



TECHNOLOGY AND DIDACTIC ON CHEMISTRY TEACHING: VR HEADSET AS AN INCLUSIVE SCHOOL ELEMENT

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ABSTRACT

In this article, we report the construction of teaching material using of VR headsets as pedagogical resource to teach Chemistry for deaf people. With the aid of VR glasses, we elaborate videos including chemistry contents in high school level where deaf students can explore information about hydrocarbons compounds, such as dynamic molecules of alkanes, alkenes and alkynes. This material can contribute with high school teachers providing learning materials. This pedagogical resource can provide tools for the elaboration of didactic activities that favor the discussion of contents in the area of Teaching of Chemistry, expanding the ways of learning.

Keywords: Chemistry Teaching, Inclusive Technologies, Pedagogical Resource.

School and contemporaneity: incompatible subjectivities

In the last years, the technology and the dynamization and the expansion of access to information has caused several and important transformations in society. In this context, there is a new dynamic characterized by a complex network of collaborations and socialization of information and knowledge, in which the subjects are connected through multi disciplinarily spaces¹.

The dynamization of the information access and the changes in the relationships, established in the transformations of these information, present a new paradigm that denotes the need to share the contents. Besides to be part of network, it is necessary to share and analyze the available data².

It is no longer appropriate think about education by restricting the reflection to the content. The student should be able to develop reasoning in order to analyze and interpret the presented data².

When referring to the educational practices developed in basic and higher education, there is a general incompatibility between the pedagogical propositions inspired in the last century and this new historical context in which children and young people are immersed. This inadequacy has become more uncontested in recent years with the advent of mobile communication and information devices, such as mobile phones and portable computers with Internet access³.

Off course this is not a fortuitous or enigmatic phenomenon: there are historical and even anthropological explanations for this increasing incompatibility. Such justifications include a broad set of sociocultural, economic, and political factors that have

been unleashed in the last decades and which are easily identifiable (although not free of complexities and even contradictions) to those who have gone through a few decades of the last century and are adults in this new millennium. These incompatibilities have become more evident in recent years: on the one hand, the school; on the other, the contemporary modes of being³.

With the purpose of adapting educational practices to contemporary education, developed from this multiplicity of technological resources, a (re) structuring of teaching work is observed. This restructuring is based on the elaboration of new didactic-pedagogical proposals that make use of Information and Communication Technologies (ICTs) considering the diversity of resources⁴.

Contemporary education and inclusive technologies

Inclusive education in high school is based on the right of each student, no matter their cognitive, physical or sensory limitations, to participate actively in the school process, according to their abilities, and without any of them being a reason for differentiation and exclusion from their classes, since it is in the school that the individuals learn to live among the peers, to share the responsibilities and tasks.

It is important to note that the special and inclusive education it is based in international documents and in Brazilian law. These laws have the role of guiding the pedagogical aspects involving the educational context⁵.

It is impossible not to recognize the technological advance in recent times, which is present in several areas of knowledge, becoming a demand in the educational context. In this sense teaching and learning can be benefited by the use of technologies, bringing infinite possibilities of

making teaching materials that help teacher and student in the classroom.

Chemistry is a science present in the daily life of society. It needs special attention in basic education, since it is one of the school courses in which students find more difficulties in appropriating knowledge. Understanding content may be even more difficult for students with some type of disability. The use of representations in Chemistry is, by itself, a highly-structured language that students must learn in order to understand and express knowledge in this field. In this sense, some studies have shown that in learning processes, students elaborate some kind of symbolic construction (images, figures, diagrams and diagrams, for example) in order to identify and relate the information and thus make it more significant⁶.

Constructing a methodology in Didactic classes: the use of Virtual Reality Headsets (VR) to teach Chemistry

In the Didactics course, taught in the Chemistry Degree course at the Blumenau Center of the Federal University of Santa Catarina (UFSC), students were encouraged to develop didactic materials and / or pedagogical tools to assist teachers in the basic education to perform the construction of Chemistry concepts in the classroom. The challenge here was, in addition to constructing a pedagogical resource, construct a activity considering the universe of the students with some deficiency, and consider as well, the importance of the inclusion of these students in the classes of Chemistry. In order to develop this activity, professors of the specific areas of Chemistry collaborate with guidelines on the chemistry related contents, characterizing this activity as interdisciplinary.

In this sense, the creation of the pedagogical resource was started by adapting the Virtual Reality Headsets (VR) to aid teaching and learning in chemistry classes. Subsequently, we selected the content. Once defined the theme (hydrocarbons, focusing on the dynamic representations of chemical molecules, alkanes, alkenes and alkynes), we started to produce the videos that would be integrated with the virtual technology. For elaborating the videos, we used 3D digital models of hydrocarbon chemical molecules and the authors were filmed translating the content Brazilian sign language and, at the same time, to Portuguese. The 3D molecules were created using the Jmol program. Subsequently, a recording video was performed with professional experts in the Brazilian sign language (Libras). Using the software called Blender, it was possible to create the skeleton of the videos, in which the 3D molecules and the translation in Libras were incorporated, for the creation of a new VR video. For the final video, along with an audio track describing the content, in Portuguese, the software OpenShot Video Editor was used. This project has been completed conducted using free software, available for the Windows platform.

It is important to mention that VR Headsets exist in several iterations, from simple ones made of cardboard, which

depends on the screen of a separate smartphone, to more complex and industrialized polycarbonate versions with built-in screens typically they all allow for the use of a joystick.

During the development of this project we utilized a cardboard based headset coupled to smartphone, which reduced the development cost and allows for a lower financial barrier for similar implementations in real world cases.

The cardboard plus smartphone kit is placed in front of the eyes of the viewer, the student, and creates a virtual scenario that visually involves the student, immersing him/her in the scene. The device we used has 35 mm focal length lenses which are responsible to create this illusion. The trick is to generate two slightly displaced images of the same object, one for each eye. The brain interprets that as a single image with a false sense of depth.



Figure 1 - Example of the use of augmented reality device. (Source: the authors)

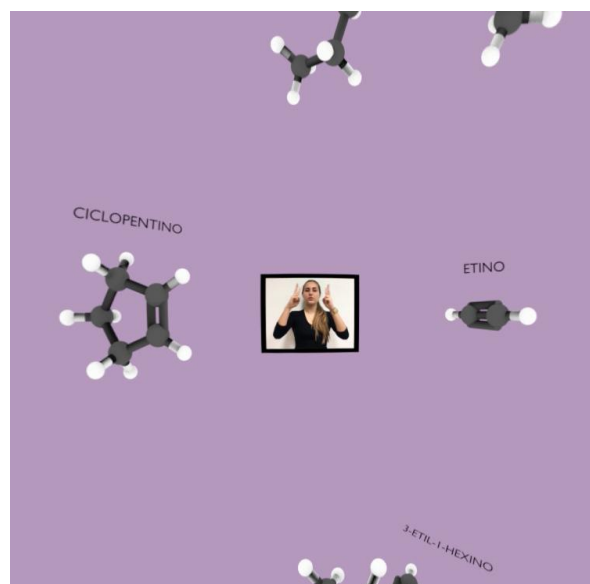


Figure 2 - Screenshot of one of the videos. (Source: the authors)

Final notes and future perspectives

It is hoped that this Virtual Reality Headsets (VR) will emerge as an inclusive technology tool for deaf students

and as a pedagogical resource for chemistry teachers. Hopefully, it will also be adapted and serve as a reference for other areas of education as well. New forms of communication between teachers and students are indispensable in contemporary society. There is a need to apply new technology to create new methodologies for school work, especially those that are inclusive.

In this perspective, the pedagogical resource we propose opens new horizons for the teaching and learning of School Chemistry. We have the understanding that the use of the material, by itself, does not transform the entire formative course of the student with deafness. But, we firmly believe that this resource can significantly impact the student's relationship with the curiosity to learn something new, a Science.

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