

Teaching and Learning of Biology in High School through Educational Computer inside Brazilian Amazon

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Abstract: This paper examined whether the use of Information and Communication Technologies would make any difference in the learning of biology by high school students. After studying the school's infrastructure, there was a need to acquire an internet signal to use the institution's equipment, which is why the machines were not used. The same school evaluation method was used. The challenge was how to minimize environmental impacts through conscious consumption. In the first moment the subject was approached in a traditional way (lectures, poster, board, chalk, magazines, etc.); secondly, technological resources (videos and slides) were used. The results showed that the students were not too lazy to develop the activities in the classes with technological resources, unlike what happens with the traditional classes; While not mastering technological resources, students quickly learned to deal with them while remaining uninterested in dealing with traditional ones; and the students' performance with technological resources was far superior to that obtained with traditional resources. The conclusion shows that the use of computers promotes much more meaningful learning than traditional classes because it can attract students' attention and willingness to learn.

Keywords: Educational Informatics; Teaching-Learning Process; Technological Resources; Traditional classes.

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I. Introduction

Technological tools are very important for teaching and learning (Day and Lloyd, 2007; Keane, Keane and Blicblau, 2016; Chinapah and Odero, 2016), as it has been transforming the exchange of experiences between the learner and the educator (Norris et al, 2015; Mihaela and Magdalena, 2017; Hlasna, Klimova and Poulouva, 2017; Reeves and Sheriyar, 2015). With it, teaching is integrated day by day through these technological resources such as computer, tablets and even the cell phone that we have all the time at hand and for this to be possible the teacher needs to make use of these resources encouraging the student to learn with more interest. Faced with the advancement of new technologies, the teacher has as a help a new resource to make his classes more stimulating and differentiated. This is a way of showing that the student can perform better than traditional classes, with educational software that enriches the act of learning.

Information and communication technologies make the teacher a mediator (Goodwin et al, 2015; Copriady, 2015; Altinay-Gazi, 2015). The teacher / facilitator creates certain facilities by increasing students' self-esteem, allowing for new values and verifying learning disabilities by readapting with interactive and easy-to-understand games. The teacher as a mediator has a significant role and it is his mission to seek viable alternatives to remove the disinterest of students who do not want to get involved and participate in projects implemented by the school. In the use of technology as a central element, one of the possibilities is to create several stations in the classroom with different learning objectives, having at least one of them supported by technology.

A triadic scheme, for example, would be possible. One station with evaluation activities, another that encourages free study or project development and a third for collaborative work. In this context, the teacher puts himself in the role of mediator, points out ways to study, doubts and plans experiences that challenge the class to move forward. And this corresponds to all technologies that interfere and mediate informational processes and is responsible for major advances in various spheres of associated human life.

Information and communication technology is changing the world in our eyes and its discoveries have kept evolving. Through this it could be seen that many authors defend both traditional learning, without the use of technologies, as educational informatics, each with a point of view and each in its own time, creating a

somewhat conflicting scientific environment. This highlights the importance of the present research, especially in relation to the Amazon reality, which seems to be separated in time and space from the large Brazilian and international urban centers precisely due to the lack of mastery over technological resources.

The justification for this research is based on what is experienced today in the Brazilian Amazon, where there are children and adolescents who use technological resources, very easily in their daily lives, especially the cell phone. Besides being easy to use these technologies, it is something that they like very much. It was intended to know if these technologies, so present in the adolescents' life, can bring some benefit to the learning when applied in the school, considering the great difficulties pointed by the pedagogical innovation. The reason is that these days there is little work done in the region and because of the high number of students who fail the subjects of the Nature Area, which include Physics, Chemistry and Biology.

Thus, this research aimed to verify if the technological resources used in the teaching and learning process of Biology have a positive impact on students' learning. To achieve this goal, a case study was conducted in a first-year high school class of a municipal school in the interior of the state of Amazonas, in the Brazilian Amazon. In this school there is and never was the use of technologies in the classroom. Teachers are limited to books, a whiteboard and a brush for teaching.

Educational Informatics in the Teaching of Biology

Educational Informatics at school facilitates students' understanding of the content of classes. According to Rocha (2018), Educational Informatics favors the use of the computer as a pedagogical tool that helps in the process of knowledge creation. In this way, the computer is a learning tool that gives students the opportunity to learn more interestingly and through this technological resource will bring benefits to our students, even living in a technological country, where they often do not have access. the information they need through opportunities or even difficult access.

Computer science when adopted in school should be integrated into the curriculum, not as a discipline, but should be considered a multidisciplinary tool that the student can count on to prepare their work; In this sense, the computer becomes a powerful learning support resource, with numerous pedagogical possibilities, provided that there is a reformulation in the curriculum, new methodological and didactic models are created, and especially the rethinking of the true meaning of learning. , so that the computer no longer becomes a travesty prop of modernity (Rocha, 2018).

According to Lopes (2018), with the globalization and the emergence of technologies, some schools, observing the potential of ICT, incorporated the educational Informatics, which, besides promoting the contact with some technological tools, the computer and the overhead projector had the objective of using this resource as an instrument to support the disciplines and activities to be performed. Lopes also emphasizes that it is necessary to seek to perform activities in the laboratory to adapt to different resources and seeking to grow professionally. Using educational informatics as a technological learning resource adds knowledge and values to classes and thus encourages students' learning. For Lopes (2018), the purpose of using technological tools is to improve teacher performance and student learning. Thus, they are tools that facilitate the construction of knowledge by the student and not make him merely receptors of learning.

To ensure the consistency of this context, Moran (1997) dialogues to make it understand that the teacher has a central role in the effort to make the student aware of its importance in the learning process. This effort is to influence them so that they are really interested in learning, really want to contribute to classes, gain knowledge and be part of the education process. That is your mission, which is why you were appointed teacher. If not, what would all technology be worth if there is no interest from teachers and students in learning? It is necessary to change habits in the Amazon reality. Although there are difficulties for transformation, every proposal for sustainable practice at school is welcome. For this to happen, Amazonian schools often face so many difficulties, which makes it a challenge to turn theory into sustainable practice at school.

Moran (1997) emphasizes that the educator is of great importance as a learning mentor for students. And that means looking for ways for this learner to become interested through technological resources that go beyond just whiteboards and books. These resources are increasingly entering the school reality of today's world.

Information and Communication Technologies are increasingly entering every corner of every society. This has also been happening in the educational environment, both inside and outside the learning environment, and has made learning more stimulating as well as the diffusion of knowledge and information. This foreshadows the birth of a new rule, which is 'learning from technology'. As expressed by Nogueira (1994, p. 73), "[...] the use of these new technologies does not only represent an advance in educational resources, but a pathway that may lead to change in this educational paradigm". This phrase expresses the need to search for new questions in the teaching and learning processes. These technological tools call into question traditional teaching, which still predominates in many public schools in Brazil, especially in the Amazon.

Carvalho (2006, p. 37) shows that "education is minimized to the transmission of ready-made concepts

and the school, in addition, provides people with conditions both in theory and in practice which they can use and transform and even though they can understand the world in the most sustainable way possible ". The reason for this is that it can be observed that the use of technological tools in the school environment has induced the teacher to work more efficiently, playing a role of intervener and promoter of knowledge.

Leite (2008) says that the real mediator is the one who provides his students with the search for the fundamental information that leads to the process of learning construction. It is by interacting with your apprentice as a human being that you have the sensitivity to look and meet your obligations and personal interests. This interaction with sensitivity is work that the computer cannot perform well.

The introduction of technological tools in the educational field provides greater participation of the educator in teaching and learning. The teacher as a mediator will have several tools available, such as audio, videos, images, animations, simulations and graphics, among others, which make the class more interesting, especially with the possibility of the student assisting in the assimilation of the themes. Chervel (1990, p. 178) also sees it this way by stating that 'the teaching contents are placed as such in the school by the surrounding society and the culture in which it plunges'.

When technology tools are used correctly, students can show their tasks more effectively. They allow them to represent their daily lives inside and outside the school environment, working to expand the learner's ability to perceive situations in which they may use technological means outside the educational field. Smole and Diniz (2007, p. 15) share the same idea in stating that "the challenge is to put all these technologies at the service of improving the educational process, associating the school project with the objective of forming a future citizen". It seeks to develop, in young and adult students, the understanding of the use of technological tools, but in their daily life, making a combination of the theoretical and the practical, so that the student can perform their tasks and master the use of technological tools in their day by day.

In common opinion, the school teaches the sciences, which have proven themselves elsewhere, away from schools. It is to this conception of school teachings that it is directly linked to the image of dominant pedagogy, whose task is to "arrange the methods so that they allow students to assimilate as quickly and as best as possible the greatest portion of existing science" (Chervel, 1990, p. 180-181). Chervel also emphasizes that we can consider that the educator needs to try to differentiate his classes by modifying his methodology, aiming to reach as many students as possible and to enable them a broad knowledge intermediate to discover the learning method that best fits the content. Therefore, the teacher must be able to adequately apply technological resources in the teaching process.

As can be seen, training is important for many authors, such as Lopes (2018). However, initiatives in this direction in the Brazilian Amazon are still rare. More training is needed in the area of educational computing to improve the use of these technological tools. Most importantly, they are used correctly, so that there is better performance of the contents of the classes by the students.

The area of Nature Science has a considerable amount of failure in high school in the state of Amazonas. As more and more content is being added, the failure and dropout levels of schools are further increased. In this area of knowledge, three subjects are taught (Physics, Chemistry and Biology), and the discipline chosen for this study was Biology. At the school where this case study was conducted, it is one of the subjects that most disapproves, as shown in table 1.

Grade	Class schedule	Class	Rate of Disapproval	Year
1st grade	13:00 – 17:15	27- High School	40%	2015
1st grade	13:00 – 17:15	23- High School	55%	2016
1st grade	13:00 – 17:15	28- High School	75%	2017
1st grade	13:00 – 17:15	25- High School	80%	2018

Table 1. Percentage of Disapproval in Biology: school of the interior of Amazonas State

Source:SEMED (2019).

Observing data from the Education in School Program (PEE) of 2018 from Borba Municipality, city of the state of Amazonas, Biology failure rates are higher than the average of previous years, as shown in Table 1. Borges and Lima (2007) blame this failure on the emphasis on the organization of biology education in Brazil, which, until today, privileges the study of concepts, languages and methodologies of this field of knowledge. According to the researchers, this leads to teaching with low efficiency, disabling students for the interpretation and intervention of today's reality. Krasilchik (2004; 2007) shares the same idea by noting that the teaching of biology in Brazilian schools is very theoretical, disconnected from the reality of life, leaving with the segmentation of contents which aims only for memorization.

Information and communication technologies are very important for the teaching-learning process. The use of these technologies as an educational tool has transformed the exchange of experiences between those who are teaching and those who are learning. With it, teaching is integrated day by day through the computer,

notebooks and overhead projector and even the cell phone, which is all the time at hand. And for these technological tools to be included in the school environment, the school needs a physical and material structure that enables their use in a way that does not cause any inconvenience.

Moreover, teachers need to be motivated to learn and innovate in their classes. Motivation and innovation are essential elements in the recognition of the pedagogical practices experienced in biology classes that introduce greater interactivity in the teaching and learning processes by providing greater access to information to students. This gives another look at the worked content. The use of these technological resources in pedagogical practice allows the possibility of diversifying the classes.

With the use of technology, it is possible to develop methods that facilitate the presentation and explanation of the themes, as it has numerous media resources such as images, videos, sounds and others. Similarly, in the National Curriculum Parameters of the Brazilian High School, it is mentioned that the teaching of Biology should focus on the development of competences that allow students to deal with information after understanding it, so that they can elaborate and refute it, when appropriate, seeking to “understand the world and act with autonomy in it, making use of the knowledge acquired from biology and technology” (Brasil, 1999, p. 225).

It is also important to emphasize that information and communication technologies help only as a support for classes and not as a means of expanding the study of biology. As Leite (2008, p. 82) states, “ICTs are important resources for disseminating knowledge and supporting students in their evolution”. This means that when employed in the teaching-learning process, technological resources allow for insights that only a very long period could bring through living in the real world that technology itself simulates. Thus, technology allows us to see in the virtual world how the real-world works.

II. Materials And Methods

This work was developed through case study and comparative method in a high school in the interior of the Amazon called Aprigio Batista e Silva Municipal School located in the municipality of Borba in the interior of the Amazon. The execution of the research began with an observation of the school which was unstructured in relation to rooms, bathrooms and cafeteria. It had a computer lab with 10 desktop computers, 1 notebook and 1 overhead projector.

The school environment did not have internet, but for the project to be implemented it was necessary to buy hours of internet to be able to put and work the contents with the students, which were used in the computers and the school notebook. The desktop computers had an educational Linux 2.0 operating system and the notebook had Windows 7.

Although this technology was available, teachers did not make use of its students as a technological resource to the teaching and learning process, there was digital illiteracy there. Book pens and whiteboards were used, most outdated books.

It was found that the school had around 490 students, distributed in the morning, afternoon and evening shifts. The target audience of this work was the 1st year high school classes, the class made up of 12 students. The school's evaluative method was qualitative, where the students' goal was to achieve the following concepts, Satisfactory Learning Construction (SLC), Partial Learning Construction (PLC).

After the observations, the classes were planned, together with the class teacher, aiming to address the contents of Conscious Consumption. The content was worked without the use of technological resources and divided into two moments, the first moment was characterized for the construction of a work talking about how we can minimize the environmental impacts through conscious consumption, in the second moment the work of the For this activity students were used: posters, whiteboard, books, magazines and notebooks for research, paper, cardboard, pencil and pen and through them could complete the work requested.

In the third moment the students worked the same content, but with the use of technological resources, in the computer lab which was built slides and videos. Finally, at the fourth moment, the students explained their work through a data show showing the other students at the school what they learned about the benefits of conscious consumption, the impacts caused by unconscious consumption in nature and the importance of resource use. technology in the teaching of biology. The culmination was done in a large room and students from other classes were invited to attend the presentation of the students as well as the Manager, Pedagogical Coordination and students. In this work the use of technological tools comprised the use of the following technological resources: digital images, videos, data show, computer, notebook, Internet search and slide show software.

To assess students' learning regarding Consumption content, an assessment was conducted for the classes. The evaluation comprised 10 questions, of which 5 were objective, 2 descriptive and required justification for the selected answers and 3 questions with personal answers. The evaluations carried out were aimed at comparing students' performance when using technological resources and not using them.

III. Results

After the application of the classes and the evaluations, the results of the students' performance in the activities performed during the classes and in the evaluation were analyzed. To verify the students' performance in the activities, the teacher was asked to report how the classes had been. The first report of the teacher was that "the use of technological resources in the biology class was extremely important, because it was remarkable the involvement of students with work on conscious consumption, which were developed with great motivation." The teacher also points out that in classes where there was no use of these technological resources students showed a certain "laziness" in performing the activities. Several times she had to encourage and request that they continue the activity, which caused a longer delay in the completion of these works by students,

Continuing the report, the teacher said that even if the students could not handle the technological tools precisely, they did not take long to perform the activities. They were so excited that classes were in the computer lab that they did the work and learned to work with those tools they didn't know very well.

As Bielschowski (2009, p. 11) puts it, "It is important to verify about the impact of technological tools on school performance with its various components, including the development of students' autonomy and creativity." Therefore, the results show that, in relation to the teacher's statements, these technological resources made a difference in the students' learning.

Using technology resources	No use of technological resources
80% of students succeeded	20% of students succeeded

Table 2. Performance of students with and without use of technology resources

The analysis of the students' performance in the evaluations was made comparing the class performance in the classes with and without the technological resources. Table 2 shows the performance of the class using the technological resources in the conscious consumption content; It is clear that it obtained a satisfactory result, with the largest number of students reaching the SLC concept. The table also demonstrates the performance of the class without the use of technological resources in the conscious consumption content, which resulted in the largest number of students achieving the PLC concept.

It can be noted that the use of technological tools was relevant in the teaching and learning process because 80% of students in the class achieved the SLC concept, compared to only 20% of those who achieved only satisfactory results (PLC) with the use of traditional tools. . These results confirm what Moran (1991) said, that educating is reaching the student in several possible ways. By utilizing the technological resources one can reach the learner faster and more fun.

After the results that these experiences and the analysis of the procedures performed the school could verify that the teaching and learning process is easier with the use of technologies. They are means that facilitate not only the transmission of the concepts of the disciplines, but to see them as they really are and to live them. As Carvalho (2006) noted, the current study, which is tied to the mere transmission of concepts, needs to change. School has another social role to play. Rather than delivering ready-made concepts, the school is challenged to make people understand the world so that they can act responsibly and consequently, giving their share of contribution to make it better, happier. The school must begin to contribute its share in building a world where happiness is possible.

These results show that it is possible to combine learning of school contents in a more consequent and pleasant way. The experiments carried out did not focus on the mere transmission of ready-made content, but on the transformative learning capacity that every human being has, especially the ability to transform oneself. In the end, everyone realized that the theories are nothing but always tentative but fundamental explanations for life. And because they are provisional, they are always challenging the human mind to perfect them, update them, finally, through new learning. And information and communication technology, it seems, has an immense and important role in this new scenario that is unfolding in the Amazonian schools.

IV. Final Considerations

This study showed that the use of information and communication technology in biology classes at an Amazonian high school improves student learning. By making use of technological resources such as videos, slides, notebook and computer, it was confirmed that their use makes a big difference in learning Biology Teaching. Thus, the introduction of media helps in learning because it provides tools for the student to act and interact in the world with autonomy, with criterion and transformative vision not only in the school environment, but in their daily life, which is impossible with the classes merely. where the teacher speaks, and the students just listen and take notes.

Although technology was not new to students and teachers, it was not seen as a learning tool in the reality of that Amazon school. After the classes with the use of these resources could gain much more satisfactory knowledge than the traditional class. The reason for this is that technologies provide differentiated

lessons, which helps to hold students' attention, motivate and integrate them into the construction of new knowledge.

Finally, it is considered that the use of technological resources by schoolteachers is very important. But to do so, institutional incentives need to be created so that teachers can handle technology and integrate it into their professional practice. The more teachers use existing technologies, the greater the possibility of further arousing students' interest in biology classes and other subjects. This collective effort may be able to integrate students from the interior of the Amazon with the world, from which they are still pedagogically separated.

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