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Review article

REVIEW ON CURRICULUM ENHANCEMENT IN SCIENCE FOR GIFTED STUDENTS

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ABSTRACT

Giftedness is characterized by the high potential of aptitudes, talents, and abilities, evidenced in the high performance in the various areas of activity of the student and/or to be evidenced in the child's development. This work aims to carry out a bibliographical survey about the scientific literature produced in the last ten years on the subject, Curriculum Enrichment for Students with High Abilities/Giftedness. In methodological terms, this work will be made possible through the search for scientific productions in databases such as: CAPES Portal, Bank of Dissertations and Theses of Graduate Programs (Professional and Academic) produced between the years 2011 and 2021. The search descriptors will be the terms high skills/giftedness, curriculum enrichment and individualized educational plan. It was possible to perceive the difficulty of implementing a culture of identification of such students due to myths created around people with high abilities and due to problems of adaptation and asynchrony that many of these students face in the educational context. It is concluded that meeting the educational needs of students with high abilities is the responsibility of the regular school, which proposes itself to be inclusive and favoring the full development of its students.

KEYWORDS: Curriculum Enrichment, Science teaching, Giftedness.

INTRODUCTION

Giftedness is related to the existence of above-average abilities in several different domains. This phenomenon involves the study of processes such as intelligence, motivation, creativity, and leadership. According to the national policy on special education, under perspective of inclusive education, students with high abilities/giftedness are those who:

> Demonstrate high potential in any of the following areas, isolated or combined: intellectual, academic, leadership, psychomotricity, and arts, in addition to showing great creativity, involvement in learning and carrying out tasks in areas of interest (1).

Educational public policies subsidize attendance in regular classrooms and resources for students with high abilities/giftedness, considering their individual peculiarities. In 2019, the number of enrollments in basic education was 47.9 million. Of this total, 1.3 million (2.71%) were students who make up the target audience of Specialized Educational Assistance (SEA), that is, students with disabilities, general developmental disorders, and high abilities/giftedness (2).

According to the National Policy for Inclusive Education (NPIE), published in 2008, SEA must be offered in a transversal, complementary or supplementary way at all stages and levels of common education, primarily in multifunctional resource rooms or centers (1).

All students with special educational needs should and are entitled to specialized policies and practices. One of the major steps taken in Brazil towards a National Policy on Special Education was the implementation of the Nucleus for Highly Ability Activities /Giftedness (NHAA/G) by the Ministry of Education in 2005. The NHAA/G can make necessary partnerships to carry out the work, offering specialized educational services and guidance to parents, students, and teachers. However, the discussion that the traditional school curriculum does not offer enough opportunities for the development of talents is recurrent. Enrichment is a strategy that allows the flexibility of the school curriculum with the aim of supplementing, deepening, and expanding school contents

and adapting the curriculum as a way of contributing to the development of students with high abilities.

The area of High Abilities/Giftedness (HA/G) continues to be a challenge, especially due to the difficulties in conceptualizing and identifying these students, a broader understanding of the concept of diversity and a school vision focused on the humanization process of all the people included in it.

Aiming at a theoretical construction that is relevant in a certain area of knowledge, the survey of the state of the art is extremely important, since it seeks to identify indispensable points in its elaboration. It distinguishes innovative experiences studied that show and direct alternatives for solving obstacles in practice, highlighting the importance of research for the subject studied (3).

Thus, this work aimed to investigate the dissertations and theses about curriculum enrichment for students with high abilities/giftedness produced in Brazil between 2011 and 2021, describing the methodologies and resources used by the authors, as well as identifying and relating the problems encountered.

MATERIAL AND METHODS

The present study sought to map and discuss the curricular enrichment for students with High Abilities/Giftedness, comparing the data collected in the dissertations and theses investigated of a qualitative nature. To this end, we searched the website of the Ministry of Education (CAPES/Periodic portal) (4) for dissertations and theses of postgraduate programs (Professional and Academic) using the following combinations of keywords in Portuguese: high abilities/giftedness, curriculum enrichment, sciences, and individualized educational plan. In this way, 7 (seven) dissertations and 3 (three) theses were selected.

To better understand research on curriculum enrichment in science teaching for students with high abilities/giftedness, the following elements were taken as the body of analysis: objectives, theoretical references, methodology used, and instruments used in data collection and obtaining results.

RESULTS AND DISCUSSIONS

Table 1 presents, in chronological order, the ten dissertations and theses selected on the area of Curriculum Enrichment for Gifted Students. They are related to the theme High Abilities/Giftedness and address curricular enrichment strategies for inclusion and monitoring of students with high abilities, both in regular schools and in specific programs. Of the 10 works mapped, only one deals with enrichment possibilities for students with high skill in science.

The work carried out in 2013 by Camargo (5) aimed to understand the educational accessibility strategies for students with AH/SD who participate in Extracurricular Enrichment Programs, from their perspective (Table 1). The work was carried out based on a qualitative approach, assuming a case study as a methodological procedure and a semi-structured interview as an instrument for data collection. The results were positive in relation to the extracurricular enrichment programs studied, developing several educational accessibility strategies aimed at students with AH/SD. They contributed significantly to the constitution of their educational accessibility, as well as to their social inclusion at school, standing out in relation to the others, those skills related to the expression of AH/SD in different languages.

The research carried out in 2015 by Liliane Bernardes Carneiro (Table 1) up two aspects as problematic: I - How the Brazilian programs for the gifted are characterized in terms of location, number of students, available classrooms, and professionals? II - What are the particularities of Brazilian programs for the gifted about the processes of student admission, identification and evaluation, theoretical framework and educational practices adopted? With the objective of mapping and evaluating educational assistance programs for the gifted in Brazil, the results showed that most of the programs were public service. Many of them were almost a decade old and had not yet consolidated services to meet the needs of this school demand (6).

Analyzing data from the National Institute of Educational Studies and Research Anísio Teixeira (INEP) about 2014 School Census, the author noted that of the 5,570 Brazilian municipalities, 76.44% do not have information on enrollment of students with high abilities/gifted in basic education. In addition, in 607 (10.9%) there was only 1 student in the entire municipal area and six municipalities reported having more than

300 gifted students enrolled. Thus, the gifted enrolled in Brazilian schools constitute a total of 13,308 students. This number corresponds to approximately 0.027% of total enrollments in basic education (n = 49,771,371). The number of gifted students informed in this survey corresponds to 42% (n = 5,597) of the total enrollment of this public in the 2014 School Census (n = 13,308). The number of gifted people assisted in Brazilian programs is negligible when compared to the number of students enrolled in basic education, according to the 2014 School Census (6).

Table 1 – Dissertations and Theses on Curriculum Enrichment for Gifted Students.

Nº	Title	Author	Institution	Year
1	Educational accessibility strategies for and by students with high abilities/giftedness	Renata Gomes Camargo (5)	UFSM	2013
2	Characteristics and evaluation of Brazilian educational assistance programs for the gifted	Liliane Bernardes Carneiro (6)	UnB	2015
3	Problematizations and curricular perspectives in the education of students with high abilities/giftedness	Tatiane Negrini (7)	UFSM	2015
4	High skills or giftedness: visible or invisible in education?	Renata Siqueira Teixeira Borba (8)	UFF	2015
5	Science club as a scientific initiation tool for gifted students and/or scientifically inclined	Felipe Rodrigues Martins (9)	UFF	2016
6	Educational policies for students with high abilities/giftedness: a cross-sectional study	Ana Carolina Cyrino Pessoa Martelli (10)	PUCPR	2017
7	Perspectives of gifted students from low-income classes on their learning trajectories: a guide for gifted programs.	Paula Teresa Pessoa Cavalcanti (11)	UFSM	2017
8	Curricular enrichment in the common classroom based on the needs of students with high abilities/giftedness	Aletéia Cristina Bergamin (12)	UNIR	2018
9	Training of teachers for the use of educational software Hagaquet in teaching and learning science for students with high ability/giftedness	Jonas Lima Nicácio(13)	UFAC	2019
10	Contributions of Type I Enrichment to the Cognitive, Academic, and Social Development of Students with High Ability/Giftedness	Lurian Dionizio Mendonça (14)	UNESP	2020

Source: elaborated by the author, 2021.

Tatiane Negrini (2015) verified how the curriculum of a public school of basic education in the city of Santa Maria has been constituted to meet the educational needs of students with high abilities/giftedness (Table 1). Her thesis was qualitative educational research characterized as a case study carried out in a public school in the city of Santa Maria/RS (7). Its main results were that the narratives show concern on the part of teachers, with difficulty in identifying and recognizing these subjects as endowed with high abilities/giftedness, as they often do not believe that this behavior corresponds as such. Therefore, it is necessary to qualify pedagogical practices, whether they are intra or extracurricular enrichment, with differentiated curricular strategies for this public.

For Renata Siqueira Teixeira Borba (2015), the results of her research point to the difficulties in identifying people with high abilities or giftedness (Table 1). Added to this, the resistance of the school to identify and work with these students, the deficiencies to equip education professionals and to put into effect what determines the legislation for this public of Special and Inclusive Education. This shows the lack of an effective support network in the care of gifted and family members (8). The area of assessment of individuals with HA/G indicators still needs to expand in Brazil. The identification of students with high abilities in the school or educational context is still a big problem to be solved. However, the fact of not being identified and, thus, enabling appropriate educational methods for these students does not prevent their existence within the regular school.

Felipe Rodrigues Martins (2016) analyzed the development of curriculum enrichment for gifted students and/or with a scientific vocation. His research was the only dissertation found with enrichment aimed specifically at science. The research aimed to evaluate the pedagogical experiences organized in the format of the “Science Club” program based on the Triadic Enrichment Model as a tool to meet the demand of students with gifted behavior and/or scientific vocation (9).

Renzulli (2014) suggests the Triadic Model of Enrichment proposes that assistance to students with high abilities/giftedness should encompass activities of types I, II and III. The main objective of Type I School Enrichment is to encourage interest in learning about topics, subjects, ideas, and fields of knowledge. Students are exposed to a wide variety of topics through visits, lectures, documentaries, articles,

films, and exhibitions. In Type II activities, students learn to do research, as well as acquire knowledge about investigative methodologies and the development of scientific reasoning. The dissemination of the results obtained provides an important moment of construction. Type III activities, on the other hand, provide an opportunity to reflect on real problems through appropriate methods of investigation, production of unprecedented knowledge, problem solving or the construction of a product or service. (15).

The research developed by Martins (2016) was designed and carried out through a descriptive-analytical study with a quantitative and qualitative approach. To obtain the results, research was carried out and closed and semi-structured questionnaires were applied (9). The research subjects were students regularly enrolled in public or private schools of Niterói city (Rio de Janeiro state) or neighboring and identified as gifted. By proposing the construction of an enrichment program for gifted students in which the activities are based on experimentation of an investigative and exploratory nature, the group's interest in tasks that demand resolution of problem situations in the field of Natural Sciences is perceived. The result also pointed to a significant learning of concepts when the method is applied, allowing the development of gifted behavior.

For Freeman and Guenther (2000), educational enrichment is:

> An intentional and planned stimulation effort, which seeks the child's growth and deepens the basic school curriculum with knowledge, information and ideas that make it capable of a greater awareness of the comprehensive context of each theme, subject, or area of knowledge (16).

This enrichment can take place within the school, especially in the resource room, or even in the High Skills/Gifted Activities Nucleus. It is a significant alternative for the development and inclusion of students in school, which can be intracurricular or extracurricular. Table 2 describes how they should happen and what differentiates them.

Table 2 - Types of Curriculum Enrichment *.

Type	Description	Objective	Local	Method
Intracurricular	Deepening of curriculum content and changes in disciplines according to the student's interest	Rethink pedagogical practices, teaching strategies and forms of assessment	In the school environment, inside or outside the classroom.	It can occur through individual research or in small groups, differentiated tasks, monitoring, tutoring, mentoring, among others.
Extracurricular	Include activities and content that are different from the common school curriculum	Meet the demands of the teaching/learning process of students with HA/G, through specific pedagogical strategies and practices.	In resource rooms or in specific nuclei that carry out the SEA. Like the NHAA/G.	It can occur through individual assistance or aimed at small groups; field surveys; contact with professionals from different areas in their work environment; visits to museums, universities, industries, libraries, among other places.

* Table produced based on reading the book Specialized Educational Care for High Skills/Giftedness / Ana Cláudia Oliveira Pavão, Sílvia Maria de Oliveira Pavão, Tatiane Negrini. – Santa Maria: FACOS-UFSM, 2018. p.232 (17)

Ana Carolina Cyrino Pessoa Martelli (2017) (10) addressed how educational policies for students with HA/G are being implemented from basic education to higher education, specifically through the Municipal Secretariat of Education of Curitiba, the State Secretariat of Education of Paraná, and the Federal University of Paraná (Table 1). In this sense, the work presented the following question: The transversality delegated to educational policies in special education is being carried out for students with AH/G? The research aims to identify whether the flow of inclusive policies, aimed at this student body, is continuous and automatic in the different stages/levels of education, or if there is an interruption in meeting the specialized educational needs of these students. The survey data indicated a break in the continuity of the offer of specialized care for these students. There was a great engagement of professionals working in the area in the different stages/levels of education, especially regarding their continuing education and the exchange of information and experiences (10).

Paula Teresa Pessoa Cavalcanti (2017) (11) aimed to understand the phenomenon of high skills/giftedness, identify students with these indicators and develop a curriculum enrichment proposal that could serve them, in addition to elaborating a synthesis with the possible enrichment practices described in digital book format (Table 1). This is research with a qualitative-exploratory approach with characteristics of action research developed in three stages. The first stage is characterized by the process of identifying and confirming high abilities/giftedness. It had as data collection, pedagogical instruments applied by the researcher and psychological tests applied exclusively by a psychologist. In the second stage, characterized by the elaboration and application of an intracurricular enrichment proposal, a logbook was used to collect data. The third stage was the development of a digital book with guidelines so that teachers can identify and develop curriculum enrichment, through suggestions of practices aimed at students with high abilities/giftedness in common classes (11).

The results of this study indicated that it is possible for the teacher to identify students with indicators of high abilities/giftedness. The enrichment proposal proved to be an efficient strategy to meet the needs of students with high abilities/giftedness, promote the development of others and identify new talents. However, during the exploratory qualitative research, the researcher found the need to develop autonomy and cooperative learning to sustain a practice that they were not used to. From this incorporation into everyday life, the proposal was increasingly strengthened (11).

Paula Tereza Cavalcante also addressed enrichment, but of an extra-school type. It was shown that the studied programs develop different and diverse educational accessibility strategies, aimed at students with HA/G and that contribute significantly to the constitution of educational accessibility, as well as to inclusion in school, standing out in relation to the others, those related to opportunities and appreciation of the expression of AH/SD in different languages (11).

Bergamin's research (2018) showed that teacher training in Brazil, in general, is worrying, as the bibliographic study on this topic confirmed the difficulty encountered by teachers in correctly identifying students with high abilities/giftedness. In Brazil, there is also a certain difficulty in finding experiences described in the literature (12). The author also pointed out a gap in terms of curriculum enrichment in the common

classroom, showing that there is a lack of publications that present practices in the Brazilian school context and that adequate service for this public deserves reflection and investment in guidance.

The purpose of Jonas Lima Nicácio's (2019) work was to analyze how teacher training for the use of the HagáQuê educational software can contribute to the science teaching and learning process for basic education students with high abilities/giftedness (Table I). The research had a qualitative approach, of the case study type, with participant observations and application of questionnaires (13). Based on this understanding, the educational product was built: Continuing Education Course: use of the educational software HagáQuê in science teaching for students with high ability/giftedness. The results of the research indicate that the use of the HagáQuê Software can contribute to improve the teaching practice in the collective or individual construction of teaching and learning of the highly skilled student, since they constitute a challenging activity, developing the reflective, argumentative capacity, as well as competence linguistic, spatial and artistic, in creating plots of stories, with images, sound effects and originality, mobilizing and integrating knowledge and practices of students and teachers.

Lurian Dionizio Mendonça (2020) aimed to investigate the contributions of curriculum enrichment activities in the cognitive, school, and social development of students identified with high abilities/giftedness (14). The research was divided into three studies. Study number 1 sought to describe the curricular enrichment activities experienced by students identified with high abilities/giftedness in an extension project. For this, questionnaires and protocols were elaborated, which were answered by the students and their parents and teachers, regarding the activities experienced by them, after the identification. Study number 2 described and compared the cognitive and academic performance of these students, before and after attending curricular enrichment activities for at least one year. Raven's Colored Progressive Matrices Test, Wechsler Intelligence Scale (WISC-IV) and the School Achievement Test (TDE) were used. Raven's Colored Progressive Matrices Test - Special Scale: designed to assess the intellectual development of children aged five to 11 years. The instrument is composed of 36 items that are formed by a figure or matrix with a missing part and, below, six options are presented, one of which completes the matrix correctly. The Wechsler Intelligence Scale for Children (WISC-IV): is an instrument that assesses the

intellectual capacity and problem-solving process in children and adolescents aged between six and 16 years. The School Performance Test (TDE) assesses fundamental skills for school performance, more specifically writing, arithmetic and reading. This instrument was developed based on the Brazilian reality, to be used with students from seven to 12 years old.

Study number 3 sought to describe and compare students' behavioral characteristics and social skills before and after participating in enrichment activities. The Capabilities and Difficulties Questionnaire (SDQ) was used, which is an instrument used to assess the behavior of children and adolescents aged four to 16 years, provided in three versions: parents, teachers and for the child (over 11 years old). It consists of 25 items, which are divided into five scales: emotional symptoms, conduct problems, hyperactivity, relationship problems with peers and prosocial behavior.

The Social Skills Assessment System (SSAS) was used to map the repertoire of social skills, behavior problems and academic competence of elementary school children (6 to 13 years old). It consists of three versions: child, parent, and teacher. The work brought as an issue the lack of assistance offered to students with high abilities/giftedness (14). The main results show that the out-of-school enrichment programs studied develop different educational accessibility strategies aimed at students with HA/G. They contribute significantly to the constitution of educational accessibility, as well as to accessibility and inclusion at school, highlighting the opportunities and appreciation of expression in different languages.

Mendonça et al. (2015) analyzed the national production of scientific articles on school enrichment programs in Brazil during the period between 2000 and 2012, aiming to describe how students with high abilities/giftedness were assisted in these programs. The research showed that, studies on the results of school enrichment programs in Brazil are scarce. In total, seven works were analyzed and none of them exposed how these students were assisted, what activities were developed or even what materials and resources were used in the activities (18).

Publications of this nature should describe successful experiences, allowing them to be replicated and improved. There is, therefore, a need for other descriptions such as these to be made, emphasizing the specificities of the population served and the culture in which it operates. During the mapping of theses and dissertations, the

lack of works that address curricular enrichment based on an individualized educational plan was noted. The elaboration of an individualized teaching plan is justified insofar as it intends to encourage students with high abilities, implementing methods to work, together with the school community, ways to maintain their interest in relation to the regular curriculum.

In addition to mapping the students' abilities, the educational plan can also help in diagnosing the difficulties of these individuals, facilitating the teachers' work. The mapped theses and dissertations, for the most part, only address curriculum enrichment and are scarce in terms of the production of an individualized educational plan and the application of this plan both in regular education and in specialized centers. In regular education, it is not possible to meet the special educational needs, areas of interest and talents of students with different learning styles and rhythms, without an identification that aims to meet these needs. In this sense, the individualized teaching plan shows how to proceed in view of the students' needs and when curriculum adaptation should occur.

CONCLUSION

It is evident that in the last ten years, little research has been carried out in Brazil on the services offered to students with high abilities/giftedness. Mainly about its results, since in the literature there are different forms of care, such as supplementation and curriculum enrichment, but scarce in experiences of educational enrichment in science teaching and studies that indicate the product of interventions, in general, are limited. In these studies, there are references to the Triadic Enrichment Model, but there is a lack of publications that show experiences about what happens in the classroom in the Brazilian educational context. It was also possible to verify the importance of the school, both for identifying the gifted and offering opportunities for their development, going through the role of the teacher and the difficulties encountered in the school environment (lack of resources, lack of knowledge about giftedness and training, absence of family-school partnership).

In this sense, it is worth emphasizing the importance of professionals working in NHAA/G in identifying, guiding, and carrying out curricular enrichment activities for gifted students, combined with an effort to demystify some points that hinder and prevent the recognition of these individuals in the environment school. With that, when it comes to discussing curricular perspectives to serve students with high abilities/giftedness, it does not only refer to aspects of the content, but to the different relationships and ways of seeing, working, and interacting with this student in the educational context.

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