THE DEVELOPMENT OF SENSORY AND IMMERSIVE CLASSES BASED ON MULTIDISCIPLINARY THEORETICAL FRAMEWORKS, ACTIVE EXPERIMENTATION AND THE TEACHER AS AN AGENT OF INTERCONNECTION

https://doi.org/10.56238/sevened2025.019-019

Alexandro Pereira da Silva[1] and Emerson Guedes Pontes[2]

ABSTRACT

The article addresses the application of an immersive and sensory methodology in science teaching in high school, with the aim of promoting students' interest and attention through practical and meaningful experiences. The proposal seeks to break with the traditional teaching model, still widely present in schools, and values the connection of scientific content with the daily lives of students. The methodology is structured in stages that include welcoming, contextualization through stories (storytelling), sensory experiments, critical discussion and continuity activities. The use of technological equipment is avoided to keep the focus on the "making of being" and on direct interaction with natural phenomena. At the end of the classes, students receive "totems" — symbolic objects built from the contents worked on — to reinforce learning.

The results showed that the students showed great interest in classes with an experimental and sensory character, especially in the early grades of high school. The survey revealed, however, a drop in interest in science in the third year, coinciding with a reduction in the supply of experimental classes and an increase in external responsibilities, such as work. The proposed pedagogical practice proved to be effective in promoting an environment of mindfulness and engagement, contributing to the humanization of science teaching. The conclusion reinforces the importance of methodologies that integrate reason, sensitivity and action, recognizing education as an essential tool for the personal and social development of students.

Keywords: Organic learning. Emotional resonance. Affectivity and learning.

[1]Master's student in Chemistry, UFRRJ
[2]Dr., UFRRJ-IQ-Department of Biochemistry

INTRODUCTION

The production of activities using immersion methodology represents a challenge, in formal and non-formal spaces, which involves, in addition to the notorious knowledge of basic contents, the ability to interconnect content according to its occurrence in the real world. To contextualize a content, the teacher must relate it to social, political and economic issues, since it is in line with the students' knowledge in the face of situations encountered in everyday life, and thus work on the content in focus. (Santos, E.P. 2012)1. A fundamental issue in this methodology is the awakening of the student's interest in the subject or theme. This awakening involves attention, affectivity, and the use of the senses, through thematic presentations, connections mediated by stories, and active, guided, and sensory experimentation. In this environment, the use of technological equipment is not desirable, since the immersion process will be aimed at making the participants to obtain greater interaction, seeking an environment of engagement and participatory development. Technology, in this specific work, can disperse the attention of the participants, since it changes the focus from the making of the being to the making of the object (in this case, the technological object is a passive electronic interaction, such as a cell phone, computer, tablet, etc.). Thinking about the teaching practice, and considering that they should have their autonomy preserved in their work environment, this work proposal aims to guide the modus operandi for the production of material with an immersive and multidisciplinary character.

When observing a classroom, in general, and also the teaching practice, it is not difficult to realize that everything is very similar to how it was thirty years ago, or even more. The feeling is that the school, especially high school, is frozen in time or at least moving very slowly towards the future. The world and our society have undergone major behavioral transformations, especially if we take into account the appearance and use of technology, so the school does not have much of a chance when the idea is to have the attention of students. Conducting traditional classes as decades ago is a sure recipe for the failure of the school as an institution and of the students as citizens, it is necessary to innovate. However, a technological innovation in schools encounters some notorious practical difficulties, among them we can highlight: The cost of its implementation, the cost of teacher training and, somewhat contradictory, the remarkable resistance of teachers to adapt to new technologies. Innovation, in turn, does not have to be limited to the use of computers, the internet or artificial intelligence, we can think of innovation as the autonomous doing of students, their ability to integrate the knowledge of school subjects with all the doing of individuals and society. Work on the way of thinking, feeling and acting to understand

nature, its phenomena, its interconnections and how all this influences our daily lives. To innovate through the perception of our natural capacities, using the sensory and cognitive tools, strength and diversified skills to promote realism to the teachings provided by the school that, after all, were developed over generations to promote our growth as individuals and as a society. With this possibility of innovation in mind, we will seek to build a methodology that is attractive, experimental, sensorial and culminates in the construction of a teaching and learning environment where mindfulness can be a common factor, thus generating what we can classify as an immersion environment, where students and teachers will be fully concentrated and focused on the class in question, fully enjoying the moment and surrendering to the experience of doing and feeling.

After completing the classes, students receive from the teacher a Totem, a representation of the class, which may vary according to the teacher's experience, their experiences and accumulated experiences, being of free construction. The totems presented here are only references due to the author's experience and his availability of materials.

General objective: To define the necessary conditions to produce a classroom environment in which students are integrated with knowledge through sensory and active experimentation, promoting attention and interest in science through doing and, especially, doing with results that stimulate the senses less used in a traditional class, such as smell, taste and touch. Integrate the student into the experience in order to promote an environment of immersion, where experimentation presents itself as a moment of reflection and critical analysis on the functioning of things and society, always seeking the sense of proximity of the knowledge studied and the doings of the world.

MATERIAL AND METHODS

For better organization of activities, they are divided as follows:

1st Moment: Answer a socio-educational questionnaire;

2nd Moment: Presentation of the class space, the teacher and the topics to be addressed. Initiate the connection of the contents with the real daily life of the students through stories (Storytelling).

3rd Moment: Presentation and study of the contents orally, expository, followed by phenomenological experiments, sometimes guided, sometimes autonomous, using, whenever possible, sensory experiences;

4th Moment: Discussion of the activities carried out and contents covered, formalization of the content and presentation of the mathematics involved, if any;

5th Moment: Availability of written material and continuity activities to be carried out, preferably, throughout the study week.

6th Moment: Answer evaluative questionnaires in order to evaluate the methodologies used as well as their participation in the realization of the activities and their impressions about it.

As an example, we have the first class, we introduced the broad concept of Matter and Energy, associating the existence of mass and volume. With air balloons, thread, paper, flashlight and scales, we carry out simple experiments to differentiate matter and energy

Chemistry deals with the knowledge of the transformations of matter, starting with its physical states and its properties. Students observe different solids in order to differentiate some properties, such as metals, wood, rubber, plastics, glass, etc., in addition to some liquids, water, milk, oil, etc., as well as properties such as translucency, transparency, viscosity, hardness, malleability and others can be presented.

They observe the changes between physical states and the flow of energy. They try to hold ice cubes and feel them melt, associating the sensation of cold as being the result of the transfer of body heat to the liquefied ice.

With a spoon, a candle and water, students transform ice into steam and with a glass cup they transform part of the steam into liquid, thus understanding the meaning of energy for physical transformations.

We present the idea of chemical elements that combine to form all substances that exist. When a substance is formed by only one chemical element, we say that it is a simple substance, as examples: oxygen in the air, ozone, nitrogen, coal, diamond, graphite, sulfur, and many others. However, the formation of compound substances is much more common and abundant, those that are formed by more than one chemical element. In the comparison between charcoal and graphite, we took the opportunity to insert the concept of allotropy.

In some jars we mix water and vinegar; water and salt, water and oil, water and sand, water and sawdust and others. Observing the mixtures, we inserted the concepts of phases, homogeneity, solution and heterogeneity.

RESULTS AND DISCUSSION

The methodology consists of establishing classes motivated by sensory experiments directly related to the topics covered. Active experimentation seeking to reproduce and understand phenomena and recognize their applications in everyday life is presented as a

way to create a connection between students and the contents, with the teacher as an agent of interconnection and, through this, the humanization of learning. Doing unites young people due to the possibility of building something together and, in this way, teachers have the opportunity to further develop their skills as educators. The interest generated helps to maintain attention and concepts such as mindfulness can be used to improve focus in class, which is quite desirable in any teaching methodology.

After the conclusion of the class, the students received two totems:

A test tube containing a piece of marble, a piece of pumice stone, water, a piece of colored plastic less dense than water, a little oil and with air space, sealed. In this tube we have a closed system, which contains a heterogeneous solid-solid mixture, marble. A heterogeneous mixture of solid-gases, pumice. A pure substance, water. A homogeneous mixture of liquid-liquid, oil. A homogeneous gaseous mixture, air. The complete system is a heterogeneous mixture and still has the three states of matter. Plastic is between water and oil and serves as a trigger for the class on the properties of materials, especially density.

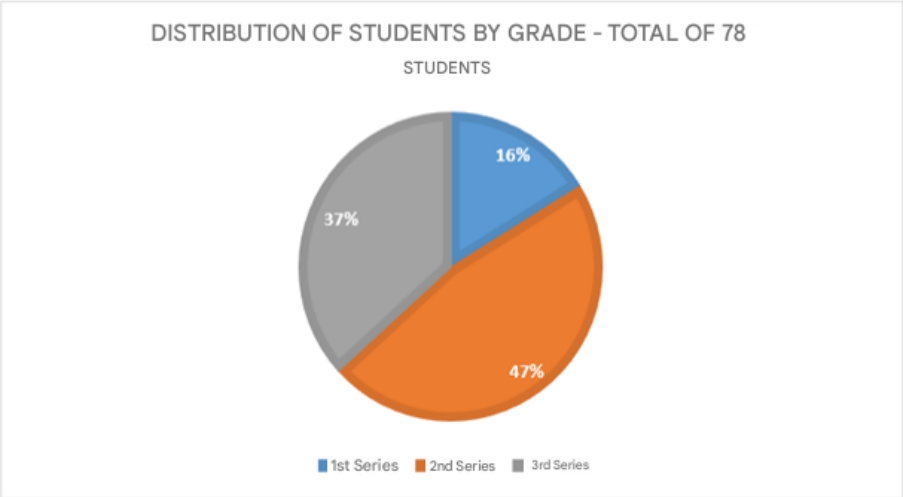
A test tube was prepared containing some iodine. Glued to the tube, a matchstick that represents the need for energy for the change of physical state. Iodine was chosen because of sublimation, which is a rather curious change in physical state.

The class, in a sensory-immersive character, had as its theme the opening content of high school, which even has a preliminary approach in some elementary education institutions, in the 9th grade. Because the content is basic for high school and, considering that its approach would not be new to the students, the objective was restricted to the "perception of value" that the students, from the various grades, could have due to the way the class takes place and not in its content itself. The central idea was to evaluate how students would receive this type of class and, also, whether their interest in the school, the discipline or the classes could increase.

DATA COLLECTION

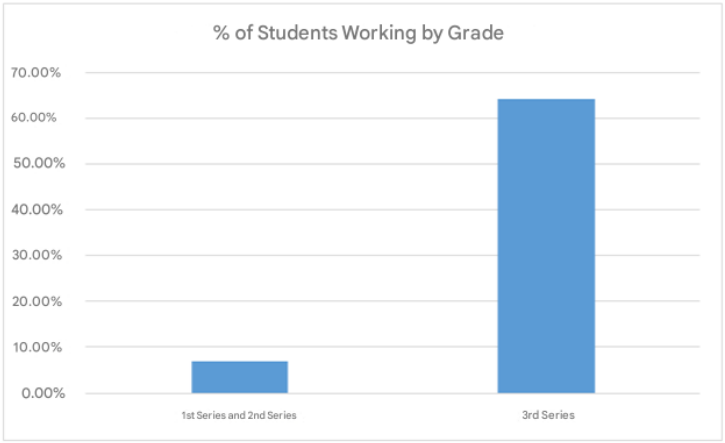
The classes were held in the laboratory of the School Unit for a total of 5 (five) classes, one of which was the first year, two of the second year and two of the third year. Each class had an average time of 1 hour and thirty minutes of activities. The same activities were carried out with all classes.

Distribution of Students by Grade		
1st Series	2nd Series	3rd Series
11	32	25



In order to know the possibilities of dedication of the students to the school, it was evaluated whether they performed labor activities, including, it was clarified that all activities that required the daily dedication of the student could be classified as work, such as taking care of the house, taking care of a brother or sister, working with parents or alone in informal activities, etc., since this would also impact their time and their willingness to dedicate themselves to school activities.

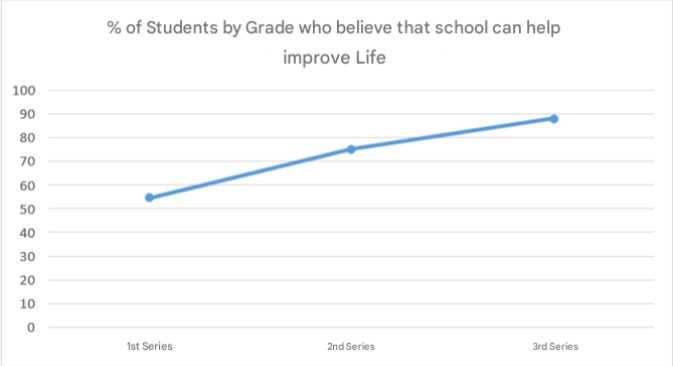
% of Students who work for series	
1st Series and 2nd Series	3rd Series
6.98%	64%



In order to assess the students' perception of the importance of education, they were asked if they believed that school could help improve the quality of their lives. The answers

show that they have a good perception of the importance of education and this perception increases as they mature and advance in the development of high school.

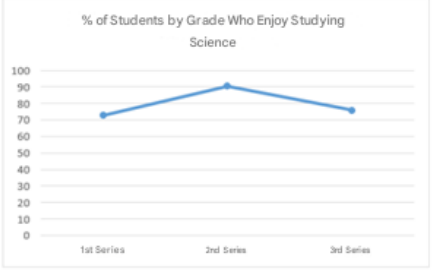
% of Students by Grade who believe that school can help improve Life		
1st Series	2nd Series	3rd Series
54.55	75	88



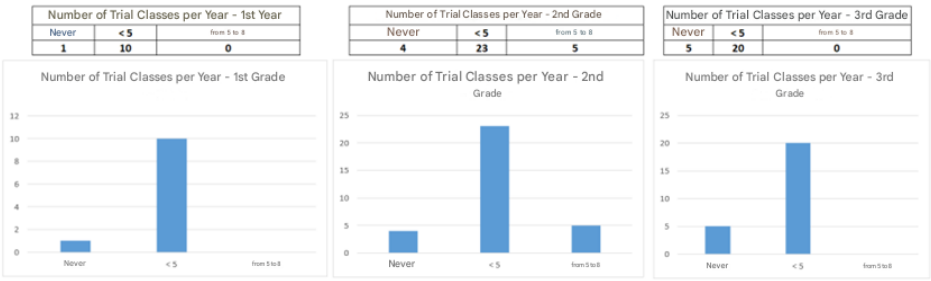
Knowing the distribution of students by grade who participated in the classes, verifying their availability to dedicate themselves to their studies and understanding their perception of the importance of school and education, their specific interests in the study of science were evaluated. This point is particularly important because an initial acceptance of the study of the content covered would allow a greater commitment of the student to "experiment" new ways of studying the content itself. We observed that interest in science starts high in the first year and increases in the second year, returning to the levels of the first year when students are in the middle of the third year. On the other hand, the interest in studying by carrying out "experiments" seems to only grow every year, which, at first, can serve as a tool to work even more on the "liking" of science that students increasingly express in the initial grades.

% of Students by Grade Who Enjoy Studying Science		
1st Series	2nd Series	3rd Series
72.73	90.63	76

% of Students by Grade Who Enjoy Studying by Doing Experiments		
1st Series	2 Series	3rd Series
81.82	88.57	96



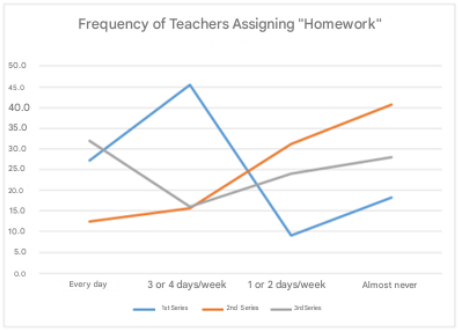
To try to understand this growing interest in experimental classes and antagonistically the reduction in interest in science in the third year, the number of experimental classes that students took during the year was evaluated. We can observe that in all grades we find students who have never participated in experimental classes and this number increases from the first to the third year. Another relevant observation is that in the third year the occurrence of experimental classes is the lowest, while the second year has the highest occurrence.



The practice of "homework" is quite common and widespread as a tool to reinforce the contents taught in the classroom and, although the school unit addressed is full-time education, for the initial two grades, an evaluation was carried out to understand how this tool is used and worked by students. The third year appears as the grade in which teachers most promote "homework" probably because it is the year in which ENEM is held and because these students do not stay at school all day, however, as we saw earlier, this segment has a large percentage of students working. The first year appears as the second segment with activities to do at home, possibly this is linked to the content load or even as a strategy to "engage" students in the "rhythm" of high school. The second year appears as the segment with the least extra-class activities, however, they have the largest number of experimental classes and, being these group activities, this could justify the large number of students using the library to make their reports, still at school, in free time and/or after shifts, which seems to be a very promising strategy also for the first year, given his interest in science and practical classes.

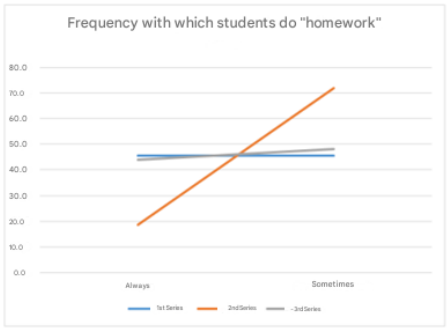
Frequency of Teachers Assigning "Homework"

Year	Every day	3 or 4 days/sema	1 ou 2 dias/s	Almost never
1st Series	27.3	45.5	9.1	18.2
2nd Series	12.5	15.6	31.3	40.6
3rd Series	32.0	16.0	24.0	28.0



Frequency with which students do "homework"

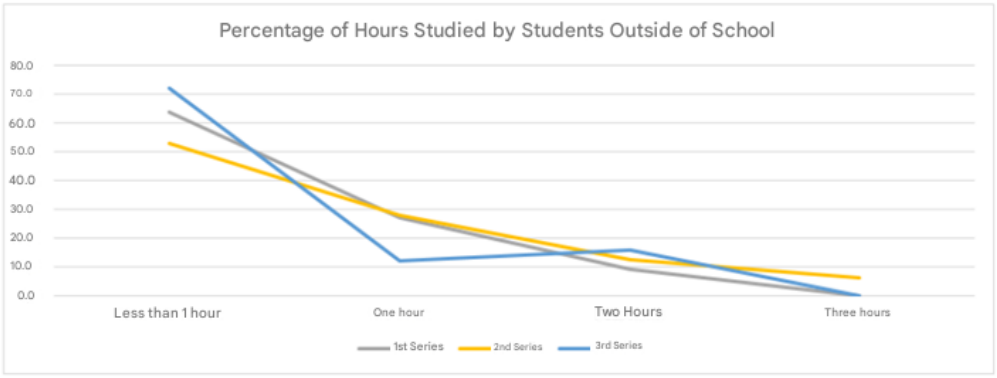
Year	Always	Sometimes
1st Series	45.5	45.5
2nd Series	18.8	71.9
3rd Series	44.0	48.0



Evaluating the time that students dedicate to studies outside school, we observe that, even in the third year, they do not dedicate much time, probably due to work. Students in the early grades, on the other hand, spend the whole day at school and it would be natural to expect them to do other activities since life is not just about studying.

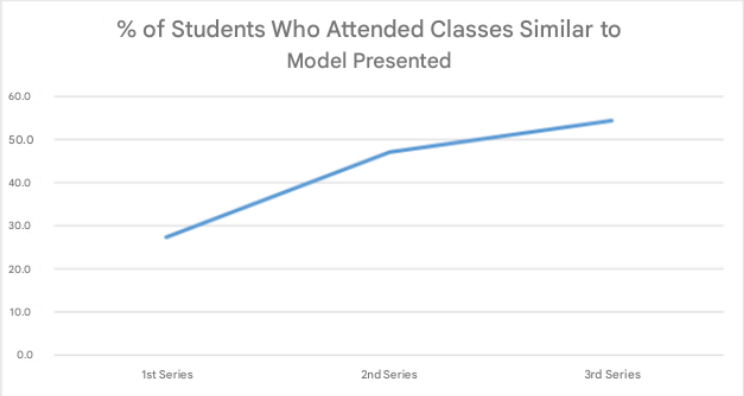
Frequency of hours studied outside of school

Year	Less than 1 hour	One hour	Two Hours	Three hours
1st Series	63.6	27.3	9.1	0.0
2nd Series	53.1	28.1	12.5	6.3
3rd Series	72.0	12.0	16.0	0.0



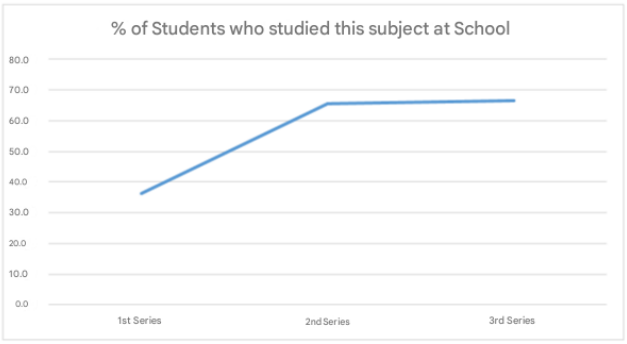
In order to evaluate the degree of novelty of the proposal, students were asked to answer whether they had participated in classes similar to the one presented. It is worth remembering at this point that he was asked about the similarity and not about the equality of the type of class. This form of questioning was chosen because it would be easier for students to recognize similar aspects instead of having to relate all the factors, with this, although it is not possible to specify the degree of originality we can conclude that it will always be greater than that documented by the students, since a common practical class brings some elements of the immersive class that can lead the student to identify similarities and answer positively to the question.

% of Students who participated in classes similar to the model presented	
Year	% of Students
1ª Series	27.3
2ª Series	46.9
3ª Series	54.2



The content of the class applied referred to the opening class of high school, therefore, theoretically the students should already be aware of the content covered. To confirm this information, the students were asked about the previous study of the content. The class was applied in August 2023 and the first-year students, for the most part, stated that they had not studied the subject before.

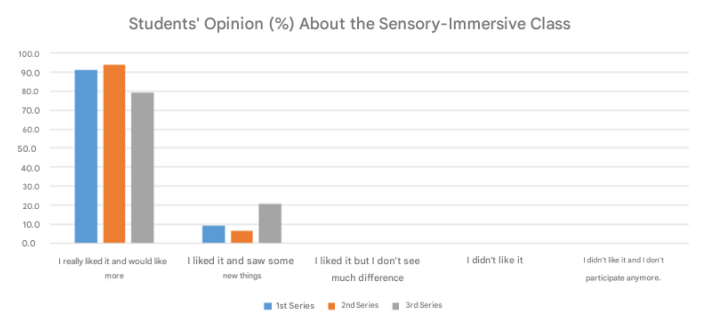
% of Students Who Studied This Subject at School	
Year	% of Students
1ª Series	36.4
2ª Series	65.6
3ª Series	66.7



After the class, the students were encouraged to register their opinion about the activities and the way they were presented and developed in view of the methodology.

Students' Opinion About the Sensory-Immersive Class

Year	I really liked it and would like more	I liked it and saw some new things	I liked it but I don't see much difference	I didn't like it	I didn't like it and I don't participate anymore.
1st Series	90.9	9.1	0.0	0.0	0.0
2nd Series	93.8	6.3	0.0	0.0	0.0
3rd Series	79.2	20.8	0.0	0.0	0.0



CONCLUSIONS

By making everything very tangible to the student, we talk about the ideas of science. Science comes to light our path in the world, giving us the opportunity to understand the world itself and ourselves, understanding natural phenomena through reason, critical thinking and imagination.

The fact that students recognize the importance of education helps us, as educators, to develop our work since the "flame" is already lit and we need to "just" feed it.

The reduction of experimental classes appears as an important variable due to the decrease in interest in science, since in addition to a certain disappointment in their expectations, the massification of theoretical and mathematical teaching can contribute to a difficulty in understanding the content. In this class model, mathematics appears, when necessary, in the final part of the studies, after the understanding of the importance of the content is perceived by the student.

As the themes were basic and recurrent, students in the later grades should be less impacted by the form of presentation and this would reduce the perception of originality of the topics, however, the persistence of a fraction of students stating that they had not studied this theme may be associated with the impact of the way it was presented, generating an "awakening", And this may be a good indication that this model, that is, sensory-immersive, holds a relevant degree of originality.

The results show that even in the third year, which has already gone through the entire development of high school, it reached the mark of just over fifty percent, when stating that it had not studied the content previously.

Critically analyzing these statements, they do not seem to be in tune with reality, and what seems more rational is that the approach taken to the subjects has been quite different, leading them to interpret that they have not studied the themes before.

The answers obtained reveal a high degree of acceptance, even among those in whom the content was already known.

ACKNOWLEDGMENT

We thank the CIEP Dr. Albert Sabin School Unit, located in the City of Seropédica for the support and permission to carry out the activities with their students.

REFERENCES

1. Faria, P., & Retondo, C. G. (2022). Química das sensações (5th ed.). Átomo.

2. Negreiros, P. R. (2005). Séries no ensino privado, ciclos no público: Um estudo em Belo Horizonte. Cadernos de Pesquisa, 35(125), 181–203.

3. Santos, E. P., Silva, B. C. F., & Silva, G. B. (2012). A contextualização como ferramenta didática no ensino de química. VI Colóquio Internacional – Educação e Contemporaneidade, São Cristóvão, SE, Brazil. https://educacaopublica.cecierj.edu.br/artigos/18/14/fatores-que-facilitam-e-dificultam-a-aprendizagem