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BUILDING BLOCKS AS INSTRUMENTS TO PROMOTE THE UNDERSTANDING OF CHEMICAL ELEMENTS IN STUDENTS WITH VISUAL IMPAIRMENT

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Abstract: Adapted teaching materials, aimed at students with specific needs, also allow teachers to seek alternatives that develop these students' learning. Building blocks were adapted for classes on Chemical Elements, aiming to facilitate understanding for everyone, including students with visual impairments. The proposal presented makes students actively participate in classes, being able to assemble molecules. When the student focuses only on memorization, they don't reflect on the content, they don't question it, they don't really understand it, and when it's no longer useful, they forget it. The instrument, this way, acts as a vector of significant learning.

Keywords: adapted materials, visual impairment, chemistry teaching.

INTRODUCTION

Ensuring learning for people with some type of specific need is extremely important. However, the difficulty in teaching them is greater. The lack of awareness on the part of the State, educators, parents, and society in general makes the inclusion of students with visual impairments more difficult than expected. There is a lack of public policies for initial and continuing teacher training, adequate teaching materials, and physical spaces to carry out these activities, just to highlight some problems.

Adapted games and toys are of extreme pedagogical importance, as they act as facilitators of work with students who have disabilities, making understanding of the content more evident. Furthermore, according to PIAGET (1972), they are instruments that bring curiosity (aspect of accommodation) and arouse interest (aspect of assimilation).

For SOARES (2004, p.14), activities such as games and/or games, "can be used to present obstacles and challenges to be overcome, as a way of making the individual act in their

reality, which therefore involves interests him and his awakening." The author also highlights interest as something material, thus highlighting that there will only be motivation to learn if there is interest involved.

Adapted teaching materials, including games and toys, aimed at students with specific needs, also help teachers seek alternatives that develop learning skills. The school has a fundamental role in promoting the appropriation of knowledge in a collective and comprehensive way (SERVICE OF PRODUCTION OF ADAPTED TEACHING MATERIAL, 2021).

This expanded summary describes the experience of developing a pedagogical instrument aimed at learning for all students. It was a final product of the Instrumentation for Chemistry Teaching II classes.

METHODOLOGICAL PROCEDURES

In the educational context, the word "toy" can be interpreted broadly, referring to interactive materials produced to assist in learning and the development of skills.

According to Soares (2013), the term toy is "the place, object and/or space where learning takes place" and, in this specific case, they are Lego® pieces adapted in Braille, developed for teaching chemistry to people with visual impairments, to be manipulated in a tactile way, aiming at inclusion and facilitating learning.

LEGO building blocks were adapted for Chemistry classes on Chemical Elements, with the main objective of facilitating students' understanding of the content covered and, in addition, it can include students. This makes them participate more actively in classes, as they can assemble the proposed molecules. It is of great importance to emphasize that this material does not only apply to students with disabilities, other students can also benefit

from the material, as it explains the content better than simply writing on the board.

The materials used to make the adapted building blocks were:

- Mounting blocks of various sizes with fitting;
- Hot glue;
- Periodic table (figure 1);
- Braille alphabet (figure 3).



Figure 1: Building blocks and periodic table

Source: Own author, 2023



Figure 2: Finished blocks

Source: Own author, 2023

A ⠠	B ⠠	C ⠠	D ⠠	E ⠠	F ⠠	G ⠠
H ⠠	I ⠠	J ⠠	K ⠠	L ⠠	M ⠠	N ⠠
O ⠠	P ⠠	Q ⠠	R ⠠	S ⠠	T ⠠	U ⠠
V ⠠	W ⠠	X ⠠	Y ⠠	Z ⠠	É ⠠	ALFABETO LECTURA 1 ⠠ 4 2 ⠠ 5 3 ⠠ 6

Figure 3: Alfabeto Braille

Source: Alphabet,s.d.

The medium and small square blocks (green and blue) represent the elements that will be used to identify the elements (carbon,

hydrogen and oxygen) to assemble the chemical equation.

The large red block will be the base identified as an asterisk, which will be used to assemble the chemical equation and the green triangular blocks represent the sum sign that will be used to help assemble the chemical equation. The blocks have different colors so they can be used if necessary with students with low vision.

On the side of each piece, small circular adhesions (balls) were made with hot glue, following the Braille alphabet to represent the symbols of the periodic table, so that the student can identify which chemical element it is.

The pieces that were made are for simple examples to be used in the classroom, so it was possible to use blocks of different sizes, making the distinction between one element and another easier.

In figures 4 and 5, two examples of molecules (H₂O and CO₂) are shown, showing what working with the material inside the room would be like.

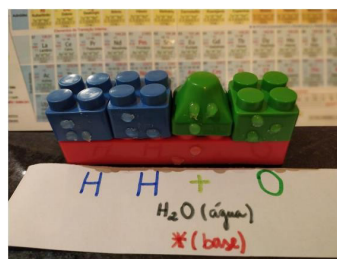


Figure 4: H₂O molecule

Source: Own author, 2023



Figure 5: CO₂ molecules

Source: Own author, 2023

The materials and methods used in the development of the research must be adequately described, using Braille writing.

RESULTS AND DISCUSSIONS

It is hoped that, with this material adapted for learning about chemical elements and molecules, students will be able to have a better idea of how to form them using chemical elements.

As this is a proposal for the 1st year of high school, only simple examples were used, so that the construction of knowledge is gradual, thinking that students can first assimilate the simplest molecules and how to manipulate them, to so that they can be continued in the construction of more complex molecules.

When students only focus on memorizing content, they don't think about the content, they don't question it, they don't really understand it, and when it is no longer useful and no longer used on a daily basis, it will inevitably be forgotten. From the moment the student assimilates and accommodates the learning structure, he or she alone understands the content transmitted, which is why learning must begin with "lighter" content that is easy

to understand (CHEMISTRY TEACHING INSTRUMENTATION II, 2021).

FINAL CONSIDERATIONS

It is hoped that with this material students will be able to better understand the content covered by the teacher, this will make them more interested in the subject and motivated to seek more and more knowledge about the area.

It was also intended to meet the specific needs of students with disabilities, making them feel part of the class and society, so that they can continue their studies and not just pass without at least understanding the contents taught in the Chemistry curricular component., because the mission of schools is to teach, regardless of how it occurs, even though this mission is often not applied in everyday life. It is up to the school and teachers not to forget what they are really there for: teaching all students, without exception!

THANKS

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REFERENCES

ALFABETO Braille. Alfabeto: Tudo que você precisa saber sobre o ABC, s.d. Disponível em: <https://www.alfabeto.net.br/alfabeto-braille/>. Acesso em: 15 ago. 2023.

UNIVERSIDADE FEDERAL DO SERGIPE. Instrumentação ensino de química II: aula 5. Disponível: [https://cesad.ufs.br/ORBI/public/uploadCatalogo/16443916022012Instru mentacao_Ensino_de_Quimica_II_Aula_5.pdf](https://cesad.ufs.br/ORBI/public/uploadCatalogo/16443916022012Instru%20mentacao_Ensino_de_Quimica_II_Aula_5.pdf). Acesso em 15 ago. 2023.

PIAGET, J. **Psicologia e pedagogia**. Dirceu Accioly Lindoso, Rio de Janeiro: Forense, 1972, 160 p.

FUNDAÇÃO CATARINENSE DE EDUCAÇÃO ESPECIAL. Serviço de produção de material pedagógico adaptado. Disponível em: https://www.fcee.sc.gov.br/images/stories/producao_material_pedagogico_adaptado.pdf. Acesso em 10 ago 2023.

SOARES, Márlon Herbert Flora Barbosa. **O lúdico em química: jogos e atividades aplicados ao ensino de química**. 2004. Disponível em: <https://repositorio.ufscar.br/handle/ufscar/6215>. Acesso em 20 ago. 2023.

SOARES, Márlon Herbert Flora Barbosa. **Jogos e atividades lúdicas para o ensino de química**. 2013, 198p.