABRAS CLAVE: Educación especial. Dotación. Medallistas. OBMEP.

Introduction

In Brazil, Special Education is understood as a teaching modality corresponding to the care of students with disabilities, global development disorders and high skills or endowment. The Law of Guidelines and Bases of National Education (LDBEN) 9,394 in article 4 points out that education systems should offer specialized educational care to this student (BRASIL, 1996).

Due to a historical process of exclusion, public policies were designed so that students with disabilities and global development disorders were included in the common education system, however, those with Endowment³ and Talent did not receive the same attention. Pérez (2021) analyzed national documents on Special Education and suggested that in them students with Endowment and Talent are forgotten or receive less attention than those with disabilities. The author argues that there is general ignorance about the theme, lack strain for the identification and care of this student, and myths are perpetuated that hinder the advancement of the theme.

The study by Diez and Fernández (2020) shows a similar picture in Spain. The researchers noted the invisibility in school documents about attention to the diversity of students with Endowment and Talent. They observed that there were few explicit or implicit references, in addition, they suggested that the educational proposals presented in the school documents seemed more advanced in relation to meeting the needs of students with learning difficulties when compared to those that would meet the needs of the Gifted and Talented.

This negligence is also perceived in the study by Singer, Sheffield and Leikin (2017).

³ We opted for the use of the terms Endowment and Talent to maintain the consonance with the theoretical framework adopted. At LDBEN, the terms used are High Skills or Gifted.

When investigating creativity and endowment in mathematics, the authors observed that the efforts of schools were concentrated on those who presented difficulties in mathematics while students with Endowment and Talent were limited by the myth that they would develop on their own.

Students with Brazilian Endowment and Talent have their rights guaranteed in the main laws, policies and educational plans in force (BRASIL, 1996, 2011, 2015a), but the implementation of actions occurs slowly, despite the identification processes evolving into a multidimensional vision (ARAÚJO, 2019).

The fragility of more effective actions in favor of this student, as well as the persistent lack of knowledge and lack of training of education professionals to identify and assist students with Endowment and Talent and by persistent myths that this public does not need any support or walk by themselves (ALENCAR; FLEITH, 2001; PERREZ; FREITAS, 2016) generate a framework for underreporting of registrations throughout the country.

According to data from the Basic Education Statistical Synopsis of 2020, there were 24,424 students registered with Endowment and Talent in the Census, which corresponded to 0.05% of the total basic education students (INEP, 2021). This percentage is considered low if the incidence of the 10% phenomenon within an age group is considered (GAGNÉ, 2015).

The need to identify students with Endowment and Talent in the country lies in the fact that they have the right to specialized educational care (BRASIL, 2011). These students go through a different process of exclusion, because most of them are already in the common school without, however, receiving support for their educational needs. Law 13,234 deals with the identification, registration and care of this student, as also points out, the need to establish guidelines and procedures for such actions to take place (BRASIL, 2015b) and, to this end, the urgency in teacher training and qualification (URQUIZA) is understood; MARTINS, 2021).

The research conducted by Carneiro (2015) mapped educational care programs for students with Endowment and Talent in Brazil, and investigated the evaluation that managers and teachers make of the programs. Of the 50 programs participating in the research, 42 of them were administered by the public initiative and eight by the private initiative. In addition, 5,597 students attended, 42% of the enrollments with Endowment and Talent in the country, in 2014. These data show that many identified students did not receive the specialized educational care provided to them by the laws.

Having put these considerations, it is important to understand who are the students with Endowment *and Talent within the Differential Model of Gifts and Talents* (DMGT), in Portuguese Differentiated Model of Endowment and Talent (2015), the characteristics of those

with higher potential in mathematics and, finally, the Brazilian Olympiad of Mathematics of Public Schools (OBMEP).

Theoretical model, characteristics of people with Endowment and Talent in mathematics and OBMEP

People with Endowment, according to the DMGT, are those who demonstrate above average potential in some domain of human natural capacity, being among the 10% most capable when compared to age pairs. For the author, the domains of capacity are divided between mental (intellectual, creative, social and perceptual domains) and physical domains (muscle capacity and motor control). People with Talent are those with performance or achievement in some field of activity that fits them among the 10% better when compared to people who have similar time of dedication in the same area. Talent takes place from the systematic development of an Endowment (GAGNÉ, 2015).

Angoff (1988) addresses the difference between potential and achievement and thus elucidates the differences between Endowment and Talent. For the author, potential is not what the person presents, but a prediction of future performance, while achievement is what someone does at the moment, they invest their capacity. In this direction, it is appropriate to say that a person with Endowment has a superior potential in an area of broad human capacity and can, through a process of capacity development in a well-defined area, have its potential become superior performance, that is, Talent.

An important point of DMGT is that the Endowment and the Developmental Process, the path through which one can reach talent, are influenced by catalysts. Gagné states that catalysts are the forces that boost certain situations and facts and generate important consequences for the development process of Endowment and Talent. They are called Intrapersonal Catalysts divided between physical and mental traits and objective management with regard to motivation and volition and environmental catalysts, divided between medium, individuals and resources (GAGNÉ, 2015).

The literature of the area of Endowment and Talent in mathematics points out common characteristics of people with these abilities. We opted for the work of Singer *et al.* (2016) dealing with the distinct characteristics related to the mathematical capacity and personality of these people.

In the specific capacities for the mathematical area were related: mathematical sensitivity, exceptional memory, concentration for long periods, preference for abstraction,

pleasure in mathematics, identification of patterns and relationships, problem solving in an unusual way, mastery and rapid structuring of content, generalization and reversal of mathematical processes. In the general personality traits, the authors point to: interest, dedication, taste for solving problems, consistency and tolerance in the face of frustration, participation in self-directed activities and willingness to defiant tasks (SINGER *et al.*, 2016).

In addition to the attention to characteristics, it is necessary to take a close look at the myths especially related to the area of Endowment and Talent in mathematics, because they can be a problem in the identification of above average capacity in students. In Sheffield's (2017) work on myths in mathematical endowment, the author reinforces that several of them, propagated in the social imaginary, are already scientifically discarded.

The myths discussed by it are: the capabilities are genetically determined, that is, they are fixed; people with mathematical endowment are white or Asian men; mathematics is not creative and requires only learning some facts and algorithms; the student can develop on his own; acceleration is the solution for the most capable students to develop to the highest levels. For the author, these myths limit the development of the capacities of people with endowment in the mathematical area and such a situation is unfavorable, considering the need for scientific and technological progress to face the current challenges in the world.

On the approach of OBMEP, it is important to mention some aspects of the test, starting with problem solving, which is the way in which students are evaluated in the 1st and 2nd phases of the Olympics.

Troubleshooting, according to Singer *et al.* (2016), is the search for a problem solution, in which the mathematical means to be used to reach the result are delimited, being a method used to identify and develop mathematical skills.

OBMEP is an annual school competition for students of the final grades of elementary and high school and aims to encourage the study of the area and the discovery of Talents, is organized by the Institute of Pure and Applied Mathematics (IMPA) with the support of the Brazilian Mathematical Society (SBM), and funded by the Ministries of Education and Science, Technology, Innovations and Communications.

In the first phase of OBMEP all enrolled students participate in an objective problem-solving test with 20 questions and the best ranked students move on to the second phase with descriptively answered mathematical problem solving. In 2019, 18,158,775 students were enrolled in the Olympics in the 1st phase and 949,240 in the 2nd phase. A total of 7,508 students received medals, of which 579 were gold, 1,746 for silver and 5,183 in bronze. In this edition, 99.71% of the Brazilian municipalities had at least one enrolled in the 1st phase and in the 2nd

phase the reach was 99.03% of the municipalities (OBMEP, 2020).

Having this stated, the objective of the study, presented in this article, was to investigate indications of Endowment in OBMEP medalist students and as a specific objective to compare the characteristics of Endowment indicated by the teachers of the medalists with the characteristics identified in people with Endowment and Talent in mathematics.⁴

Method

The design was descriptive and was based on a case study. The case study, according to Yin (2001), investigates a current event in its context using different sources of information.

Four (4) teachers participated in the study: C. of mathematics and A. of the discipline Chemistry of the high school (M.); S. of the discipline of Mathematics and M. of the discipline of Sciences teachers in elementary school (F.). Two (2) students also participated: K. Of the 8th grade of elementary school and B. student of the 2nd year of high school, medalist of OBMEP. The inclusion criteria of the participants were: a) OBMEP medal students enrolled in one of the schools participating in the research. b) Teachers of mathematics or some Exact Science who, at the time of collection, taught to a class with at least one OBMEP medal student.

The Direct Observation Guide in the Classroom (GUENTHER, 2013)⁵ was used for data collection. The Observation Guide is an instrument with 31 items, which indicate signs of Endowment to be observed by teachers in the classroom. For each of them, the teacher must indicate the two students who are in what is described in the item, considering the whole class. Each item corresponds to a Capacity Domain, and a single item reflects the Catalyst. These 31 items are quite general because the intention of the instrument is not to define whether or not there is Endowment, but to track more promising students through an observation.

The instrument indicates three distinct levels as a response to the analysis: normal capacity, High Capacity and Endowment. For the domains General Intelligence, Creativity and Socioaffective, the analysis is given by the sum of the corresponding items, reaching the established number of items is indicated the High Capacity or Endowment. In the subdomains "General intelligence with nonlinear thinking" and "General intelligence with verbal capacity", in addition to the sum of the corresponding items, the student needs to be flagged in at least four items of the General Intelligence domain to indicate High Capacity or Endowment

⁴ This study is part of the master's thesis developed between 2018 and 2020.

⁵ The instrument is available in full in the book Paths to Develop Potential and Talent of the author Zenita Cunha Guenther (2011).

(GUENTHER, 2013).

The Observation Guide was answered by the teachers of students B. and K. Followed by the form of analysis indicated by Guenther (2013), however, for the classification, different parameters were established. The difference in classification was justified by the fact that for the author the Endowment is present in the population in a percentile of 3 to 5%, while for Gagné, author adopted in this study, the Endowment is among 10% more capable in some capacity domain.

The teachers' answers were compared, seeking the items that were repeated for each student, and the characteristics indicated in the literature of the area were compared with the items in which both students were appointed by their respective teachers.

The research followed all ethical procedures recommended and approved by CAEE: 94644318.9.0000.5504.

Results and Discussion

K., enrolled in the 8th grade of elementary school at the time of collection, was indicated by analyzing the answers of professors M. and S., as a student with indications of Endowment, and was a bronze medalist of OBMEP in 2018.

Of the 31 items of the Observation Guide (GUENTHER, 2013), the student was nominated in 22 by both teachers. In **General Intelligence** he stood out in the items: easier and faster to learn; more curious, he asks, he is interested in everything; faster thinking and action; more able to think and draw conclusions; more attentive, insightful and observant; good collection of knowledge and information; greater autonomy and initiative. In **General Intelligence with nonlinear thinking**: better in areas of mathematics and science; greater capacity for concentration and attention; safe, has self-confidence; good mental organization and vision of the whole; attention focused on the search for solution. In the field **General intelligence with verbal capacity**: better production in language, communication, expression; 'alive', insightful, lots of mental energy. **Mastery of Creativity**: ability to think and act by intuition; unexpected and pertinent actions and ideas. In **the Socioaffective Domain**: good presence in regular and extra-class activities; able to pass energy and motivation to the group; good communication and persuasion skills; concerned about the well-being of others; sensitive and kind to colleagues. In addition, it was pointed out in the item **Catalyst** that manifests itself in persistence, commitment, reach the end of what it does.

It is possible to observe, from the data obtained, that K. was indicated in all domains

and subdomains of capacity present in the Observation Guide, in addition to the catalyst that fits in all domains.

According to the analyzed answers, K. obtained indications of Endowment in the general intelligence domain and in the general intelligence subdomain with nonlinear thinking beyond high capacity in the Socioaffective domain.

Student B., who was in the 2nd year of high school at the time of collection, was a bronze medalist in OBMEP in 2018 and demonstrated high-capacity indicators in the General Intelligence subdomain with nonlinear thinking in the notes of teachers A. and C.

The teachers' indications for B. coincided with 12 items, corresponding to four of the five domains/subdomains present in the Direct Observation Guide. In **General Intelligence** he was appointed with: greater ease and speed to learn; greater speed of thought and action; more able to think and draw conclusion; good collection of knowledge and information. In the field of general **intelligence with nonlinear thinking**: better in areas of mathematics and science; greater capacity for concentration and attention; safe; has self-confidence; good mental organization and vision of the whole; attention focused on the search for solution. In the Field of Creativity, they indicated it in the items: original, authentic, fluent in ideas and actions; ability to think and act by intuition. And in **the Socioaffective Domain**: security and self-confidence in group situations.

From the results of K. and B., a common profile was formed to identify the characteristics and compare them with the literature data on Endowment and Talent in Mathematics, particularly in relation to those that stand out in problem solving. Table 1 exposes the items in which both were indicated and their corresponding Domains.

Table 1 - Common characteristics in K. and B

Item	Description
	Intelligence with depth and nonlinear thinking
1	Better production in mathematics and science
6	Increased ability to concentrate and attention
11	Safe, has self-confidence
16	Good mental organization and vision of the whole
21	Attention focused on the search for solution
	General intelligence
4	Easier and faster to learn
14	Faster thinking and action
19	Ability to think and draw conclusion
26	Good collection of knowledge and information
	Creativity
23	Ability to think and act by intuition

Source: Oliveira (2020)

The students coincided in the domain of General Intelligence with four (4) items, in the subdomain Intelligence with depth and nonlinear thinking with five (5) items and in the domain of Creativity with one (1) item.

According to Guenther (2013) it is possible to notice some signs of Endowment in the classroom. The author describes the indicators to be considered in the General Intelligence from the observation of the student who presents: Ease of learning without the need for repetition, good memory, knows a lot of information, taste for learning, good performance in school work, ends before the activities, good grades, has varied curiosity and interests, has intensity, presents higher production in languages, communication and oral expression, written or pictorial, is observant and has pertinent opinions about what he sees, sense of humor, does and says unexpected things, presents good vocabulary and clarity when speaking, ends activities, engages and performs well in extracurricular activities, engages in volunteer work and assists teachers and colleagues outside the classroom.

In the general intelligence with nonlinear thinking subdomain, Guenther (2013) cites as some of the indicatives observable in students: good production in mathematics and science, reluctance with regard to subjects that require verbal response or justification, capable of doing mental calculations and it is common not to explain how he did, draws well, with a sense of balance and good distribution on the sheet, focused on activities, sometimes becomes inattentive around so, has autonomy, is safe and self-confident, observes carefully, thinks and draws conclusions, gives preference to express himself through schemes, tables, drawings and gestures and likes to work alone.

From these indicators and the attributes previously pointed out by Singer *et al.* (2016), it is perceived, the convergence of characteristics of Endowment in the domain of General Intelligence with the characteristics of those that stand out in the area of mathematics.

It is necessary to highlight that K. and B. were indicated, in addition to the items of General Intelligence and General Intelligence with nonlinear thinking in two items of Creativity by their teachers. These results are in line with the indicators of creativity present in people with mathematical endowment, according to the studies of Singer, Sheffield and Leikin (2017) and Sheffield (2017).

It is considered that the very achievement of the medal in OBMEP can be an indicator of the Endowment. It is observed in the data *available on the* OBMEP website, in 2019, that the state of São Paulo had 1,686 medalists. Inep data (2020) on enrollment in the state, in that same year, totaled 2,367,699 students in the final years of elementary school and 1,551,906 in high school in the state of São Paulo. In this amount, OBMEP medalists accounted for 0.04%

of the students enrolled, this means a very low number of winners.

The study by Simplicio (2013) addressed the educational care offered by the 'New Talents Project', to observe whether there was interference of this support in the students' academic performance. The author explained that the forms of identification and recruitment for the project were: informative lectures given to teachers on Mathematical Talent, dissemination of the project in newspapers, as well as students who excelled in the Brazilian Mathematical Olympiad (OBM) and OBMEP. Among the project participants, three were gold medalists in OBMEP.⁶

The results showed that the students benefited from the care offered in the Project and that the grades obtained by them in the mathematics discipline were high in two cases and in one of them presented disinterest and constant absences generating lower averages in two out of six units. The author indicated that these low results were consequences of socioaffective issues generated by family distance and difficulties in relationship with peers (SIMPLÍCIO, 2013).

Pérez (2006, 2021) indicate that there is little elucidation about students with Endowment and Talent in undergraduate courses and courses in Psychology, Neurology and Pediatrics, especially because the theme is rarely mentioned in undergraduate courses. These authors also mention that the programs of the Ministry of Education (MEC) for the area of Special Education deal little about students with Endowment and Talent and that the continued training offered scanty addresses the theme, which evidently impacts on specialized care.

In Carneiro's study (2015) on educational care programs for gifted and talented students, she identified that in the 50 programs investigated, 72.9% of the professionals worked were teachers or pedagogues, 15.9% psychologists and the rest of other areas. This data becomes relevant, because it is possible to consider which professionals can conduct the process of identifying students with Endowment and Talent, in the Brazilian scope.

Observing that professionals more present in the programs for students with Endowment and Talent in the country are teachers, it is reasonable to indicate the need for qualification, through initial and continuing training (URQUIZA; MARTINS, 2021), as well as the need to "promote the implementation of public policies aimed at the full development of the potential of this student" (BRASIL, 2015b).

⁶ OBM is an academic competition for students of the final grades of elementary school, high school and university. The winners are trained and taken to international competitions in the area. The Olympics is organized by the Brazilian Mathematical Olympiad Association (AOBM) with the support of the Brazilian Mathematical Society (OBM, 2022).

Advancing beyond the identification issues, there is a need to rethink the school and the structure in which it is organized. Diez and Fernández (2020) point out that, in addition to a teacher response to educational care for students with endowment, a change in the school structure is needed to make it more flexible and inclusive.

The results obtained show that the students presented important indicators of above-average capacity. Along with this, it is worth noting that their teachers were able to observe these skills in their daily work in their classes.

Final considerations

Despite the time limitations of the study that made it impossible to evaluate the indications of Endowment more broadly, it was possible to observe that the participating OBMEP medal students showed signs of Endowment. The findings are promising, taking into account that OBMEP medalists may be special education students.

Endowment and Talent are not only related to mathematics or academic areas, but encompass all domains of human capacity and activities performed and valued in society. Due to the low number of enrollments of students with Endowment and Talent in the country, starting the identification by a more accessible area, such as the academic one, can open a way for the expansion of the attention of education professionals and, consequently, promote the fulfillment of the educational needs of this public.

The lack of identification, the perpetuation of myths and the lack of knowledge of the theme Endowment and Talent generate the marginalization of students, because they have an inattention to their needs and the absence of educational responses. The area needs to be thought of with more commitment by the drafts of Brazilian public policies.

The indication of Endowment and Talent in OBMEP medalists may consist of a promising idea for students to be registered in the national register and attended by their demonstrated ability in mathematics. It can be seen that research on this theme may have future continuations, mainly, with greater coverage of participants and use of different instruments.

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