EDUCATIONAL PRACTICES BASED ON UNIVERSAL DESIGN FOR LEARNING (UDL)

PRÁTICAS EDUCATIVAS PAUTADAS NO DESENHO UNIVERSAL PARA APRENDIZAGEM (DUA)

PRÁCTICAS EDUCATIVAS BASADAS EN EL DISEÑO UNIVERSAL PARA EL APRENDIZAJE (DUA)

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ABSTRACT: This article intends to present the Universal Design for Learning, with its principles and its use in educational practices fundamentally on the essential components of the curriculum: objectives, methodologies, resources and evaluation. From a qualitative research, developed through a bibliographic research on the UDL with a focus on Higher Education. We consider that working with UDL can mean a change in the way of thinking about educational practices, since it proposes, from the approach of ideas to achieve the motivation of the learners, a flexibility in the ways in which the information is presented and in the way proposal for students to express the knowledge acquired. We found that various researchers proposed other ways of organizing their classes and/or scheduling activities, so that all students could interact and learn, as well as be able to reflect on their own learning, with a more motivating connotation. This shows the need to think about the inclusion of the UDL principles in teaching planning for a school of quality, equity and for all.

KEYWORDS: Universal Design for Learning. UDL. Educational Practices. Inclusion.

RESUMO: *Este artigo objetiva apresentar o Desenho Universal para a Aprendizagem (DUA), os princípios e uso no desenvolvimento de práticas educativas relacionadas aos componentes essenciais do currículo: objetivos, estratégias de ensino, materiais, recursos e avaliação. Trata-se de um estudo qualitativo, cunhado pela pesquisa bibliográfica acerca do DUA, e direcionado para a Educação Superior. O DUA pode significar uma mudança no pensamento da prática educacional, a partir de um trabalho de motivação para com os estudantes, servindo-se da flexibilização da maneira como a informação é apresentada e na maneira proposta para que os estudantes respondam ou expressem conhecimentos e habilidades. Constatamos que os pesquisadores conseguiram propor outras formas de*

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organizar suas aulas e/ou ministrar os conteúdos, de modo que todos os estudantes pudessem interagir, participar e aprender ativamente; ter a experiência de um processo de reflexão sobre suas próprias aprendizagens, ficando mais engajados no processo. Isso evidencia a necessidade de pensar na inclusão dos princípios do DUA nos planejamentos docentes para uma escola de qualidade, com equidade e para todos.

***PALAVRAS-CHAVE**: Desenho Universal para Aprendizagem. DUA. Práticas educativas. Inclusão.*

***RESUMEN**: Este trabajo tiene como objetivo presentar el Diseño Universal para el Aprendizaje (DUA), con sus principios y su utilización en prácticas educativas relacionadas a los componentes esenciales del currículo: objetivos, metodologías, materiales, recursos y evaluación. A partir de una investigación de tipo cualitativo, desarrollada por medio de búsqueda bibliográfica sobre el DUA con foco en la Educación Superior. Nos planteamos que trabajar con DUA puede significar un cambio en la forma de pensar sobre las prácticas educativas, pues propone, desde el planteamiento de ideas para conseguir la motivación de los aprendices, una flexibilización de las formas como la información es presentada y en la manera propuesta para que los estudiantes expresen los conocimientos adquiridos. Constatamos que diversos investigadores propusieron otras formas de organizar sus clases y/o programar las actividades, de modo que todos los estudiantes pudiesen interactuar, participar y aprender, así como poder reflexionar sobre sus propios aprendizajes, con una connotación más motivadora. Eso pone de manifiesto la necesidad de pensar sobre la inclusión de los principios del DUA en la planificación docente para una escuela de calidad, equidad y para todos.*

***PALABRAS CLAVE**: Diseño Universal para el Aprendizaje. DUA. Prácticas educativas. Inclusión.*

Introduction

In an attempt to meet a growing demand for inclusion and minimize barriers in the schooling of all students, among them those with disabilities, the perspective of the Universal Design for Learning (UDL) is presented as another possibility of educational practice in the process of developing flexible and organized educational environments, whose principles and guidelines enable the non-hierarchization or favoring a single way of learning, but promoting greater interaction and learning for students and teachers (CHA; AHN, 2014; EDYBURN, 2010; RAO; OK; BRYANT, 2014; ROSE *et al.,* 2006).

In order to materialize the practices of inclusive education, it is necessary, among other things, some form of reorganization of the school curriculum, from the proposal to be considered, by Brazilian standards, as open and flexible. Conceptually, we must consider that we find, within this perspective, the so-called adaptations or adjustments, the flexibilities, and also the curricular differentiations.

One of the tools that demonstrate a completeness for the development of inclusive education is the so-called curricular differentiation, which is concretized in the UDL with its three principles, which make it possible to create challenging and engaging learning environments for all students.

The model of curriculum organization of the UDL is a tool with great potential in combating discrimination and exclusion, in comparison with other inclusive pedagogical practices, no less valid, but directed to only one student. Nowadays, there is already an understanding that all students can learn, both through UDL and individualized forms of curriculum organization.

The use of Universal Design for Learning, as set forth in the Higher Education Opportunity Act of 2008 (BRAZIL, 2008), has a series of scientifically valid references to guide educational practice that:

a) Provides flexibility in the ways in which information is presented, and in the ways in which students respond to or demonstrate their knowledge and skills, and in the ways in which students are motivated and engaged in their own learning;

b) Reduces barriers in the way of teaching, provides appropriate adaptations, supports/help and challenges, and maintains high expectations for success for all students, including those with disabilities and those who are limited by their language competence in the language of learning.

From the above, this paper aims to present Universal Design for Learning (UDL), as well as the principles and use in developing educational practices related to the essential components of the curriculum, namely: objectives, teaching strategies, materials, resources, and assessment. This is a qualitative study, coined by the bibliographic research about the UDL, in which, in Brazil, there is still little research, and it is also directed to Higher Education. We will describe the philosophical principles of UDL and the educational practices from the perspective of UDL.

Universal Design for Learning

Initially, in order to understand what we are talking about, we must start by explaining and understanding the principles of UDL: the multiple ways to access information and knowledge ("what" of learning); the multiple ways to approach strategic tasks (the "how" of learning) and the multiple ways to become and remain engaged in learning (the "why" of learning) (EDYBURN, 2010; MEYER; ROSE; GORDON, 2014; ROSE; MEYER, 2002).

These three principles that underlie this form of educational practice complement each other as guidelines for its application at any educational level.

Principle I: Provide Multiple Modes of Presentation (The "what" of learning). Students differ in the ways they perceive and understand information presented to them. For example, those with sensory disabilities (blind and deaf), with learning disabilities or specific learning disorders (dyslexia, dyscalculia, dysmorphography, attention deficit hyperactivity disorder), with other languages or cultures, may require different ways to ascend to content. Others may simply grasp information faster or more efficiently through visual or auditory formats than with printed text.

UDL starts from the basis that learning and transfer of learning must occur by providing multiple forms of presentations, multiple ways of presenting the same content, activity, as this allows for the variability of students, from consideration of multiple intelligences and, in time, making connections within as well as between concepts. In summary, there is no one medium of optimal or ideal representation for all students; providing multiple modes of presentation of content is essential to reach all.

Principle II: Provide Multiple Modes of Action and Expression (The "how" of learning). Students differ in the ways they seek knowledge and express what they know. For example, people with significant movement changes (cerebral palsy), those with difficulties in strategic and organizational skills (executive function disorder), those with barriers with communication, etc., do the action and expression of learning very differently. Some may be able to express themselves well with a written text, but not orally, and vice versa.

This principle is based on the recognition that action and expression require a great deal of strategy, practice and organization, because everyone may have different ways of exposing the same thing, and this is another aspect in which students differ, related to creativity and divergent thinking.

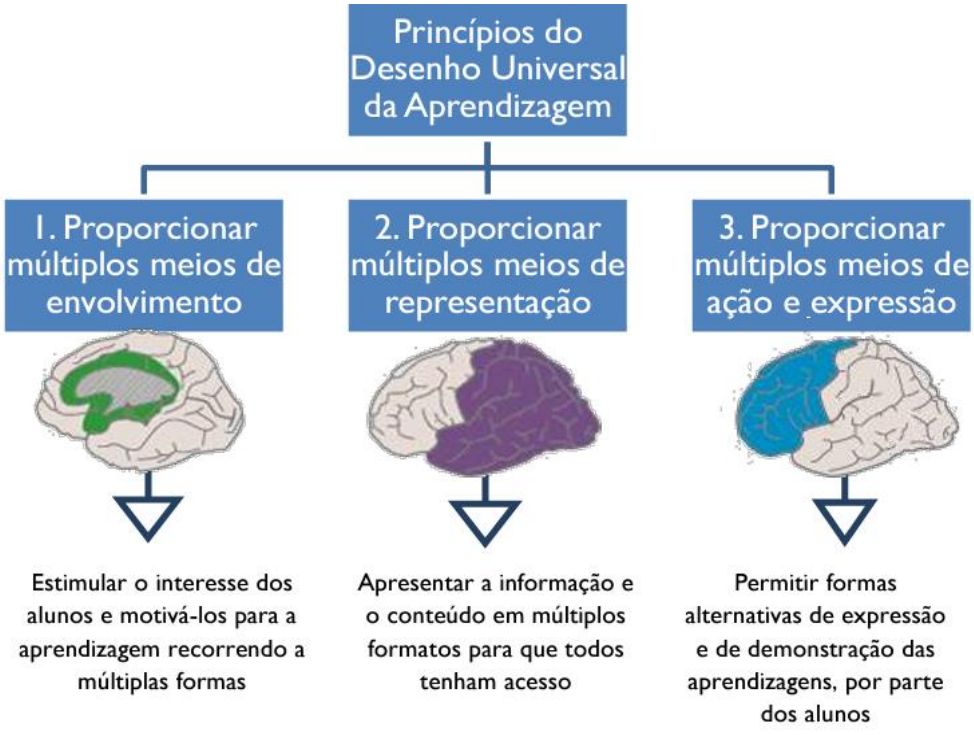
In reality, there is not an optimal or ideal means of action and expression for all students, the one-size-fits-all models of evidence are not efficient when it comes to proving or understanding learning processes, so one must promote varied options for action and expression to manifest.

Principle III: Provide Multiple Modes of Implication, Engagement, and Involvement (The "why" of learning). People's emotions and affectivity are a crucial element of learning, and students differ remarkably in the ways in which they can be provoked and motivated to learn.

There is a diversity of sources that influence when it comes to explaining individual affective variability and engagement. These can be neurological and cultural factors, personal interests, subjectivity, and prior knowledge, along with another variety of factors present in these guidelines. Some students are very spontaneously interested in novelty, while others lack the interest to be included and are frightened by these facts, preferring routine activities. Some students prefer to work alone, while others prefer to work with their classmates. In reality, there is no single medium that is optimal for all students in all contexts. Therefore, it is essential to provide multiple modes of involvement and engagement.

In order to represent this planning process, in Figure 1 we show the objectives of each principle, so that the teacher can support himself in this investigative process of organizing his teaching activity, from an inclusive perspective.

Figure 1 – UDL's basic principles for teacher planning from an inclusive perspective[4]



Source: CAST (2011)

[4] Princípios do Desenho Universal da Aprendizagem = Principles of Universal Design of Learning; Proporcionar múltiplos meios de envolvimento = Provide multiple means of involvement; Proporcionar múltiplos meios de representação = Provide multiple means of representation; Proporcionar múltiplos meios de ação e expressão = Provide multiple means of action and expression; Estimular o interesse dos alunos e motivá-los para aprendizagem recorrendo a múltiplas formas = Stimulate students' interest and motivate them to learn in multiple ways; Apresentar a informação e o conteúdo em múltiplos formatos para que todos tenham acesso = Present information and content in multiple formats for everyone to have access to; Permitir formas alternativas de expressão e demonstração das aprendizagens, por parte dos alunos = Allow alternative forms of expression and demonstration of learning by students

Rose and Meyer (2002) recognize that these three principles are directly related to the three main neural networks-an intrinsic relationship with neuroscience-that are involved in the variability of the learning process, in which they comprise:

- the recognition networks (gathering and categorizing what is seen, heard, and read);

- strategic networks (organizing and expressing ideas);

- affective networks (linking the learning experience to an emotional background, determining involvement and motivation).

The first network, the recognition network, whose principle is the Means of Representation, encompasses the different ways of accessing information or content, whether through visual, auditory, and other abilities (ROSE *et al*., 2006).

The representation principle points paths that can be offered to the learner, so that they access prior knowledge, concepts and ideas from the presented information, that is, it provides support to build knowledge about the subject taught. To do this, a variety of examples should be presented, highlighting the salient and important features of each, through various types of media and other formats that offer this information. Practical examples would involve the use of digital books, specialized software and specific website resources, preparation of posters, schematics and summaries of texts, construction of tactile and visual cards with color codes, among others (ROSE; MEYER, 2002).

The second network, called Strategic Network, has as its principle the action and expression, and encompasses the demonstration of what the student has learned, which takes into account the student's choices, preserving their autonomy (CAST, 2011). The teacher should be the provider to the students of opportunities for them to demonstrate what they know, through differentiated activities, which include physical actions, media, construction of objects, written production, among others (ZERBATO; MENDES, 2018).

The third network is the affective, which corresponds to the principle of engagement, that is, the why of learning, the motivation that a student has to learn and the flexibility and the availability of various means that allows to accommodate the characteristics of each one, their culture, their subjectivity and basic knowledge, because there is not a standard for participation to occur (CAST, 2011).

Educational practices with the UDL

According to the Center for Applied Special Technology (CAST, 2011), the institution that founded the concept of UDL, led by Meyer and researchers, the educational institution that bases its practices on the Universal Design for Learning understands the curriculum in a flexible way, built based on the characteristics of students and built in spaces commonly heterogeneous as the school, specifically the classroom.

The recognition of these student diversities can direct the teacher and the institution to generate changes and the creation and implementation of teaching strategies capable of reducing and minimizing learning differences and the different ways of learning. This knowledge allows us to reflect on the variability in the learning process and the need to rethink the way teaching is done in a closer relationship with the premises of UDL in general education.

The current model leads us to the need to rethink that being "universal" does not mean being "equal for all", but implies that curricula and materials should be conceived/designed to accommodate the widest possible variety of learners' preferences and needs, which is strongly advocated by authors Rappolt-Schlichtmann *et al*. (2013). It is necessary and of fundamental importance to anticipate the diagnosis of a class so that student variability is considered as a strength in the instructional planning process (SMITH, 2012).

Even being aware of the differences in learning, we still experience a situation of great dilemma, both in Brazil and in other countries with other realities and educational needs, because the construction of inclusive education remains deeply rooted in the discourse of Special Education (BAGLIERI *et al*., 2011), and diversity is something much broader.

Prais (2016) highlights the importance of the construction of teaching materials by teachers through inclusive perspectives, from the identification of theoretical and practical subsidies on the organization of teaching in inclusive education. Although the resources used in the construction of educational materials to promote accessibility are not new, following a guide from UDL was important to understand the needs for adaptation of teaching content (MARTINS; AMATO; ELISEO, 2018).

The principles of UDL must be considered from lesson planning through implementation to evaluation. The principles of UDL should address this reorganization, called differentiation, of the essential components of the curriculum, namely (NATIONAL CENTER ON UNIVERSAL DESIGN FOR LEARNING, 2012):

- goals;

- teaching strategies;
- materials and resources;
- evaluation.

UDL practices geared towards goal design

Bock, Gesser, and Nuernberg (2019), during their research, listened to the participants with the objective of understanding if the principles and guidelines of the UDL met their expectations regarding the supply of resources and methodological strategies that contemplate different learning profiles. According to the authors, the framework of UDL contemplated the speeches of the participants and revealed to be suitable for applicability in planning and offering courses that are intended to be accessible, considering, a priori, the existence of people with different characteristics for participation and permanence in distance learning courses in Higher Education.

The UDL has been used as a strategic tool for the construction of courses, materials and content, which aim to equalize the learning of all people with different learning styles, without the adaptation or replacement of equipment (ZHONG, 2012). Complementing this idea, it must be reinforced that UDL does not remove academic challenges, it removes barriers to their access (NIELSEN, 2013).

Initiatives such as Nano Online Open Courses, built under the inclusive perspectives of UDL, can help supplement the education of students through the in-depth development of certain content and/or skills. Certain universities, such as, for example, the University of Alicante (Spain), are encouraging their professors to develop continuing education initiatives based on UDL principles (GOMÉZ-PUERTA *et al*., 2018).

Izzo's (2012) work emphasizes the importance of teachers being attuned to the educational needs of their students and of greater flexibility in instructional design. The author argues that UDL offers a promising approach to meeting the learning needs of all students, that its structure challenges educators to rethink the nature of the school curriculum, and empowers them with the flexibility needed to serve a diverse population of students.

Kennette and Wilson (2019), in analyzing students' perspectives on UDL, noted that, in general, students find the principles of UDL useful for learning and that they consider it important for their teachers to include these elements in their taught curricula. When designing the curriculum, specific considerations can be given to the elements that students

found especially beneficial, but faculty should also ensure that they include elements of the three principles of UDL in the curriculum.

Lima and Oliveira (2020) concluded that the inclusion of UDL in the educational context has brought numerous implications, since it has contributed to generate equal opportunities for learning. Thus, knowing the design model inserted in educational organizations is fundamental to understand the characteristics, challenges, limits, and its contributions to the achievement of educational objectives.

According to Bock (2019), the UDL contributed to the construction of educational processes aimed at meeting the needs of different profiles of distance learning students in higher education and, also, it is consistent with the theoretical and conceptual bases adopted regarding the conception of disability.

All authors cited in this section consider that the inclusion of the principles of UDL, in the construction of the objectives to be achieved in school curricula, has brought numerous benefits for the understanding of the content by students with different profiles and various educational needs. Thus, it is of fundamental importance that the curriculum is designed based on the inclusive principles of UDL.

UDL practices directed to the design of teaching strategies

The study conducted by Prais (2020) presents the UDL as a subsidy in teacher training processes in order to make teachers reflect on the act of planning and develop more accessible strategies to promote the participation and learning of all students in pedagogical activities. In addition, it was noticed that teachers, during the proposed training process, perceived themselves as fundamental parts in the teaching process of students with Special Educational Needs (SEN), or target audience of Special Education, and started to believe that the act of learning is possible for all students, depending mainly on the teacher's attitude and practice.

Still according to Prais (2020), the implementation of UDL in the organization of pedagogical practice offered teachers support to recognize and meet the learning needs of all students through the application of the principles. In short, these studies advocated the need for teacher training to implement UDL in the planning of teaching and the development of inclusive pedagogical activities.

According to the author, just the fact that teachers reflect on the principles of AED already makes them rethink the methodological strategies to be implemented in order to meet

the educational needs of students. If the goal is to build a curriculum that caters to all students, then the use of teaching methodologies based on UDL is necessary.

Smith (2012), in his analysis of how people learn from instruction, how different approaches interfere with learning, and how teaching strategies meet individual differences in learning, concluded that DUA provides opportunities for flexible approaches inherent in digital formats and that this can have a positive impact on students' perceptions.

Many of the inclusion and UDL proposals happen through technologies that include the use of computer equipment; however, contrary to this thought, several authors agree that there is no need for technological implementation, computers or internet, referring to the strategies to be implemented as the so-called co-teaching or co-learning (FREY *et al*., 2011; KATZ, 2013; LEE; PICANCO, 2013): in fact, UDL can be implemented with or without technologies.

The integration of UDL principles in different courses has been shown, if effectively implemented, to be a positive tool in motivational aspects. A study conducted with 92 Iraqi HE students, in which none of them had any kind of hearing or visual impairment or other apparent disability, obtained results that suggest that using educational technologies to address curricular limitations is a bridge to enhance student willingness to accept e-learning (AL-AZAWEI; PARSLOW; LUNDQVIST, 2017).

In a study conducted by Scott and Temple (2017), the authors came to the conclusion that creating software based on UDL principles can help in blending Special Education and pedagogy in online courses and in the design and delivery of content in a Special Education.

According to Gronseth (2018), UDL's engagement strategies helped the students participating in the study feel more connected to the course teacher and other students: the use of a DUA-based framework is a valid method for increasing student motivation.

The UDL was also applied as a proposal that encompassed guidelines for the development of adapted course material. Toyama (2019, p.58) "stressed the essentiality in working on the content using the principles of inclusion, such as UDL."

Other simple, effective and low-cost strategies are attitudes that should permeate teaching practices, such as: highlighting key concepts throughout the texts, providing activities in written and oral form, providing summaries and guiding questions along with the texts indicated for reading (DAVIES; SCHELLY; SPOONER, 2013; FREY *et al*., 2011; NIELSEN, 2013). However, strategies must be thought out intentionally and with great responsibility, contemplating the premise of ethics and care.

We know that students learn with different stimuli and different times. Something that motivates one student may not motivate another student to learn. A teaching strategy can stimulate students in different ways. In this context, the use of UDL is fundamental, because its principles are based on the flexibility of methods, arousing everyone's interest, aiming at the learning of all, and reducing the barriers to learning.

UDL practices directed toward the design of materials and resources.

Larocco and Wilken (2013) emphasize that adults learn better when they understand why they know something, that is, when what is learned has meaning for them. Other authors have identified that students become more engaged and committed to learning when the learning goals and the why of each activity to be developed are evident, promoting greater engagement of learners in the teaching and learning processes (KATZ, 2013; KATZ; SUGDEN, 2013; MARINO *et al.*, 2014; SMITH, 2012).

Well-designed, diversified materials, optimization of time, changes in the physical space of the classroom, group activities, among other teaching strategies, make the pedagogical practice a daily challenge, which requires knowledge by professionals of strategies that should be used, as well as more information about their student and their real needs (GONÇALVES, 2006).

Peixoto, Fernandes, and Almeida (2020) demonstrated the importance of the use of UDL in pedagogical practices, especially in the context of mathematics for students with intellectual disabilities, and brought the importance of knowledge of UDL in teacher training.

Studies conducted with teachers at two Universities in California, who incorporated UDL principles into course content and institutional practices, evidenced the minimization of learning barriers among elementary and middle school students (LEE; PICANCO, 2013).

In a study conducted with 138 Slovenians, whose objective was to categorize the activities performed in the virtual learning environment following the principles of UDL, the most positive result evidenced is that prospective teachers perform more activities with the use of technologies compared to other teachers, which can meet the diverse educational needs of students, but they lag behind in performing activities related to engagement and collaborative activities. Following the principles and guidelines of UDL, teachers are encouraged to provide various activities in order to meet the diverse needs of students, along with the use of Information and Communication Technology (ICT) (LEBENICNIK; PITT; STARCIC, 2015).

Chen, Bastedo, and Howard (2018) highlighted that the technological design of online courses evaluated in the field of science, technology, engineering, and mathematics (STEM), were satisfactory to students, as they reported that because they were supported by UDL learning principles, they benefited not only students with disabilities, but all students. Corroborating this statement, Martins and Ribeiro (2018) point out that UDL is a proposal that aims to ensure access to content for all scholars.

In another study, this time conducted by Chuquimarca, Rodriguez, and Bedón (2018), the importance of using technologies based on UDL principles as a teaching methodology in a Psychology course was observed, with the purpose of developing digital skills and learning autonomy in students.

Among the studies read, of note is a study conducted by Bryans Bongey, Cizadlo, and Kalnbach (2010), in which the authors proposed the use of an online course website to undergraduate Biology students, planned and implemented in order to provide the benefits of UDL. This intervention was used to expand the representational, strategic, and affective aspects of the course.

Sanchez-Fuentes *et al*. (2016) discuss the need for studies to endorse the use of inclusive methodologies, UDL being the most appropriate and current paradigm in Chilean educational laws. The UDL perspective corroborates with an entire inclusive education proposal. Likewise, it is known today that it is impossible to think about inclusion without considering accessibility (SCHMITZ; REIS, 2018).

Several authors recognize that the UDL approach focuses on teaching processes and, in particular, on how to make knowledge accessible regardless of the characteristics of each student, and that teachers in training presented certain difficulties in thinking of alternatives, which enhance an approach that contemplates the heterogeneity of students (LINDEMANNI; BASTOS; ROMAN, 2017).

The construction of materials and resources aimed at teaching and learning should also be carried out from the perspective of the principles of inclusion of UDL. Some students learn even with the use of abstractions, others learn only if concrete, tangible materials are used that facilitate the understanding of concepts and lower the barriers to visualizing certain structures. The use of technological approaches and materials has been widely and successfully used under the UDL principles. However, such resources are not always available to everyone. In this context, UDL is a very effective tool for planning the construction of materials and resources for learning for all students.

Assessment-oriented UDL practices

In this aspect, we recognize that through the use of UDL it was possible to observe that teachers were able (NEVES; PEIXOTO, 2020) to envision curriculum changes and propose other ways to organize their class and/or teach the contents. These reorganizations should occur so that all students can interact, participate and act actively; have the experience of a reflection process about their own practice, thinking about it, questioning their actions, analyzing the inclusive nature or not of their teaching; advance in the understandings about disability, inclusion, mathematics teaching, content, and, above all, about who their students are, looking at them first of all as "people".

It was verified a complete ignorance about these topics and a lack of reflection on their teaching work conditions, which prevent a favorable practice for all students: large classrooms, lack of articulation with the Specialized Educational Attendance and continued training for the attendance in the common room, etc., criticism of the viability of the UDL proposal in the context of the schools in which they are inserted (school time versus content to teach) and the precariousness of the teaching profession (high workload to account for).

Bell and Swart (2018) conducted a study for students with intellectual disabilities assessing their perception of the inclusive process at the University. The participants in this study made a number of important recommendations for reducing barriers to learning, with flexibility and curriculum transformation being the main barriers faced. According to Ricardo, Saço, and Ferreira (2017), students need equal opportunities and equity in opportunities. According to the authors, UDL means a change in the way of thinking about educational practice, with flexibility in the way information is presented and in the way students respond or express knowledge and skills.

UDL has been shown to be a tool that improves student engagement and contributes positively to discussions and a better understanding of content in the Problem-Based Learning (PBL) method, which is one of the main pedagogical approaches used in medical undergraduate programs (FATIMA *et al*., 2019).

We know that assessment processes and methods are widely studied and discussed by teachers at all levels of education. Under the UDL perspective, students are led to be an integral part of the teaching and learning process and this can facilitate the teacher's work regarding student assessment.

Regarding the evaluative criteria that make up the curriculum, the authors Morris, Milton, and Goldstone (2019) proposed in their study to analyze the evaluative activities of a

university and showed that greater diversification in evaluative methods is needed in order to meet the demand of students with and without disabilities. They concluded that inclusive assessment and feedback processes in Higher Education based on UDL principles that prioritize multiple assessment methods are essential if the diversity of our students is to be recognized, valued, and supported.

In a case study with students in a healthcare course, Kumar and Wideman (2014) presented a course in which UDL principles were applied with variety of means of representation, engagement, and expression. At the end of the course, students were interviewed in order to identify how UDL influenced their perception of accessibility in the course. It was identified that students felt more in control of their own learning process and more confident to make personal choices to best support their learning process. This highlights the need to include the principles of UDL in the course curricula and in the planning carried out by each faculty member to carry out their pedagogical practices.

Pedagogical practices, including student evaluation, based on the inclusive principles of UDL are designed to be flexible and diverse, and to meet the different realities and needs of the students. Therefore, it is very important that teachers include the principles of UDL in the construction of mechanisms and strategies for evaluation, because only then they will be fairer when evaluating their students and will provide means for students to demonstrate what they have learned.

Final remarks

The data presented reveal that, for many researchers today, focusing their studies on UDL forms part of their interest from a broad inclusive perspective, and this implies that the construction of knowledge is growing, that practices are changing, and a perspective of Curricular differentiation can be an alternative for serving all students. Even so, the present study corroborates the incipience of research carried out in Brazil on the subject of UDL (BOCK, 2019).

It is recorded that understanding the principles and guidelines of the UDL meets the expectations of teachers with regard to the possibilities of offering resources and methodological strategies that contemplate different learning profiles. In addition, students find the principles of UDL useful for learning and consider it important that teachers include these elements in the curricula taught. Thus, planning based on the UDL is valid and allows for major changes.

Starting from the basis that teaching strategies satisfy individual differences in learning, the UDL is a powerful tool, whether from the proposal for the use of technologies or with guidelines for the elaboration of adapted didactic material. It is recorded that the UDL engagement strategies helped students feel more connected to the teacher and other students, and the use of a UDL-based framework is a valid method to increase student motivation.

It is also identified that students are more involved and committed to learning when the learning goals and the reason for each activity to be developed are clearly presented. Thus, the importance of using the UDL in pedagogical practices and efficiency is demonstrated, for example, in relation to the technological designer of online courses, in the field of science, technology, engineering and mathematics. With this, it is observed that these adjustments were satisfactory to the students, as they reported that, as they were supported by the UDL learning principles, they benefited not only students with disabilities, but all students.

It was possible to verify that the teachers were able to envisage curricular changes and propose other ways of organizing their classes and/or teaching the contents, so that all students could interact, participate, act actively and have the experience of a process of reflection. about their own learning.

The UDL can mean a change in the way of thinking about educational practice, with flexibility in the way information is presented and in the proposed way in which students respond or express knowledge and skills. From the research, it is noted that students felt more in control of their own learning process and more confident to make personal choices to better support the learning process. This highlights the need to include the principles of the UDL and the need for teacher training to contain more practices and aim to identify possible difficulties in teaching in an environment of diversity, suggesting that curricular plans be built on the principles of the UDL.

Much remains to be done to put UDL practices in education and move from the theoretical to the action plane, offering unique experiences that would allow us to grow based on action research and contribute to the development of inclusive practices based on the Universal Design for Learning model.

Finally, although our analysis was only about a few products, the data reveal a lot of research and reports, which can be significant for the growth of interest in this subject in the panorama of research on inclusive education in the world and the placement of the value of the practices inclusive educational strategies in education, in this case, with the Universal Design for Learning.

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