Development of Interactive Educational Content for Teaching Chemistry Using Augmented Reality Resources.


Abstract
The development of 3-D applications with the use of augmented reality is proving increasingly efficient for the development of education. In this way, the objective is to develop an application for the study of molecular geometry that allows the union of the modeling process with augmented reality.

Key words:
Modeling, augmented reality, molecular geometry.

Introduction
The teaching-learning process in chemistry on many occasions can be an obstacle for both student and teacher. The process of studying molecular geometry becomes complex when trying to perform the representation of molecules in the 2-D plane. Thus, making it difficult for the student to be able to recognize the dimensions and differences between molecules. The difficulty found in the classroom is related to the students' level of abstraction of content. Therefore, with the explosion in the popularity of smartphones and the development of augmented reality (AR) applications, the teacher has been given an unexplored way of teaching spatial reasoning skills to chemistry students. Transforming the technology present in smartphones into a learning tool. AR technology enables impressive and immersive experiences, offering untapped opportunities for research and education. In this way, the objective is to develop an interactive application that facilitates the teaching-learning process in the study of molecular geometry, allowing the understanding of this content through modeling with the use of augmented reality in smartphones. In which the use of AR to understand this topic will represent a significant increase in the level of understanding on the part of the students.

Results and Discussion
For the modeling of molecules selected for study of molecular geometry, BCl₃, CH₄, H₂O, NH₃ and SF₆, a research was made of the angles, bond length and relative sizes of the atoms in the literature. Through Blender software 2.79 molecules were modeled having the application of interactive animation. After performing the modeling of the molecules in Blender 2.79 the Blend4web platform (figure 1) allowed to transform the modeling done in Blender 2.79 to html files. The augmented reality application was performed using Vuforia software (figure 2) only the octahedral SF₆ molecule. The other molecules are in development. Both of the software used are free platforms.

Conclusions
With the construction of the prototype of this project, it is believed that the use of smartphone resources will achieve greater involvement by students and a positive influence on the development of molecular geometry content. Allowing an increase in cognitive and memory working capacity in students and facilitating the process of teaching learning.

Acknowledgement
Federal Institute of Education, Science and Technology of São Paulo - Campus Campinas
Information Technology Center “Renato Archer”