ACTA SCIENTIAE

ISSN: 2178-7727
DOI: 10.17648/acta.scientiae.7706

An Accessible Curriculum Proposal in Functions Content Based on the Universal Design for Learning

Marcelio Adriano Diogo [a]
Marlise Geller [a]

Universidade Luterana do Brasil, Programa de Pós-Graduação em Ensino de Ciências e Matemática, Canoas, RS, Brasil.

Received for publication 4 May 2023. Accepted after review 15 May 2023
Designated editor: Claudia Lisete Oliveira Groenwald

ABSTRACT

Background: As of 2017, with the approval of Law No. 13.409, which provides for exclusive places for people with disabilities in high school technical courses of federal educational institutions, the demands for permanence and success of students with disabilities, particularly intellectual, have become teachers' focus. **Objectives**: This article seeks to present and reflect on a curriculum accessibility proposal aimed at the content of functions for students with intellectual disabilities in technical education. **Design**: Qualitative research of the research-action type with the formation of a focus group and interpretive descriptive analysis of the results. **Setting and participants**: The research environment is a Federal Institute of the metropolitan region, and its methodology was the creation of a focus group of mathematics teachers for the discussion and elaboration of an accessible curriculum proposal in the content of functions for a student with Down syndrome enrolled in the first year of a technical course. **Data collection and analysis:** Data collection was obtained from the development of a sequence of activities applied to the student, and the analysis was inspired by interpretive descriptive analysis. **Results**: The results obtained point to the success of the curricular accessibility proposal based on the principles of the universal design for learning (UDL). **Conclusions**: The presentation of a curriculum from the perspective of curriculum accessibility for students with intellectual disabilities is promising to enable learning and develop desired skills in students.

Keywords: Curriculum accessibility; Universal design for learning; Intellectual disability; Mathematics.

Corresponding author: Marcelio Adriano Diogo. Email: m.celo1974@gmail.com

Uma proposta de currículo acessível no conteúdo de funções a partir do desenho universal para a aprendizagem

RESUMO

Contexto: A partir de 2017, com a aprovação da lei nº 13.409, que prevê a reserva de vagas para pessoas com deficiência nos cursos técnicos de nível médio das instituições federais de ensino, as demandas para permanência e êxito dos estudantes com deficiência, particularmente a intelectual, se tornaram foco de atenção dos docentes. **Objetivos**: Esse artigo busca apresentar e refletir sobre uma proposta de acessibilidade curricular voltado ao conteúdo de Funções para estudantes com deficiência intelectual no Ensino Técnico. **Design**: Pesquisa qualitativa do tipo pesquisa-ação com formação de um grupo focal e análise descritiva interpretativa dos resultados. **Ambiente e participantes**: O ambiente da pesquisa é um Instituto Federal da região metropolitana e teve como metodologia a criação de um grupo focal de docentes de Matemática para a discussão e elaboração de uma proposta de currículo acessível no conteúdo de Funções para um aluno com síndrome de Down do 1º ano de um curso técnico. **Coleta e análise de dados**: A coleta de dados foi obtida a partir do desenvolvimento de uma sequência de atividades aplicada ao estudante e a análise foi inspirada na Análise Descritiva Interpretativa. **Resultados**: Os resultados atingidos apontam para o êxito da proposta de acessibilidade curricular inspirada nos princípios do Desenho Universal para a Aprendizagem (DUA). **Conclusões**: A apresentação de um currículo sob a ótica da acessibilidade curricular para estudantes com deficiência intelectual é promissora no sentido de viabilizar aprendizado e desenvolver habilidades desejadas nos estudantes.

Palavras-chave: Acessibilidade curricular; Desenho Universal para a Aprendizagem; Deficiência intelectual; Matemática.

INTRODUCTION

The attention to more inclusive education in Brazil goes back to the 90s of the twentieth century. We can consider the World Conference on Education for All, held in Jontien, Thailand, in 1990, as the beginning of attention to the demands of special educational needs in the country.

In 1994, Salamanca's Declaration translated this attention more clearly by including in its text the structure of action in special education:

> The fundamental principle of this line of action is that schools should welcome all children regardless of their physical, intellectual, social, emotional, linguistic, or other conditions. They must welcome children with disabilities and gifted children; street and working children; children from distant or

> nomadic populations; children from linguistic, ethnic, or cultural minorities; and disadvantaged or marginalised children from other groups or areas. (Brasil, 2003, p.19-20)

Since then, Brazilian legislation has moved to guarantee more and more rights of an education that provides care to students with special educational needs. The Law of Guidelines and Bases of National Education (Lei de Diretrizes e Bases da Educação Nacional) brings an entire chapter dedicated to special education in its text (Brazil, 1996). In 2001, Resolution CNE/CEB No. 2 pointed out the target audience with specific needs of the educational structure:

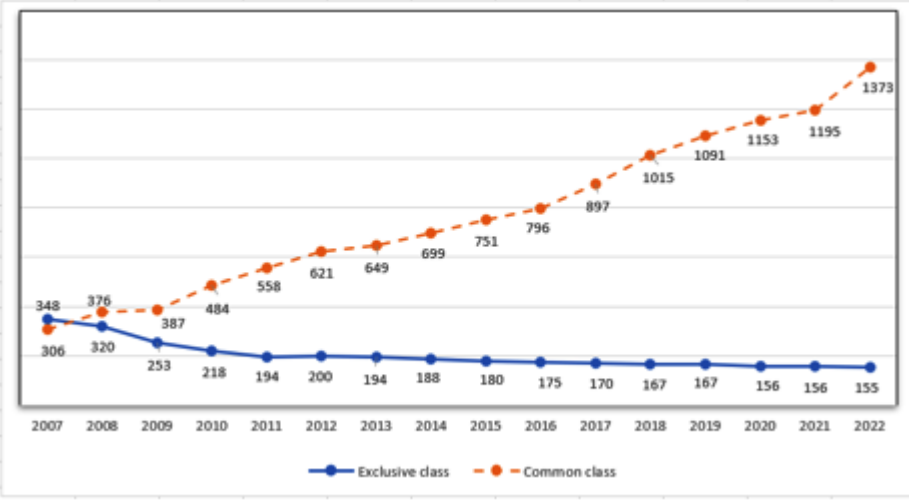
> Art. 5. Students with special educational needs are considered those who, during the educational process, present:
>
> I - marked learning difficulties or limitations in the development process that hinder the monitoring of curriculum activities, comprised of two groups: a) those not linked to a specific organic cause; b) those related to conditions, dysfunctions, limitations or disabilities;
>
> II - communication and signalling difficulties differentiated from other students, requiring the use of applicable languages and codes;
>
> III - high skills/giftedness, great ease of learning that leads them to master concepts, procedures and attitudes quickly. (Brasil, 2001).

In 2008, the National Policy on Special Education from the Perspective of Inclusive Education (Política Nacional de Educação Especial na Perspectiva da Educação Inclusiva - PNEEPEI) defined students with disabilities, global developmental disorders, and high skills/giftedness as a target audience for special education (Brasil, 2008).

In 2015, Law No. 13,146, known as the Disability Statute, was another step towards guaranteeing the rights of students with disabilities and other specific learning needs. This set of actions was reflected straightforwardly in students' arrival to regular classes. Figure 1 shows this displacement.

Figure 1

Enrolment of special education in standard and exclusive classes (Statistical Summary of Basic Education INEP/MEC, 2007 to 2022 – Figures expressed in thousands)

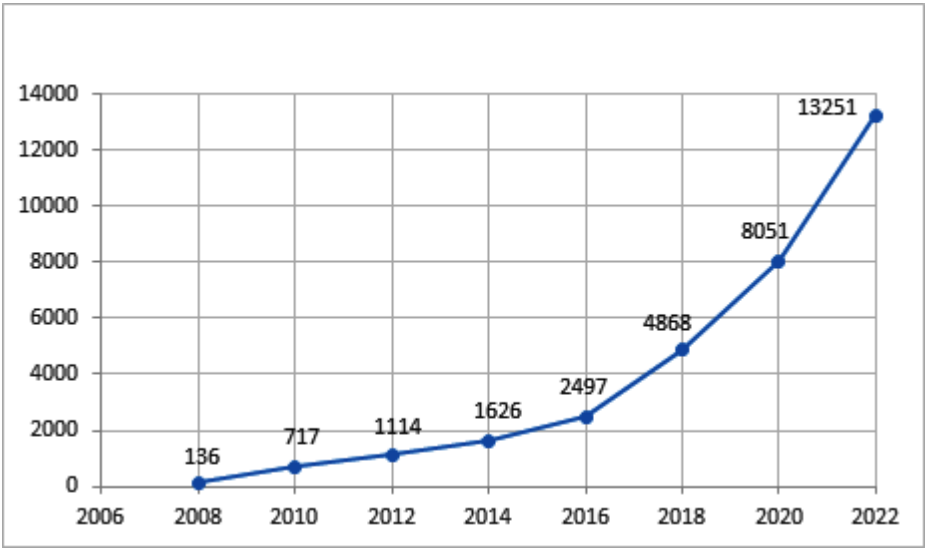


In technical education, the entry of students with disabilities began to accentuate from Law No. 13.409, which provides for the reservation of places for people with disabilities in high school technical courses and higher education courses of federal educational institutions, establishing that, out of the vacancies destined for public school graduates, a proportion equal to the percentage of this public in the Federation unit where the institution is installed must be directed to people with disabilities (Brasil, 2016).

Figure 2 shows the evolution of the arrival of these students in integrated technical high schools from this policy. Since the law came into force in 2016, the number has increased by about 430%.

Figure 2

Evolution of special education enrolments in integrated technical high school (Synopsis Basic Education Statistics INEP/MEC, 2007 to 2022)



Most of the integrated technical high school courses take place at the federal institutes. These institutions were created by Law No. 11.892 (Brasil, 2008), in which the Federal Network of Professional, Scientific and Technological Education (Rede Federal de Educação Profissional, Científica e Tecnológica - RFECPT) was also established. The Federal Network is composed of 38 federal institutes, two Federal Centres for Technological Education (Centros Federais de Educação Tecnológica - CEFET), 22 technical schools linked to federal universities, and Colégio Pedro II. Considering the respective campuses associated with these institutions, there are 661 units distributed in the 27 units of the federation.

The arrival of public-school students targeted by special education in the regular classes of technical courses caused the need for teachers linked to these courses to reflect on the type of methodology indicated to meet a diversity that is increasingly accentuated in the classroom. The impact of students with disabilities entering a space that needs to develop varied technical skills causes disquiet in teachers.

Recent research with teachers from the South Rio Grande do Sul Federal Institute (Instituto Federal Sul-rio-grandense - IFSUL)) (Diogo & Geller, 2022) showed that we still have to advance in the understanding that this public has the right to occupy all educational spaces they can access. In the question, "How do you position yourself before the inclusion of students with intellectual disabilities (ID) in the regular classes of technical courses?" with the possibility of answering on the Likert scale in which grade zero corresponds to 'strongly disagree' and grade 10 corresponds to 'strongly agree', the teachers in the technical area assigned a 7.0 on average.

The legislation gives the resources we can use in the care of students with disabilities. In particular, curricular adaptations are important devices whose potentiality and characteristics need to be better understood to not be seen as a mere simplification of the curriculum. In this work, from a clipping of a doctoral thesis that seeks to analyse how curricular accessibility can promote conditions of a regular certification and in which situations differentiated certification is an inclusive option, we put into practice a curriculum proposal in the content of functions that we understand to fit the principles of curricular accessibility and universal design for learning (UDL). The activities were applied to a student with Down syndrome in the 1st year of technical education at a federal institute in the metropolitan region of Porto Alegre, RS.

THE PATH OF CURRICULUM ACCESSIBILITY

The trajectory of the resources that we can use to provide access to the curriculum began in the Law of Guidelines and Bases (LDB) with the prediction of curricula, methods, techniques, educational resources, and specific organisations to serve students with disabilities, global developmental disorders and high skills or giftedness (Brasil, 1996).

In 1998, the Ministry of Education (MEC) presented the National Curricular Parameters – Curricular Adaptations: Strategies for the Education of Students with Special Educational Needs (Parâmetros Curriculares Nacionais (PCNs) – Adaptações Curriculares: Estratégias para a Educação de Alunos com Necessidades Educacionais Especiais), which brings curriculum adaptations for access, indicating the adequacy of objectives, contents, and assessment criteria to meet the diversity of students in the country, highlighting that these are carried out within the pedagogical project, in the curriculum developed in the classroom and at the individual level of the student (Brasil, 1998).

Since then, the curriculum adaptation has been changed by legislation and has undergone academic studies on its meaning. In 2001, the National Council of Education (CNE) instituted the National Guidelines for Special Education in Basic Education in which the term "flexibilization" appears for the first time, used in the sense of a flexible curriculum to meet some students' specific needs not in the sense of impoverishment but of accessibility.

In 2003, the document *Strategies for the education of students with special educational needs* reinforced this possibility of adjustment in the curriculum using the term "adequacy" (Brasil, 2003). In 2011, Decree No. 7.611 was published, providing for special education and specialised educational care. The expressions *reasonable adaptations* and *accessibility* appear in this document in the sense of possibilities of access to the curriculum and attention to students' individual needs.

Whatever name is used, the fact is that adaptations, adequacy, or flexibilisation provoke debate in academia about its use and its limits (Fonseca, 2011; Mendes, 2011; Pletsch, Souza & Orleans, 2017; Xavier, 2018; Capellini, 2018). Eliminating content and simplifying objectives to be achieved –legally possible (Brasil, 1998, 2001, 2003) so that students with disabilities, particularly intellectual disabilities, can advance in their studies– is a cause for concern and reflection.

For Fonseca (2011, p. 36), the terms are distinct. The author distinctly demarcates adaptation, adequacy, and flexibility, offering the following definitions:

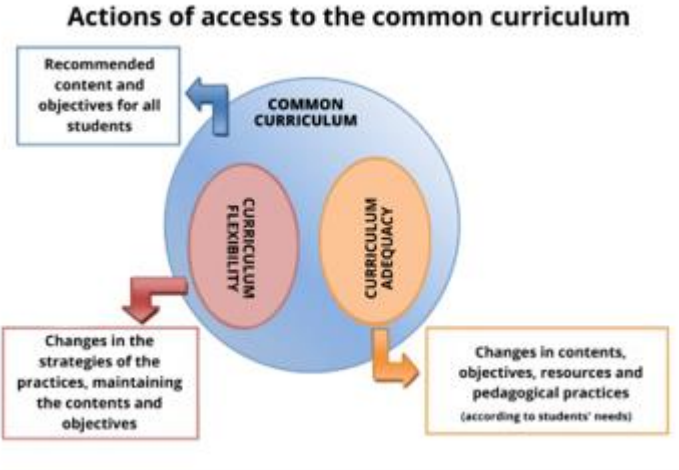
> *Flexibilisation* - Programming of activities designed for the classroom – refers to changes in strategies within the scope of pedagogical practices that do not consider changes in the curricular planning of teaching.
>
> *Adequacy* - Individualised activities that allow access to the curriculum that focus on the teacher's performance in evaluating and meeting the academic needs of each student – concern adjustments to the teaching curriculum planning, considering the need of specific students, predicting changes in objectives, content, resources, and pedagogical practices.
>
> *Adaptation* - Focuses mainly on school organisation and support services, providing structural conditions that may occur in the curriculum planning of the classroom, taking into account individual differences – concerns the change of the

> curriculum planning itself, proposing a changed curriculum for a given student, who may benefit from a planning model different from that worked with the other students.

To this author, flexibility and adequacy are attitudes directed at students' collectivity. However, adaptation consists of a curriculum format specifically aimed at those with significant learning difficulties, such as students with intellectual disabilities—Figure 3 shows, according to Fonseca (2011), the interconnection between flexibility and curricular adequacy.

Figure 3

Interconnection between flexibility and curricular adequacy (translated from Fonseca, 2011, p. 37)



Mendes (2011), when checking the notebook of children with intellectual disabilities, observed contents that were disconnected from what was being studied in class. For the author, curricular differentiation is negative, as it does not allow students to appropriate essential elements in their learning. Xavier (2018) corroborates this idea by stating that curriculum adaptations intrinsically bring the idea of a shorter, poorer curriculum, marked by impossibilities and not exactly by the contextualisation of the learning object.

However, some conceptions consider adaptation, adequacy, and flexibilization as synonyms. Araújo, for example, treats them "as adjustments,

modifications, and differentiations made to understand the special educational needs arising from intellectual disability" (2019, p.28).

Correia (2016) criticises the term adaptation and adequacy, as it also understands that they refer to the simplification and impoverishment of the curriculum. It brings the idea of curricular accessibility as a proposal, and says that "the more accessibility to the curriculum is provided by the methodology used, the fewer individual adaptations will be necessary" (2016, p.154), concluding:

> In summary, what is defended as "accessibility to the curriculum" moves away from the idea of simplification, reduction, and approaches the idea of "support", of making possible the effective participation in the collective process of experiencing the curriculum. It is about giving up apparent equality of results in the name of "equal opportunities". (Correia, 2016, p. 155)

Reflecting on the words and the meanings they produce in those who listen to them, we agree with Correia (2016) that an accessible curriculum comes closer to what is desired in a classroom. Making an analogy with a building, the difference between an affordable house and an adapted house is that the first was thought from the beginning in who would inhabit it, while the second was remodelled due to an unforeseen need. For us, the difference is significant, but we dare not say that the adaptations and even simplifications of the curriculum are the manifestations of discrimination and exclusion.

The need for a significant change in the curriculum to respect the learning conditions of students with disabilities, notably intellectual disabilities, contemplates deeper changes and may result in a specific completion certification of the stage completed by the student. Thus, differentiated certification (DC) became an agenda of the Federal Network (Brasil, 2013, 2019), with the issuance of opinions favourable to the extension of this right to students of technical courses. Therefore, the DC constitutes a form of completion of the technical course that is produced from a differentiated curriculum offered to the student.

Curricular accessibility problematises the need for differentiated certification, as it seeks to preserve the original objectives of the curriculum, presenting it within the universal design for learning theory. We will leave the discussion on differentiated certification for another time and advance the

production of curricular accessibility aimed at a student with intellectual disabilities who is in the 1st year of the course.

METHODOLOGY

The research presented is qualitative, with the action research technique as an activity guideline. The researcher built a focus group with teachers interested in the theme selected from the participation in a broader questionnaire that investigated the degree of knowledge and interest of mathematics teachers in the theme of curricular accessibility.

According to Gray (2012), action research is an adequate form of research when the partnership with subjects with the same interest can cause a union of forces and knowledge for the elaboration of a proposal with the possibility of modifying reality or intervention in practice, in our case, in the classroom. To the author, the various approaches of action research have in common the fact that the agents involved are in a democratic partnership with the researcher, the research is seen as an agent of transformation, and the data (materials) are generated from direct experience with the research participants.

The focus group was composed of five professors from the Sapucaia do Sul campus[1], for reasons of interest and ease concerning the schedules, with weekly meetings totalling four meetings with two hours each.

In the definition of the theme for the didactic sequence, the content of Functions was chosen, a subject seen in the 1st year of high school, which is a fundamental point in the structure of mathematics development. For the application of the proposal, students with intellectual disabilities attending technical courses were indicated as the corpus of analysis.

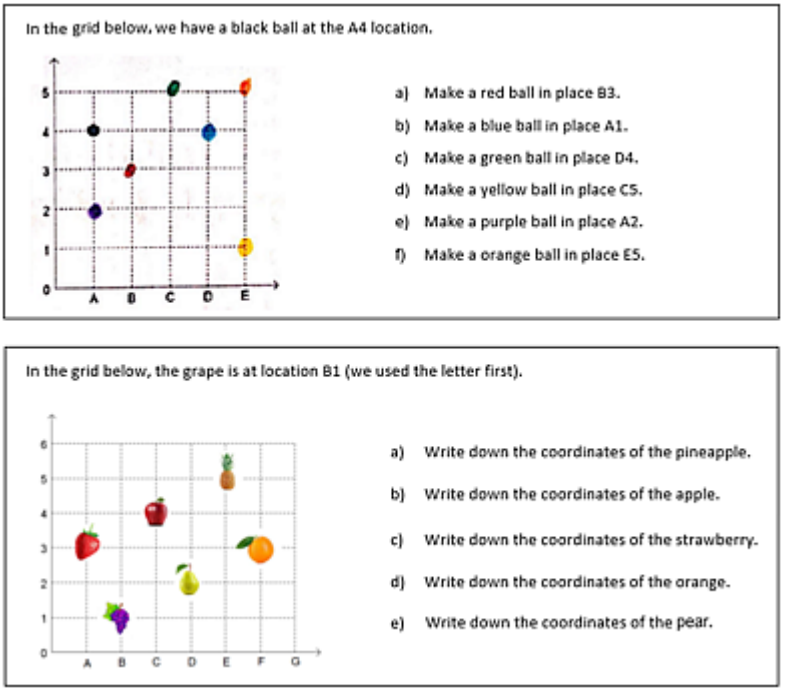
For data analysis, the interpretive descriptive analysis inspired by Rosenthal (2014) was used, in which the analysis starts from the object investigated for the formulation of hypotheses, allowing the proposition of theories. Thus, the analysis allows the investigation of the new and the unknown, the apprehension of the subjective sense, the detailed description, the reconstruction of the complexity of the action structures from the particular case and the verification and construction of hypotheses from a particular case (Rosenthal, 2014).

[1]Research submitted to the Ethics Committee and approved under the CAAE protocol: 39995020.2.0000.5349.

The activity consisted of an initial investigation applied to 5 students with intellectual disabilities entering the 2022 class from the selection process with reservation of vacancies. The initial tasks aimed to assess students' degree of understanding with introductory activities of the subject to be developed, as seen in Figure 4.

Figure 4

Activity for initial investigation



From the results obtained from the five students, three presented satisfactory performance and were discarded from this proposal. Of the two with difficulties, one student did not have free time during the night shift, leaving one student with Down syndrome who was available for intervention.

The meetings took place over one month, with one or two moments per week of 90 minutes in the researcher and student's campus space.

ACCESSIBLE CURRICULUM AND UNIVERSAL DESIGN FOR LEARNING

The origin of the universal design for learning (UDL) is the universal design for architecture, which implies users' accessibility to all spaces. A premise in the conception of UDL is the limitations of the curriculum and how these limitations incapacitate students. UDL, therefore, expands the concept of architectural accessibility and seeks to break down barriers to learning, approaching the concept presented of curricular accessibility. According to Nunes and Madureira (2015), this approach seeks to minimise barriers to learning and maximise the success of all learners, requiring the teacher to perceive the limitations of a standardised curriculum instead of underlining the limitations of students.

The word "universal" may refer to a mistaken understanding that this theory would serve the learning of all students. Valle and Connor (2014, p. 96) state that "universal design for learning is achieved through flexible curricular materials and activities, which provide alternatives for students with different capacities".

According to the UDL Guidelines, organised by the United States Department of Education's Center for Applied Special Technology (CAST):

> The curriculum created following the UDL's reference is planned from the beginning to meet the needs of all students, making subsequent changes, as well as the effort and time linked to them, expendable. UDL's reference encourages flexible proposal creation from the ground up, featuring customisable options that allow all students to progress from where they are, not where we imagine they are. The options to achieve them are varied and robust enough to provide an effective education for all students. (Heredero, 2020, p.735-736)

Here we make a counterpoint that guides our work: we cannot guarantee that the curriculum is accessible to all students because the diversity of subjects, particularly within the intellectual disability, does not allow us to affirm it. We understand UDL as a proposal to remove barriers to learning, adapting to the potentialities and needs of each person. However, as UDL's own conceptions bring, the curriculum is alive, changed, and redesigned. Thus, flexibilities are considered normal and healthy within the program.

UDL has three principles that guide its use. It provides: (1) multiple modes of presentation, (2) multiple modes of action and expression, and (3) multiple modes of involvement and engagement (Heredero, 2020). The principles are broad and general so that they apply to a wide variety of students and can certainly be used, according to their purpose, for people with varied disabilities. The UDL thus provides flexibility in the way information is presented and reduces barriers in teaching, providing adaptations that suit individual needs.

The purpose of the UDL is to set in motion different teaching methods to lessen or remove learning difficulties. The idea comes in line with adapting to the potentialities and needs of each student, promoting curricular accessibility away from a mere adaptation of the curriculum. Thus, UDL constitutes a proposal for continuous reflection on the diversity of the classroom. We do not talk about equal conditions for all students, as the trajectories of each one are different, but we seek to privilege equity in the learning conditions offered.

According to the UDL Guidelines (Heredero, 2020), the components that guide the UDL curriculum are (a) the objectives, (b) the methods, (c) the materials and (d) the assessment. In these components, the objectives are the expectation of learning, the methods are the approaches and procedures to enable learning, the materials are the means used to present the contents, and the assessment is the process of collecting information about the student's performance.

The UDL is premised on the fact that it considers the curriculum deficient and not the students. It considers that the curriculum is designed for the average student as if this average were the standard student within the classroom. Thus, traditional teaching methods exclude extremes and are very harmful to students with learning difficulties. The UDL escapes the stereotype of curricular adaptation and adjusts to the curricular accessibility that we defend, as it intentionally and systematically designs the curriculum to consider individual differences to enable a broader understanding. We differ only in the aspect that it is impossible to anticipate ALL learning possibilities and needs because we consider the statement, "A UDL curriculum provides the means for its restructuring, repairing the damage and promoting the inclusion of all students" (Heredero, 2020, p.741) unreal.

Regarding the UDL fundamentals, they are fully adjusted to the sociocultural development and the zone of proximal development (Vygotsky,

1991), in addition to being compatible with the proposal of walking[2] during the activities for the different audiences in the classroom. The "scaffolding" can be laid out and removed as one progresses in the objectives outlined.

Several researchers (Mendes, 2016; Almeida, 2016; Lima, 2017) point out a lack of curricular accessibility in teaching in their studies, which is strong evidence that other alternatives to access the curriculum need to be considered. The teachers of technical education, in particular, with the recent arrival of students with disabilities, previously invisible at the end of elementary school, need to appropriate the theoretical framework and the options available to adapt to the demands and needs of this public in order to provide development within a new schooling cycle.

As we make sure to highlight, we do not consider UDL as the solution for the inclusion of all students in all curricula because, beyond any theory, individuals have different life histories. Now we are talking about teachers. These stories are very particular, and the myriad of trajectories lead to a roughly inclusive pedagogical practice, depending on personal experiences. But the UDL is an alternative that deserves to be considered and studied, as the proposal expands the options for working in the classroom, becoming a scaffolding for the student and for the teacher. According to Orsati (2013, p.214), "planning the classroom for diversity involves, first, accepting the range of skills, learning styles, capacities and interests in the classroom". It is up to the teacher to advance in this construction and understanding.

It is worth highlighting the concern of several researchers with the impoverishment of the curriculum and the indiscriminate simplification of contents (Mendes, 2011; Pletsch, Souza & Orleans, 2017; Xavier, 2018; Capellini, 2018) due to planning that treats the student with an intellectual disability automatically as incapable. Knowing the DUA Guidelines implies realising that the proposal does not involve a reduction in the supply of subjects that should be studied but in diversifying how the themes are presented to students.

UDL's motto is: "Essential for some, good for all" (Meyer, Rose, & Gordon, 2014, n. p.). These are guiding principles and not a standardised recipe, nor a personified teaching. We cannot be satisfied with the probability distribution curve, which considers that extremes (students with learning

2 Technique of providing support that allows a child or learner to solve a problem, accomplish a task, or achieve a goal that would be beyond their unassisted efforts. (Wood, Bruner, Ross, 1976)

disabilities and giftedness) fall outside the learning objectives – it is not possible to naturalise this, or at least, we should not.

Although UDL is offered to all students, we are particularly interested in its principles for presenting curriculum accessibility to students with intellectual disabilities. According to Meyer, Rose, and Gordon (2014), various means of engagement, various means of representation, and various means of action and expression must be provided. It is important to note that the UDL does not aim to facilitate learning but to present appropriate challenges at each level of development. What keeps students interested is engaging in the activity, which is obtained through a careful selection of contents and strategies offered in developing a topic.

We consider that curriculum accessibility is translated by the UDL's principles. It will be up to teachers to realise that "If a child cannot learn the way it is taught, it is better to teach it the way it can learn." This thought, credited to Marion Welchmann, very well reflects the need to adapt learning strategies to all audiences attending school classes.

In the context of the learning process, Figure 5 presents the three major cortical systems of the brain involved during learning: affective, recognition, and strategic networks.

According to Consenza and Guerra (2011), neuroscience is an area of study dedicated to analysing the central nervous system (CNS) and its actions in the human body. In education, neuroscience assists in understanding how the brain behaves in learning processes from neural connections, which can be stimulated and strengthened with appropriate pedagogical intervention.

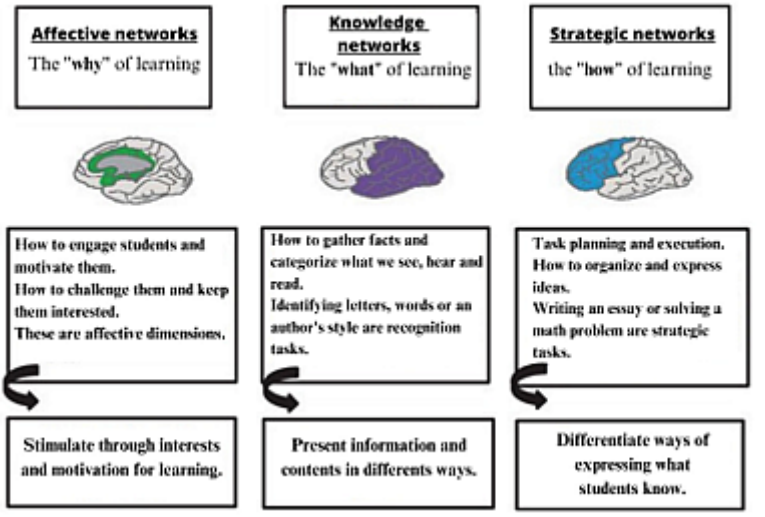
It should be noted that neuroscience is used to support the principles of UDL. According to Meyer, Rose, and Gordon (2014), modern neuroscience sees the brain as a complex web of integrated and overlapping networks, with learning being seen as changes in connections within and between these networks. Thus, it is natural to consider that students learn in different ways, although we insist on standardising ways of offering curriculum. Therefore, UDL emphasises the creation of a flexible and inclusive learning environment that is very appropriate to the historical-cultural conception of Vygotsky (1991), as it considers development, experiences, and social context as fundamental factors in curricular accessibility proposals.

Given these concepts, our proposal of curricular accessibility finds the Federal Institute of South Rio Grande do Sul - Sapucaia do Sul campus as a place of application. The proposal was developed with a student with an

intellectual disability, entering the 1st year of a technical course with a Down Syndrome report.

Figure 5

UDL's *strategies aligned with learning* networks (translated from Zerbato & Mendes, 2018, p.151)



THE PROPOSAL OF AN ACCESSIBLE CURRICULUM, ACCORDING TO THE UDL

The initial school year of the technical courses is particularly challenging, as students are full of doubts and fears about leaving elementary school and entering technical education. With the arrival of an increasingly heterogeneous contingents, the beginning of the work has also been a challenge for teachers.

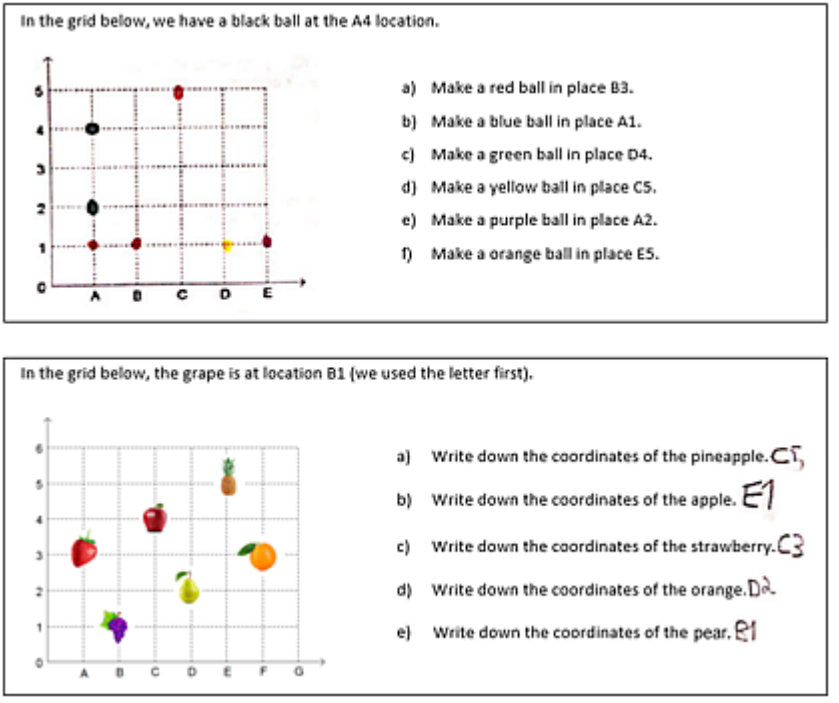
The formation of the focus group to reflect the proposal of ways of accessing the curriculum in a mathematics topic was based on a questionnaire that verified the intention and availability of the teacher to participate in the group to discuss the concepts of curricular accessibility and propose a didactic sequence.

In Mathematics, much of the predominant topic in the 1st year of high school concerns the content of functions. It is a theme that requires an increasing level of abstraction and that relates to various aspects of daily life that the student has difficulty perceiving.

The didactic sequence presented aims to develop this topic of mathematics, and we put as the final objective in this work to be achieved by students (only as a finalist goal in the temporality of the activity) the charting on the Cartesian plane from the law of a function. The proposal is part of a doctoral research that aims to discuss the means of access to the curriculum by students with intellectual disabilities and the form of completion of the course –regular diploma or differentiated certification– that can be achieved.

Figure 6

Initial Investigation Task



The activities start from the premise of being as comprehensive as possible, i.e., that they can be easily replicated in similar contexts within a classroom, which is in accordance with the UDL.

However, we make it clear that the classroom context requires frequent reflections on the directions and redesigns that will be made in order to achieve the proposed objective (and if the objective cannot be achieved, then other means can be launched, such as curriculum differentiation for a new formative itinerary).

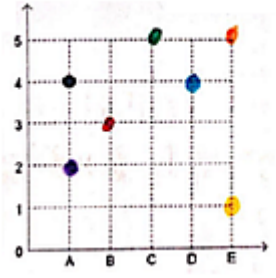
An initial survey, composed of two activities, aimed to identify the student's previous level of development to verify the need to change the sequence initially planned. This follows the UDL Guidelines (Heredero, 2020), which advocate that inflexible curricula generate unintended barriers to access to learning. Figure 6 shows the tasks and the response presented.

Both activities make us realise that the student has not consolidated a location system such as the one proposed. In mathematics, the location is given by the association of a number of the horizontal axis and another of the vertical axis, in that order. The use of letters here is intended to facilitate the understanding of this system and is even used in games and hobbies such as naval battle, which can also be explored as a complement and are within the proposal of the UDL.

Figure 7

Activity 1 of the didactic sequence

In the grid below, we have a black ball at the A4 location.



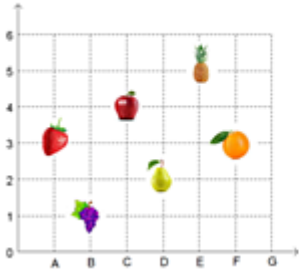
a) Make a red ball in place B3.
b) Make a blue ball in place A1.
c) Make a green ball in place D4.
d) Make a yellow ball in place C5.
e) Make a purple ball in place A2.
f) Make a orange ball in place E5.

During the subsequent consultations with this student, which began one week after the initial investigation, the activities were resumed, now preceded by reading and explanation, which agrees with the UDL, whose first principle concerns precisely providing multiple ways of presenting the task, using scaffolding that must be removed little by little as the student becomes more autonomous. The results were promising, as shown in Figures 7 and 8.

Figure 8

Activity 2 of the didactic sequence

In the grid below, the grape is at location B1 (we used the letter first).



a) Write down the coordinates of the pineapple. E5

b) Write down the coordinates of the apple. D4

c) Write down the coordinates of the strawberry. B3

d) Write down the coordinates of the orange. F3

e) Write down the coordinates of the pear. D2

After the previous explanation, the rate of correct answers in Activity 1 regarding the initial investigation grew 100% (from three to six correct answers). In Activity 2, although there are still some errors, there was a clear improvement compared to the initial activity. It should be noted that the components that guide the UDL are present, as the teacher is clear about where he intends to arrive with the activity (objectives), built an approach that can be replicated in any context (method), provided the activity in an accessible format (material), and gave feedback to the student with an analysis of response (assessment).

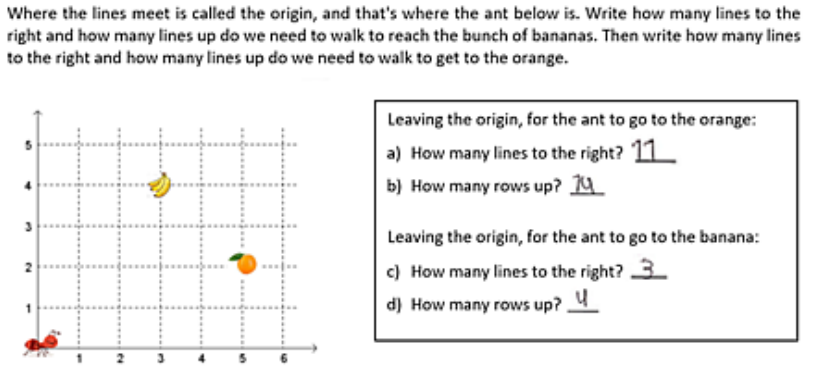
The third activity (Figure 9) withdrew the support of the letters on one of the coordinated axes. The reading and explanation script, followed by the instruction to do the task, continued to be used.

Upon reading the question, the researcher realised that the student felt confused by the word “origin”. In other words, curriculum accessibility should also focus on all aspects of access, including simple language within reach of the student’s knowledge. In addition, using the expression ‘intersecting lines’

to denote the meaning of the word “origin” was not the most appropriate since many lines are found in the figure. When asked why the answer is 11 in the first question, the student pointed out and counted 11 dashed line traces, which reinforces the care that must be taken with the presentation of materials and emphasises that path corrections and language corrections should always be considered. With the researcher’s intervention, the answers (c) and (d) were correct, as shown in Figure 9.

Figure 9

Activity 2 of the didactic sequence



In the fourth activity (Figure 10), after reading and explaining, there was great understanding and a very considerable success rate, with little intervention by the researcher in the activity. During the exercise, the student was reminded of how to present the answer: “One opens parenthesis, puts the number of the ‘laying line’ after the number of the ‘standing line’”. The use of accessible language produced a good result in the resolution of the activity.

Here, we highlight a very expensive principle of curricular accessibility: curricular accessibility is not synonymous with impoverishment, a concern present in the works of Correia (2016), Xavier (2018) and Araújo (2019), who consider it a present risk when we make only one curricular adaptation.

The perceived understanding made it possible to advance to the activity that introduced negative numbers into the Cartesian plane. To achieve this goal,

the tasks brought the idea of right, left, up and down to use the student's sense of location to assist in understanding.

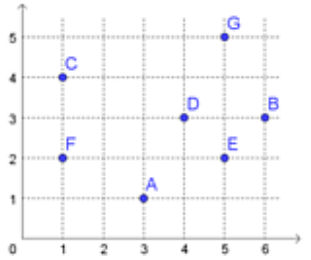
Figure 10

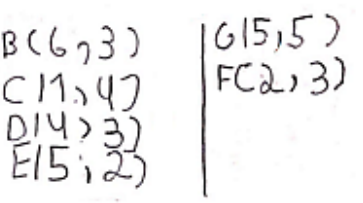
Activity 2 of the didactic sequence

A point has its location represented by two numbers in parentheses separated by a comma, like point A with coordinates (3,1) in the figure. The first number we write is the number of units we must move to the right of the origin. The second number we must write is the top number that locates the point.

In the figure below, point A has its location given by (3, 1), which means that it is located at number 3 to the right of the origin and at number 1 above the origin.

Now write the location of points B, C, E, F and G.





Apparently, there was understanding of the activity, and the expectation of being able to advance to the next objective of the sequence of activities; but a fundamental component of the UDL still needed to be analysed: the assessment. We understand this component as a guarantee that the goal was reached, as presented by Heredero (2020) in his presentation of the UDL.

Thus, a task was presented (figure 12) to ascertain the level of understanding of the developed theme.

The evaluative task was preceded by an explanation of the location of points A and B. When asking the student to mark point C, the first attempt shows point C near the vertical axis. With intervention, the location of points C and D. When asking for the marking of point E, the student made the drawing close to B. This made the teacher end the assessment and reflect on how to remedy the difficulty in the next meeting.

Figure 11

Activity 2 of the didactic sequence

Now let's include the negative numbers.

(a) Leaving the origin, if the ant in the figure walked 4 lines to the right and 3 lines up, note in black where it would stop.
(b) Leaving the origin, if the ant in the figure walked 3 lines to the left and 2 lines down, note in red where it would stop.
(c) Leaving the origin, if the ant in the figure walked 4 lines to the left and 4 lines up, note in blue where it would stop.
(d) Leaving the origin, if the ant in the figure walked 5 lines to the right and 2 lines down, note in green where it would stop.

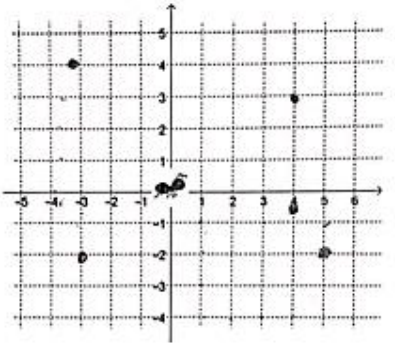
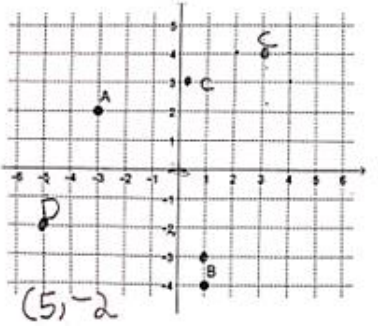


Figure 12

Evaluative task

Remember: at a point, we first look left and right, then up and down. In the figure, we draw the point A(-3, 2) and B(1, -4). Now it's your turn: draw the indicated points.



a) C(3, 4)
b) D(-5, -2)
c) E(4, -3)
d) F(-6, 4)
e) G(4, 0)
f) H(-2, -4)
g) I(0, 5)

Figure 13

Activity with manipulative material

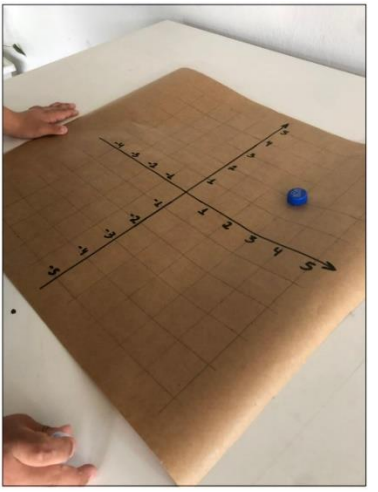
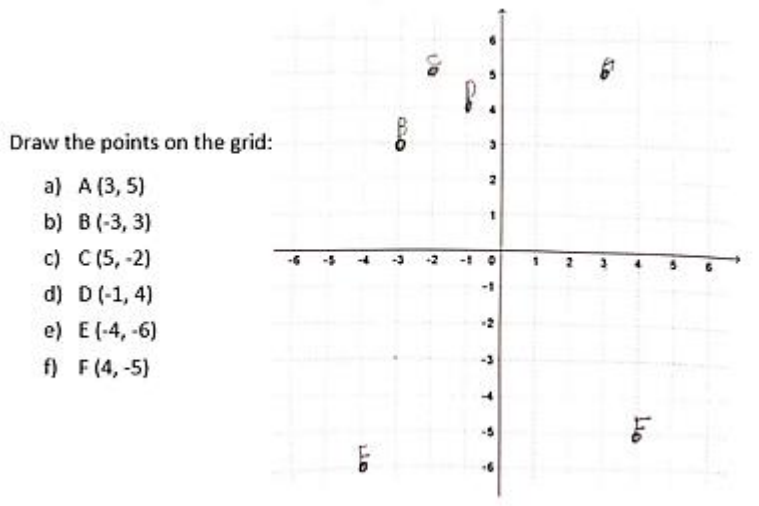


Figure 14

Evaluative task



As Meyer, Rose, and Gordan (2014) emphasise, in UDL, we must provide various means of engagement, representation, action, and expression. To meet this premise, the use of manipulative concrete material was proposed, with the creation of a Cartesian plane on butcher paper with bottle caps symbolising points (figure 13).

The explanations were well understood, and the results after this intervention were very promising, as seen in Figure 14, in a new learning verification process.

Activities to study the relationship between variables were presented to advance the proposal of the didactic sequence. The activities favoured everyday situations in attention to the affective networks that should be privileged in the UDL, that is, to stimulate learning through interests and motivation.

Figure 15

Activity 2 of the didactic sequence

The picture below shows T-shirts held together by clothespins. Note that to hold 1 T-shirt, 2 clothespins were used.

Now complete the table below, indicating how many clothespins are needed for the indicated amount of clothes.

Number of T-shirts	Number of clothespins
1	2
2	3
3	4
4	5
5	6

(a) If there were 6 T-shirts, how many clothespins would be used? 7

(b) If there were 10 T-shirts, how many clothespins would be used? 11

In explaining the question, the researcher realised that the student produced relationships with known facts, which may have facilitated the understanding of the activity. A unique fact is that the student has difficulty retaining count; that is, in previous investigations, the student arrived at a number by counting from the beginning. Here, he answers directly and proudly, faced with the researcher's question: "How many pegs are needed when we have ten t-shirts?" And "11" was the answer, with a smile.

Curriculum accessibility advocates equal opportunities (Correia, 2016), which can be achieved if presented in a way that allows the student to use personal experiences and everyday situations to appropriate the theory. In addition, Vygotsky (1991) points out that the individual is a social being, and, as such, the experiences of collective experience produce stimuli and connections that are used in learning development. In this case, the personal experience of contact with a family member who extended clothes in this way facilitated the understanding of the activity and the correction of the response.

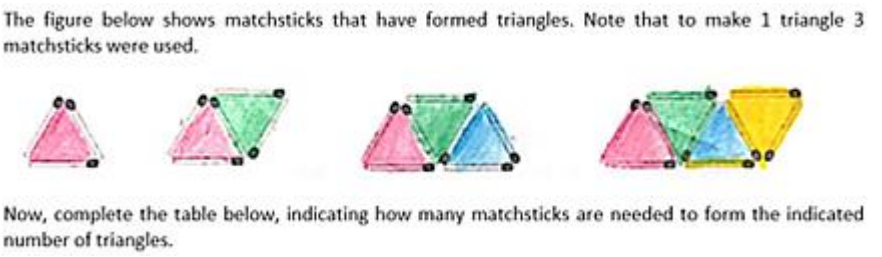
Following the activities, the figure of triangles formed by matchsticks was used as a proposal to present the notion of relationship, which could be adequately explored with concrete material. We noticed, then, in the reading of the activity, that the student had not yet internalised the meaning of a 'triangle'.

> *Researcher: How many triangles are there at the beginning of the picture?*
> *Student: 1, 2, 3... (counting the matchsticks).*
> *Q: Yes, G (student name) is not a triangle. These are the sides of the triangle. Triangle is the inner region.*
> *Q: Look at the next drawing (researcher pointing to the second figure of the sequence). How many triangles are there?*
> *E: 1, 2, 3, ... (counting the matchsticks).*

The dialogue above shows what we talk about when we argue that planning is never static, and the teacher must always be attentive to promote curricular accessibility. The student was then asked to paint each internal region of the figure, again explaining that this would be the triangle.

Figure 16

Activity 2 of the didactic sequence



Researcher: How many colours did you use in the painting of the first drawing?
Student: Red.
R: How many triangles are in the first drawing?
Student: One.
R: And how many matchsticks?
S: 1, 2, 3.
R: And in the second figure? What colours did you use?
S: Red and green.
R: How many triangles? Each colour is a triangle.
S: Two
R: And how many matchsticks are in the drawing?
S: 1, 2, 3, 4, 5, 6 (counting the matchsticks).

After understanding the meaning of a triangle in the sentence, the student could count the matchsticks used and complete the table correctly. To produce the abstraction sought in these activities, the use of concrete material is an ally and should be used as a catalyst for learning. UDL aims to set different teaching methods in motion to lessen or remove learning difficulties.

Figure 17

Activity 2 of the didactic sequence

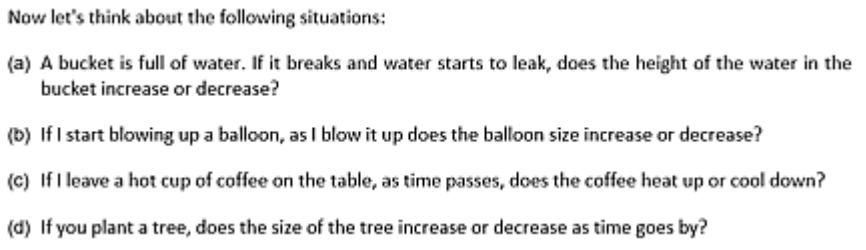
Now, complete the table below, indicating how many matchsticks are needed to form the indicated number of triangles.

Number of triangles	Number of matchsticks
1	3
2	5
3	7
4	9
5	11

In the continuity of the study, everyday situations were brought up. Figure 18 shows the initial activity in which the teacher researcher read the question and formulated each question. Abstraction refers, in this case, to the student accessing their personal experiences to answer, according to the sociocultural context of learning (Vygotsky, 1991).

Figure 18

Activity 2 of the didactic sequence


Now let's think about the following situations:

(a) A bucket is full of water. If it breaks and water starts to leak, does the height of the water in the bucket increase or decrease?

(b) If I start blowing up a balloon, as I blow it up does the balloon size increase or decrease?

(c) If I leave a hot cup of coffee on the table, as time passes, does the coffee heat up or cool down?

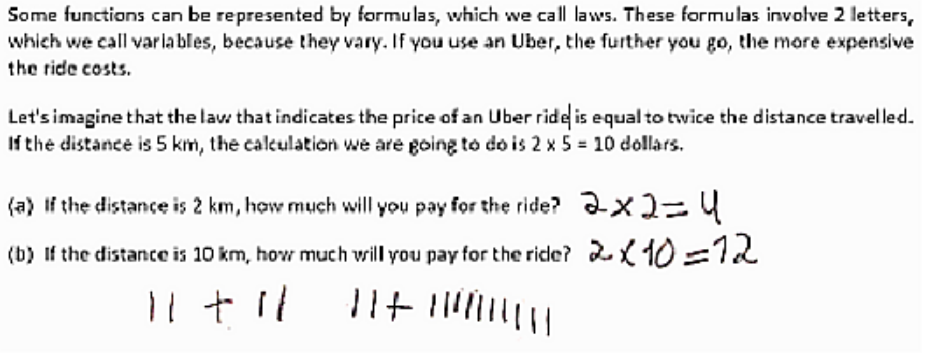
(d) If you plant a tree, does the size of the tree increase or decrease as time goes by?

In three of the four situations, there was a hit. When asked why the temperature of the coffee rose, the answer was, "Because coffee is hot." In the next appointment, having returned to the same question, the four were answered correctly after the following intervention of the researcher: "If you hold a little to drink the coffee, does it get warmer?" Given this direction, the answer was correct.

The following situation (Figure 19) took advantage of a means of transport that the student used. To start the activity, the researcher asked if he used Uber. He said yes, with his father. As he was asked about the places he went and what price he paid, he said that "The farther the place, the more his father paid."

Figure 19

Activity 2 of the didactic sequence


Some functions can be represented by formulas, which we call laws. These formulas involve 2 letters, which we call variables, because they vary. If you use an Uber, the further you go, the more expensive the ride costs.

Let's imagine that the law that indicates the price of an Uber ride is equal to twice the distance travelled. If the distance is 5 km, the calculation we are going to do is 2 x 5 = 10 dollars.

(a) If the distance is 2 km, how much will you pay for the ride? 2x2=4

(b) If the distance is 10 km, how much will you pay for the ride? 2x10=12

11 + 11 11+ 11111111

The situation reported that the course fare was double the distance, but the student did not know the meaning of the word “double”. Explained as being twice the distance value (the teacher showed in table 2 x 2 and 2 x 10), the calculation he presented did not represent the meaning of the product. There began a change in the structure of activities to account for this limitation.

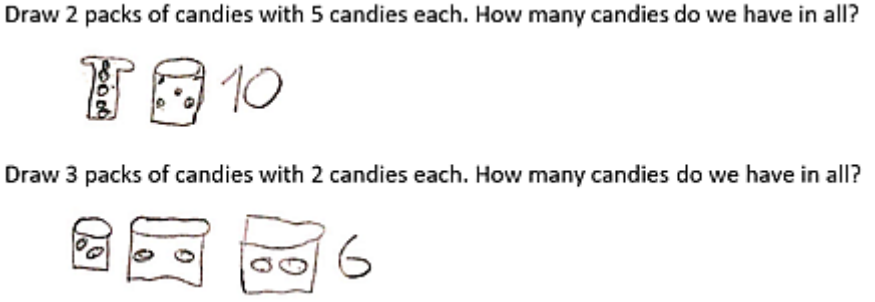
As can be seen, in the product operation, the student quantified the numbers involved in the activity with scratches and always added them.

The question constituted a barrier since, in the study of mathematics, expressions such as 2X, 3Y, 2M are commonplace in the algebraic part. For the next visit, the researcher adapted the activity. Here we make a point of suggesting that what we are doing is a curriculum accessible to the need of the student with intellectual disabilities and, by extension, to a wide variety of individuals who inhabit the classrooms.

The concern of several authors for the simplification of the curriculum when talking about curriculum adaptation (Mendes, 2011; Pletsch, Souza & Orleans, 2017; Xavier, 2018; Capellini, 2018) is not present in the idea of adapting an activity for a better understanding. The meaning of 2X, i.e., the way to express two sets with X things, is not trivial, and in several classes in which this researcher teaches, this understanding is not present even in high school.

Figure 20:

Activity 2 of the didactic sequence



As a proposal to continue in the search to promote the development of the concept of relationship and function and to ensure that the student operates exercises related to this content, activities involving everyday situations were

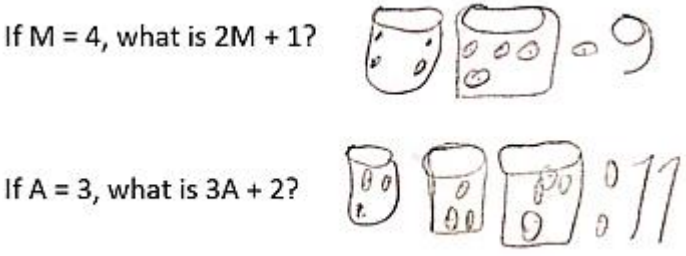
brought, as UDL predicts (Heredero, 2020). In Figure 20, modifying the initial planning but understanding that the search for an accessible curriculum requires continuous changes in direction, we show exercises involving sets of candy to build the understanding we need.

The student only understood it after the teacher intervened, making the first drawing on the green board. Afterwards, the student understood and reproduced the figures.

Next, a situation in which the research professor used the analogy with packets of candy and the quantity of candy inside and outside the package was presented. With appropriate explanations and questions, the student related the expression and its result to the previous activity, producing meaning for the question at hand.

Figure 21

Activity 2 of the didactic sequence

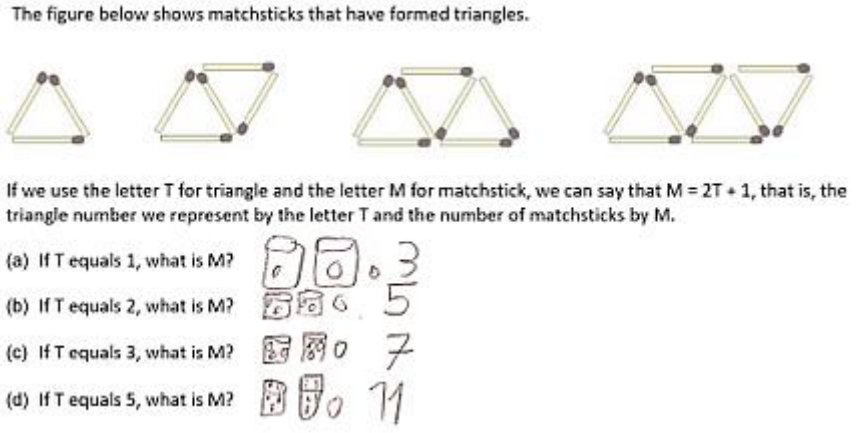


Researcher: What does this 2 represent, showing the expression 2M + 1?
Student: The number of packages (of candies).
R: What does M = 4 represent?
S: The candy inside the package.
R: Then draw two packets and put four candies inside each one.
R: What about this 1, showing the expression 2M + 1?
S: The candy outside (of the package).

Moving forward, the activities initially planned were resumed with the expectation that the student would now be able to understand and answer. The analogy was still necessary with candies for the explanation, but the construction indicated more and more understanding and autonomy in the answers.

Figure 22

Activity 2 of the didactic sequence

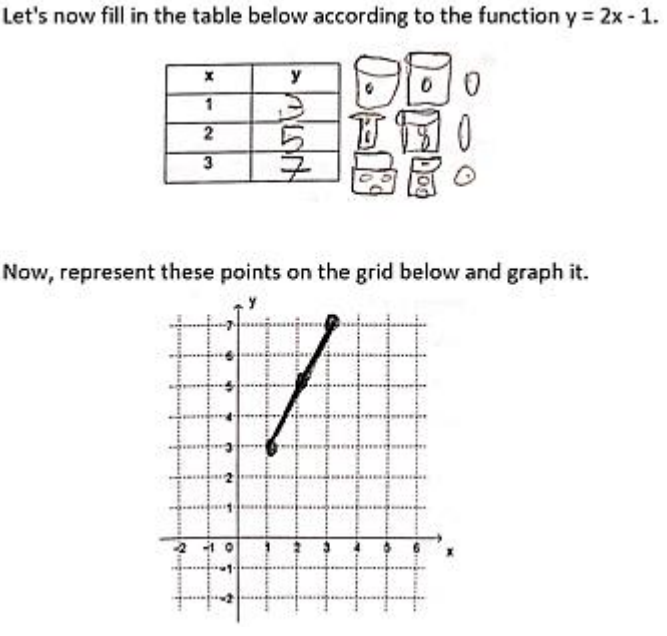


The study of functions occupies a large part of the mathematics content of the 1st grade of high school. In this sequence of activities, we list the objective of developing the idea of relationship between variables and define as the endpoint of this accessibility proposal curriculum the construction of graphs as a representation of the association between two of these variables. Thus, the last activities of this didactic sequence converge towards this goal.

Figure 23 presents the activity and the way to access it used by the student, who, we believe, demonstrates flexibility and understanding of the task. It is observed that there was no suppression of the objectives in the presented sequence, a concern present in several researchers (Mendes, 2011; Pletsch, Souza & Orleans, 2017; Xavier, 2018; Capellini, 2018), but only a reorganisation and care in presenting an accessible curriculum along the lines of what UDL recommends.

Figure 23

Activity 1 of the didactic sequence



The only support in the activity given by the researcher was questions, as in the dialogue below:

> *Researcher: What does this 2 represent, showing the expression 2M + 1?*
> *Student: The number of packages (of candies).*
> *R: What does x = 1, 2 and 3 represent (pointing to the table)?*
> *S: The candy in the package.*
> *R: What about this 1, showing the expression y = 2x + 1?*
> *S: The candy outside (of the package).*

We believe that the student achieved the objectives in the established sequence and recognise that there were adjustment needs throughout the proposal motivated by discovering gaps in learning simpler concepts.

FINAL CONSIDERATIONS

The perception that individuals who attend a classroom have different life histories, with skills and difficulties in different areas, should be sufficient to understand that curriculum accessibility is directed to all audiences.

The educator's role is to offer multiple forms of access to the curriculum, since diversity implies different learning modes. Thus, using the premises of the universal design for learning to present the contents that will be worked on in the subject is a strategy that meets the needs of a heterogeneous class, as the UDL considers individual differences regarding skills, interests, and learning styles.

The proposal forwarded in this work and the results achieved corroborate the expectation that an accessible curriculum allows the development of skills and competencies that a traditional approach could not produce. Understanding that disability is not synonymous with inability requires reflection on the practice itself and, above all, realising that the disability may be the class format itself.

We consider that the results produced show that curricular accessibility that considers the principles of UDL is a successful strategy in presenting a didactic sequence aimed at developing content.

AUTHORS CONTRIBUTION STATEMENT

MAD was responsible for the theoretical framework and data collection, while MG guided the theoretical assumptions, the methodological referrals, and the writing follow-up. The results and final considerations were discussed and written by both authors.

DATA AVAILABILITY STATEMENT

The authors agree to make their data available upon reasonable request from a reader. It is up to the authors to determine whether a request is reasonable.

REFERENCES

Almeida, R. V. M. (2016). *A construção do conhecimento e o letramento de alunos com deficiência intelectual*. (Dissertação de Mestrado). Universidade Federal de Goiás, Goiânia, GO, Brasil.

Araújo, M. A. (2019). *Adaptações curriculares para alunos com deficiência intelectual: das concepções às práticas pedagógicas*. (Dissertação de Mestrado). Programa de Pós-Graduação em Educação, Universidade Federal de Goiás, Catalão, GO, Brasil.

Brasil. (1996). *Lei nº 9.394, de 20 de dezembro de 1996*. Estabelece as diretrizes e bases da educação nacional. https://www.planalto.gov.br/ccivil_03/Leis/L9394.htm

Brasil. (1998). Secretaria de Educação Fundamental. Parâmetros curriculares nacionais: Adaptações Curriculares / Secretaria de Educação Fundamental. Secretaria de Educação Especial. MEC/SEF/SEESP.

Brasil. (2001). *Resolução nº 2, de 11 de setembro de 2001*. Institui Diretrizes Nacionais para a Educação Especial na Educação Básica. http://portal.mec.gov.br/cne/arquivos/pdf/CEB0201.pdf

Brasil. (2003). Ministério de Educação. *Estratégias para a educação de alunos com necessidades educacionais especiais*. Aranha, M. S. F. (Org.). Ministério da Educação, Secretaria de Educação Especial. http://portal.mec.gov.br/seesp/arquivos/pdf/serie4.pdf

Brasil. (2003). *Declaração de Salamanca: recomendações para a construção de uma escola inclusiva*. Coordenação geral: SEESP/MEC; organização: Maria Salete Fábio Aranha. Brasília: Ministério da Educação, Secretaria de Educação Especial. http://portal.mec.gov.br/seesp/arquivos/pdf/serie3.pdf

Brasil. (2008). *Política Nacional de Educação Especial na Perspectiva da Educação Inclusiva*. MEC/SEESP. http://portal.mec.gov.br/arquivos/pdf/politicaeducespecial.pdf

Brasil (2008). *Lei n° 11.892, de 29 de dezembro de 2008*. Institui a Rede Federal de Educação Profissional, Científica e Tecnológica, cria os Institutos Federais de Educação, Ciência e Tecnologia, e dá outras providências. http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2008/lei/l11892.htm

Brasil. (2011). *Decreto nº 7.611, de 17 de novembro de 2011.* Dispõe sobre a educação especial, o atendimento educacional especializado e dá outras providências. https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2011/decreto/d7611.htm

Brasil. (2013). *Parecer CNE/CEB nº 2/2013*. Consulta sobre a possibilidade de aplicação de Terminalidade Específica nos cursos técnicos integrados ao Ensino Médio, pelo Instituto Federal do Espírito Santo (IFES). http://portal.mec.gov.br/index.php?option=com_docman&view=download&alias=13586-pceb002-13&Itemid=30192

Brasil. (2015). *Lei nº 13.146 de 6 de julho de 2015*. Institui a Lei Brasileira de Inclusão da Pessoa com Deficiência (Estatuto da Pessoa com Deficiência). https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2015/lei/l13146.htm

Brasil. (2016). *Lei nº 13.409, de 28 de dezembro de 2016*. Altera a Lei nº 12.711, de 29 de agosto de 2012, para dispor sobre a reserva de vagas para pessoas com deficiência nos cursos técnico de nível médio e superior das instituições federais de ensino. http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2016/lei/l13409.htm

Brasil. (2019). *Parecer CNE/CEB nº 5/2019*. Consulta do Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Sul . . . visando desenvolver uma política de aplicação do procedimento de certificação diferenciada e assegurar o direito à terminalidade específica aos educandos. http://portal.mec.gov.br/index.php?option=com_docman&view=download&alias=118421-pceb005-19&category_slug=julho-2019-pdf&Itemid=30192

Cosenza, R. M. & Guerra, L. B. (2011). *Neurociência e Educação: como o cérebro aprende*. Artmed.

Capellini, V. L. M. F. (2018). *Adaptações curriculares na inclusão escolar: Contrastes entre dois países*. Appris.

Correia, G. B. (2016). *Deficiência, Conhecimento e Aprendizagem: uma análise relativa à produção acadêmica sobre Educação Especial e Currículo.* (Dissertação de Mestrado). Universidade Federal do Rio

Grande do Sul, Porto Alegre, RS, Brasil. https://www.lume.ufrgs.br/handle/10183/147927

Diogo, M.A. & Geller, M. (2022). A educação especial e os cursos técnicos: a visão dos docentes sobre os processos de adaptação curricular. *Revista Brasileira de Educação Especial, 28*(e0122) 561-578. https://doi.org/10.1590/1980-54702022v28e0122

Fonseca, K. A. (2011). *Análise de adequações curriculares no Ensino Fundamental: subsídios para programas de pesquisa colaborativa na formação de professores*. (Dissertação de Mestrado). Programa de Pós-Graduação em Psicologia do Desenvolvimento e Aprendizagem, Universidade Estadual Paulista, Bauru, SP, Brasil.

Gray, D. E. (2012). *Pesquisa no Mundo Real*. (2a ed.). Porto Alegre: Penso.

Heredero, E. S. (2020). Diretrizes para o Desenho Universal para a Aprendizagem (DUA). *Revista Brasileira de Educação Especial*, *26*(4), 733-768. https://doi.org/10.1590/1980-54702020v26e0155

INEP. (2022). Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. *Sinopse Estatística da Educação Básica 2008-2021*. Inep. https://www.gov.br/inep/pt-br/acesso-a-informacao/dados-abertos/sinopses-estatisticas/educacao-basica

Lima, M. F. C. (2017). *O que significa mediar a escolarização de alunos com deficiência intelectual?* Dissertação (Dissertação de Mestrado). Universidade Federal Rural do Rio de Janeiro, Seropédica, RJ, Brasil.

Mendes, G. M. L. (2011) As práticas curriculares nos cadernos escolares: registros de inclusão? In: M. D. Pletsch, & A. Damasceno (Orgs.), *Educação especial e inclusão escolar: reflexões sobre o fazer pedagógico* (pp.137-148). EDUR.

Mendes, R. S. (2016). *A escolarização de alunos com deficiência intelectual no ensino fundamental da rede de ensino de Itajaí – SC*. (Dissertação de Mestrado). Universidade do Vale do Itajaí, Itajaí, SC, Brasil.

Nunes, C. & Madureira, I. (2015). Desenho Universal para a Aprendizagem: construindo práticas pedagógicas inclusivas. *Da Investigação às Práticas*, *5*(2), 126-143.

Orsati, F. T. (2013). Acomodações, modificações e práticas efetivas para a sala de aula inclusiva. *Temas sobre Desenvolvimento*, *19*(107), 213-222.

Pletsch, M. D., Souza, F. F., & Orleans, L. F. (2017). A diferenciação curricular e o desenho universal na aprendizagem como princípios para a inclusão escolar. *Revista Educação e Cultura Contemporânea*, *14*(35), 264-281.

Rosenthal, G. (2014). *Pesquisa social interpretativa: uma introdução*. Edipucrs.

Valle, J. W. & Connor, D. J. (2014). *Ressignificando a deficiência: a abordagem social às práticas inclusivas na escola*. AMGH.

Vigotski, L. S. (1991). *A formação social da mente*. (4a ed.). Martins Fontes.

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry*, *17*(1), 89-100.

Xavier, M. S. (2018). *Acessibilidade curricular: refletindo sobre conceitos e o trabalho pedagógico*. (Dissertação de Mestrado). Programa de pós-graduação em Educação, Universidade Federal de Santa Maria, Santa Maria, RS, Brasil.

Zerbato, A. P., & Mendes, E. G. (2018). Desenho universal para a aprendizagem como estratégia de inclusão escolar. *Educação Unisinos*, *22*(2), 147-155. https://doi.org/10.4013/edu.2018.222.04