СОВМЕСТНОСТЬ И ТВОРЧЕСТВО
COLLABORATION AND CREATIVITY

Talented Children who Develop Digital Artifacts and Derive Strength from them: an Example from the Brazilian Metropolis Talent Project

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The present paper presents the Brazilian experience of the Metropolis Talent Program (PTM), which aims to develop the cultural talent of young people with high skills in the field of information technology and its interfaces, through scientific research, the expansion of creativity, innovation, and entrepreneurship. This project also aimed to create opportunities for the dissemination of new knowledge in both developmental psychology and education, as well as to explore professional career possibilities related to the field of gifted individuals, by offering a context that facilitates development through creative insertion in the world of work and social solidarity participation. The program's actions have been contributing to ensuring the existence of mechanisms that allow the full attendance of the special educational needs of these young people, as intended by the Brazilian Low number 9,394, December 20, 1996.

Keywords: giftedness, talent developed, human development.

Талантливые дети, разрабатывающие цифровые артефакты и черпающие в них силы: пример из бразильского проекта Talento Metropole Project

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В настоящей статье представлен бразильский опыт программы Talento Metropole Program (PTM), целью которой является развитие культурных талантов молодых людей с высокими навыками в области информационных технологий и их интерфейсов посредством научных исследований, расширения творчества, инноваций и предпринимательства. Этот проект также был направлен на создание возможностей для распространения новых знаний, как в области психологии развития, так и в области образования, а также для изучения возможностей профессиональной карьеры, связанных с проблемой одаренности людей, поскольку содержит контекст, облегчающий развитие через творческое погружение в мир труда и социального солидарного участия. Реализация программы способствует обеспечению механизмов, позволяющих в полной мере удовлетворять особые образовательные потребности этих молодых людей, как это предусмотрено Законом Бразилии № 9 394 от 20 декабря 1996 года.

Ключевые слова: одаренность, развитая одаренность, развитие человека.

1. Introduction: talents, giftedness, high abilities and so on

The Great Encyclopedia of Medicine, edited in Moscow by N.A. Semachko and published in 1929, bears, in columns 612 to 414 of Volume VI, the entry *'Genius'*, written by L.Vigotski. In it, the author points out that if heredity makes genius possible, only the social dimension enables realizing this potential. The discoveries and genius creations result from a historical process, tangential to the culture of a certain era. Quoting Beitov, L. Vigotski states that talents arise everywhere and always, as long as social conditions are favorable to their development. It concludes, therefore, that genius represents a qualitatively distinct type of development, resulting from the co-genesis of biological, psychological, and social aspects, still far from being understood by science [1; 2]. Approximately one hundred years after this publication, science continues to seek explanations that enable the understanding of the phenomenon of high abilities, here called giftedness, and the relations between this and cultural talent.

D. Dai & F. Chen [3] have identified "the gifted-child paradigm," which has dominated the thinking of scholars

and practitioners in gifted education since the field's advent. For these authors, "paradigms" in gifted education sometimes present themselves explicitly and other times implicitly in our practice, functional but not well articulated.

Three paradigms seek to reference the phenomenon of giftedness today. The first refers to a conception of the phenomenon as strictly associated with biological inheritance. This definition of giftedness can be exemplified by the model advanced by Lewis Terman, an author who considers giftedness something inherited by a restricted portion of the population, the "1% higher level in general intellectual capacity, measured by the Stanford-Binet Intelligence Scale or by a similar instrument" [4, p. 43]. In definitions based on the domain-general model, or whether it is gifted or not since individual talent exists as a gift (from the English gift, to which the term "gifted" is associated, loosely translated as "gifted", "gifted"). Early definitions also discussed profile heredity, investigating the genetic components responsible for exceptional performance [5].

The second paradigm rejects the biological dimension and considers the phenomenon of giftedness as intrinsically psychological. Intelligence is associated with other dimensions, such as creativity and motivation [3]. It is noteworthy the change of emphasis in relation to the paradigm previously mentioned, the transposition of biological/genetic etiology to psychological/personality traits, but still individual. Both paradigms separate the subject from the social and cultural dimensions. The third paradigm considers endowment as a phenomenon founded on social aspects of development, emphasizing the role of contextual factors, such as social support or conditions of practice [3].

We propose that historical-cultural psychology represents a fourth paradigm in the theoretical approach to the bases of giftedness. This paradigm advances by proposing the social and cultural role in a dialectical, cogenetic process of formation of the phenomenon of endowment (and giftedness) in the psychological subject. In this direction, the focus should not be existential ("*Is this student gifted?*") but should rather be educational ("*What form (s) of instruction are appropriate for this student at this time?*") [6].

Despite all scientific contributions, this theoretical debate concerning the very nature of giftedness persists, mixing empirically-based data, myths, and common sense. This heterogeneous blend of stereotypes and prejudicial notions about intelligence, giftedness, and human talents keeps representing a challenge for psychology, education, and other inquiry domains. Ironically, one of the biggest annoyances in the domain of high skills/giftedness is the construct's definition. A central question remains: *When we discuss high skills, giftedness, high abilities, and talent are we referring to the same construct?* Unlike the status quo in other conceptual domains, there is no lack of terms and definitions here, where the non-consensual variety is disconcerting, as stated by L. Cross &T. Coleman [7]. For many researchers, the terms are used interchangeably, causing terminological and conceptual confusion. Consequently, concepts become vague with numerous and different definitions. One of the main reasons we try to define concepts is to clarify what we understand and, in this way, to identify and evaluate phenomena. These conceptualizing efforts, here and in other domains, face two

opposite risks: first, we risk being generic, and therefore describing something else; on the other hand, if we are very specific, we risk getting rid of important variables, creating inaccuracy. Therefore, in dealing with high abilities in psychology and education, it is essential to choose a theory of development and carefully build up the concepts with which it is intended to work [8].

The contribution of psychology to the understanding of human development trajectories has historically tended to two quite different positions: firstly, a biological framing, and secondly the emphasis on the accumulation of experiences and habits as the core of development. During such disputes, historical-cultural psychology presents a methodology for investigating human development and general laws that regulate this development [9].

For L. Vigotski, the development of higher psychological functions is configured as a central focus of psychological research, emphasizing the need to overcome dichotomous perspectives, which sometimes disregard natural, and sometimes social aspects. From the Vigotskian dialectic, it is necessary to consider two lines of development and the synthesis generated by their intertwining. Quoting this author, "the biological and the cultural — both in pathology and norm — have turned out to be heterogenous, distinctive, specific forms of development that do not co-exist next to each other or one above another and are not mechanically linked to each other, but instead are fused into a higher synthesis, complex, though still unified" [10, p. 26].

Based on the above, it is necessary to consider that the human constitution "is distinguished by unique special qualities and characteristics, specific to each individual, which, essentially, represent a variation of this average type of 'man in general'" [11, p. 283]. When he reflects on individual differences and inherited forms of behavior, L. Vigotski emphasizes "very clear and obvious deviations from personality concerning the general average" [11] or, in other words, the variation of intelligence in the upper and lower levels.

Such an inheritance, however, cannot be considered a destination; on the contrary, this potential does not take place in a vacuum; it is only realized in a social environment through the offer of tools and sociocultural mediations. L. Vigotski uses the concept of cultural talent to refer to the result of this intertwining. This was a radical argument with vast political and social implications for education, research, and politics, including the effort to conceptualize high skills, giftedness, high abilities, and talent. According to this theoretical framing, these categories might be considered in a multidimensional way to allow the advancement of the delimitation of terms to be used. It becomes possible, as a consequence, to consider an inherited potential. Still, the central aspect is its transformation based on social development mediation, which is situated, interaction-relational, and dynamic-systemic. Metropolis Talent Project (TMP) considers a distinction between high abilities and talent, the first being associated with exceptional natural skills. In contrast, the second is associated with cultural tools, specific contexts of learning, and working activity, including interindividual cooperation. Such an epistemic turn was initially discussed by B. Gagné [12] and R. Subotnik & L. Jarvin[13].

2. The mediation of digital tools and technologies in human development

The development of digital technologies is among the upheavals experienced in recent years in the domains of material and immaterial culture. These, if we consider the Vygotskian concept of cultural mediation, present themselves as new tools of the human mind; they contribute to transforming the structure of higher mental functions, becoming an essential part of the mental system, and broaden the range of activities within which new psychological functions can operate [10]. Technological development has become a tool in human evolution and individual development and has transformed the human mind through digitally mediated socialization.

As proposed by M. Falikman[14], the phenomenon of human incorporation of digital tools can be described as extended cognition, characterized by the reconstruction of the system of higher mental functions through digitally mediated activity, since these tools provide extended access to information, going beyond cognitive support or scaffolding. However, it is noteworthy that digital devices and applications incorporate certain social practices like any other cultural artifact.

The proposition of a talent development program in the field of information technology has a link with the very core of this discussion, considering two interconnected aspects: on the one hand, the importance of the development of cultural talent for children with high skills and, on the other hand, the digital world that characterizes contemporary culture. Metropolis Talent Program aims to develop the interest of young talented people in scientific research and creativity in information technology and its interfaces. It also aims to create opportunities for the dissemination of new knowledge and explore professional career possibilities related to this field, with a view to creative insertion in the world of work and social solidarity participation.

3.TalentoMetrópole Project: a proposition for identifying and supporting the development of cultural talent in the technology of information contexts

Metropolis Talent Program (TMP) is an initiative linked to the Metropolis Digital Institute — IMD, a special unit of the Federal University of Rio Grande do Norte (UFRN), located in the state capital of Natal, in the northeast region of Brazil. It must be emphasized that this region has the country's lowest indicators of human development and quality of life. IMD develops projects towards training technical and graduate personnel, developing actions aiming to integrate the social and digital inclusion of young people from basic education to graduate school.

It is noteworthy that students with giftedness in Brazil are considered the target audience of special education efforts, as well as people with disabilities or global developmental disorders. Therefore, they have the right to the necessary specialized educational care to guarantee access to individualized and effective support measures, in environments that maximize their academic and social development, according to the goal of full inclusion.

As mentioned earlier, the conceptual characterization of giftedness can be described in four phases. The first phase comprehends the phenomena associated with high IQ. The second one broadens this conception and includes other individual characteristics, such as creativity and motivation. The third refines the concept and considers the social context in which the subject is inserted. Finally, the room breaks from the previous ones by shifting the focus from identification to talent development.

TMP is based on the Paradigm of Talent Development, from which the specific domain of Information Technology builds up experiences that allow cultivating talent and creativity, expanding the learning routes towards a solidary social insertion. The Program is less concerned with distinguishing those with an endowment from those not in this category. Above all, it is more concerned with better recognizing individuals who demonstrate distinct strengths and interests in IT and taking them as far as possible along a line of talent development. It assumes as central operational objectives: 1) to compose a diverse group of students served; 2) to accommodate the different trajectories and paths of talents; 3) to connect with 21st-century themes; and; 4) to contemplate the different personal interests and aspirations. To this end, it offers a range of additional educational resources, opportunities, and challenges for students differently from what is regularly offered in schools.

The model for developing cultural talent that underlies the TMP is proposed by R.Subotnik et al. [15], which provides relevant principles through which the potential is transformed into competence, competence in expertise, and eminence expertise. The first stage, called potential and circumscribed to childhood, is characterized by offering varied stimuli and a wide range of opportunities, with the central objective of increasing development and learning routes. At this stage, it is common for the child to be intensely involved with specific themes and activities of particular interest (hyperfocus).

The second stage, notably identified in the period of entry into formal education, is characterized by the movement to transform potential into competence. For this, formal learning, deliberate study, and practice in specific areas of socially recognized talents are vital. The third stage, characterized by the transition from competence to experience (expertise), typical of adolescents, requires surpassing the knowledge of the fundamentals of a specific domain. It implies movements that allow the initial socialization in the culture of a certain field of knowledge, which can be accomplished through cooperative work with other professionals, tutors, and other students. Finally, we highlight the transition from experience to eminence, which commonly occurs in adult life and is characterized by the original contribution and the reference that the individual assumes in a specific field of knowledge [15].

One of the strengths of the described model of talent development is the potential to offer opportunities and guidance that reach a broader range of young people, including those from families with low income, and opportunities for insertion in diverse cultural activities and linguistic environments. From the above, it is necessary to consider that the proposal of a talent development program depends on the link between young people and

universities and research centers, among other social devices [15].

The didactic sequence and the nature of the activities offered at TMP were elaborated based on the *Talent Development Model* [14] and the formative guidelines of the International Society for Technology in Education (ISTE). Four matrices guide the proposition of the three regular disciplines and complementary activities: Digital citizenship and collaboration; Research, information management, and communication; Critical, flexible, and innovative thinking and Problem solving and computational thinking. The overall structure of the TMP is shown in Table 1.

Students must prepare, together with their tutor each semester, an Activity Plan containing the schedule of studies and research projects to be developed. These plans must reflect their interests. Additionally, they carry out activities to develop social skills and creativity. Among these activities, *Talent Cine* (about movies), Art Club, and reading books stand out; the creation of a League to participate in scientific Olympics at the national level and monitored technical visits to laboratories, universities, research centers, and incubated companies in other cities areas are also programmed activities.

Currently, the TMP comprises 30 participants, aged between 12 and 24 years, coming from the last three years of Brazilian Elementary School, High School, and Under-Graduation. The process of identifying these young people is procedural and complex, involving four distinct stages, ranging from the training of teachers who assist in the identification of candidates for the program in schools to the dynamic of winter/summer courses where candidates are invited to face challenges in the context of technology of information. A transversal dimension in the proposition and proposition of the project as an academic initiative is the need for an expanded assessment of intelligence, motivation, creativity, and the skills and competencies that comprise them.

3. Final Remarks

The traditional conceptions of individual endowment refer to endogenous factors, considering subjects' greater probability of success based on educational objectives or criteria. However, the effective educational system should not be attentive to the chances of someone standing out in school or the labor market but to the processes involved in the search for the full development of the potentialities of all participants. In a contemporary conception, the endowment cannot be disconnected from the curriculum, the mediation, and the cultural group where the talented individual is inserted. In this sense, it is argued that curricular strategies should optimize the learning of individuals with a particular profile of strength points, interests, and preferences. Subsequently, it is necessary to configure the curriculum so that it presents itself as challenging for the student and thus raises him to a new level of competencies, with pedagogical and technical support that provides the opportunity to develop talents to the level of excellence. Finally, it is necessary to provide students in such a program with a "community of practitioners" [16] in the context of which they can find identification, complementarity, and, therefore, an opportunity for development. In this way, the variety of trajectories and development paths is contemplated [5].

Brazil, like many other Latin-American countries, has a shortage of programs that aim to develop the talents of children and young people in general. There is also a lack of programs for individuals with high abilities. Seeking to contribute to minimizing this gap, Metropolis Talent Program aims to develop the cultural talent of young people with high skills in information technology and its interfaces, always aiming at innovation and entrepreneurship.

We propose here the use of the concept of situated learning developed by J. Lave & E. Wenger [16], for which learning is fundamentally a social and cultural process and not solely an individual process limited to the learners themselves. The authors mentioned above maintain that learning must be viewed as a situated, in-process activity. Learners participate in communities of practitioners, moving toward full participation in the sociocultural practices of a community.

The program aims to offer quality training that addresses the student's interests, considering their potential and bypassing the hierarchy and rigidity of traditional instructional curricula. The program has proposed to explore professional career possibilities related to this domain, with a view to creative insertion in the world

T a b l e 1

Global Structure of Metropolis Talent Program

Timeline and thematic	Goals	Activities
Semester 1. The World of Technology: Yesterday, Today and Tomorrow	Presenting the IT domain, identifying the impact of current research, presenting different thematic areas to expand the horizons of knowledge	Students participate in workshops and lectures on different topics; technical visits to laboratories and research centers are provided; participation in round tables on contemporary themes are encouraged
Semester 2. Interdisciplinarity and Transversality in Information Technology	Verticalization of knowledge production and socialization in the IT field: IT interfaces with other areas of knowledge. The participant student is invited to develop ideas and solutions to real problems	Students participate in workshops and short courses on using specific IT tools and knowledge. They visit and interact with professors, researchers, and professionals from other areas of knowledge who develop projects in interface with ITs
Semester 3. IT Research, Innovation, and Entrepreneurship	Development of research, extension, innovation, and entrepreneurship projects	Students must select the laboratory and research project in which they will develop their activities. These can be carried out individually or in small groups, with the tutorship of a researcher professor

of work and solidary social participation. In the case of the TMP, we can highlight research and products aimed at helping to create productive processes, for example, tackling childhood cancer and mitigating the effects of the Covid-19 pandemic, through scientific and technological dissemination in public schools.

Finally, TMP has been trying to inspire new programs, fostering actions that transform the full potential of these children and young people into actions that guarantee a more egalitarian world with a better quality of life for all. This is important everywhere, and crucial in developing countries like Brazil.

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