



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

IJDR

International Journal of Development Research

Vol. 12, Issue, 03, pp. 54336-54340, March, 2022

<https://doi.org/10.37118/ijdr.23978.03.2022>



RESEARCH ARTICLE

OPEN ACCESS

MICROBIOLOGY PRACTICES AS A TEACHING-LEARNING STRATEGY AT FUNDAMENTAL LEVEL II

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ARTICLE INFO

Article History:

Received 11th January, 2022

Received in revised form

26th January, 2022

Accepted 27th February, 2022

Published online 19th March, 2022

Key Words:

Microbiology; Microorganisms;
Teaching-learning; Experimentation.

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ABSTRACT

Microbiology is the science responsible for the study of microorganisms, including eukaryotic, prokaryotic and unicellular beings. In the teaching-learning process, the teacher has an important role, seeking attractive methodologies to expose certain content in a way that draws students' attention, relating the students' routine with the exposed content, fixing learning through practical investigative experiment. Thus, this work aimed to present microbiology practices as a teaching-learning strategy at elementary level II. The research was carried out through theoretical and practical classes with the application of a questionnaire before and after the experiments, with students from a municipal school located in the rural-river area of Amazonas. The collection of biological material was performed with the aid of a swab. Biological material was collected from the mouth, feet, hands of students and from the surface of school chairs. At the end of the collection, the material was inoculated in different petri dishes. At the end, the plates were sealed and incubated at 28 °C, being observed after eight days. After the growth time, it was possible to observe the growth of fungi and bacteria in all plates. With the accomplishment of this research, the students were able to verify that there are microscopic beings in different environments that live in a harmonious way with us every day. In addition, it was possible to complement the contents transmitted in the classroom through practical classes. Based on the evaluation of the questionnaires after the practical class, the students concluded that, in most cases, microorganisms are beneficial to humans.

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Citation: Angelica Levi Ferreira, Paulo Alexandre Lima Santiago and Sarah Raquel Silveira da Silva Santiago. "Microbiology practices as a teaching-learning strategy at fundamental level II", *International Journal of Development Research*, 12, (03), 54336-54340.

INTRODUCTION

Microbiology and Teaching: Microbiology is classified as the area of science that studies microorganisms, including eukaryotic, prokaryotic and unicellular beings (Barbosa and Oliveira, 2015). They are microscopic organisms, constituting a diverse group such as bacteria, viruses, fungi (yeasts and filamentous fungi), protozoa and microscopic algae (Tortora, 2012). When we talk about microorganisms, people tend to associate them only with diseases, especially elementary school students, when they make their first contact with the microbiological world. During the teaching process, students must acquire knowledge about microorganisms, both the harm and the benefits, as they play an important role in our daily lives, at the end of elementary school, students must have critical thinking about the topic of microbiology (Moresco et al, 2017). According to the literature, many authors suggest that science teaching, including microbiology, suggest that the mere verbalism of content be replaced by expository and experimental classes.

In this way, students would be encouraged to discover and explore knowledge and not just "learn information" (Capeletto, 1992; Fracalanza, do Amaral, and Gouveia, 2008). In the case of experimental classes, they stand out because they are able to relate what is observed by the student and the objects of their knowledge. In these classes, students can interpret natural phenomena and processes from the knowledge previously acquired in the classroom and from their own knowledge and hypotheses (LIMA, JÚNIOR, and BRAGA, 1999). For practical classes, it is a consensus that laboratories provide students with the opportunity to exercise skills such as cooperation, concentration, organization, handling equipment, observing phenomena, recording data, formulating tests and drawing conclusions about everything that has been demonstrated. In this way, laboratory classes work as a powerful catalyst in the process of acquiring new knowledge, as it facilitates the fixation of related content (Capeletto, 1992).

Teaching-Learning Tools: It is characteristic of the teaching of microbiology, the deficiency of activities aimed at student learning,

regarding the topic of microorganisms. Allowing to understand the microscopic world in general, contributing to their learning. The teacher plays an important role in the teaching-learning process, seeking attractive methodologies to expose certain content in a way that draws the attention of individuals (Barbosa and Barbosa, 2010). According to the literature, a tool that can help in teaching-learning processes is experimentation, as it facilitates the understanding of the phenomena and transformations that occur throughout the classes. The more practical classes are integrated with theory through problem creation, contextualization and the stimulation of research questioning, the more meaningful the learning will be (Russell, 1994; Guimarães, 2009). The use of experimentation as a methodology for teaching science in schools follows an orientation established by the National Curricular Parameters (PCN). The teacher participates as the main mediator to disseminate the theme, relating the students' routine with the exposed content, establishing learning through a practical investigative experiment. Associating theory and practice has considerable relevance, as it arouses students' curiosity, since they have an active participation in the developed practice (Brasil, 2000; Gonçalves and Galiazzi, 2004). Experiments are not limited to just a laboratory, they can take place in the classroom, using low-cost resources, as long as it encourages students to reflect on the exposed content, causing curiosity and critical thinking to ask questions and give answers. Meaningful learning can be achieved through experimentation, developing investigative and cognitive knowledge in students (Taha, 2015; Sodr e-neto and Vasconcelos, 2017). In this context, each student has a different understanding of microorganisms, some already have prior knowledge and others do not, on which they will build new knowledge. In this way the learning process will be different for each one. The school does not only function as a transmitter of information, but as an opinion maker (Barbosa and Oliveira, 2015). Thus, this work aimed to present microbiology practices as a teaching-learning strategy at the elementary level, evaluating student learning in relation to microbiology contents, relating theory and practice in the classroom.

METHODOLOGY

Place of study: The work was carried out at the Monte Sinai Municipal School, located in the Monte Sinai community, lower Rio Preto da Eva – Itapaiuna – Rio Amazonas in the State of Amazonas. Initially, a theoretical content on “Introduction to General Microbiology” was presented. The content taught with the help of the textbook, blackboard and Datashow. After exposing the content, students were asked to answer a questionnaire entitled “Knowing the world of microbiology” containing two subjective and four objective questions as described below.

Knowing the World of Microbiology

- Describe in your own words what are microorganisms?
- Where can we find microorganisms?
- Do most microorganisms cause disease?
 - Yea
 - No
- Do you think that whenever you eat food with microorganisms, you can feel sick or get sick?
 - Yea
 - No
- Do you think washing your hands prevents illness?
 - Yea
 - No
- Can microorganisms bring benefits to humans?
 - Yea
 - No

The practical class was held on 11/13/2018, with students from the 7th year of the school, the class consists of 15 students, being a single

class in the morning period. Petri dishes containing the Potato Dextrose Agar (BDA), Sabouraud (SB) and Mueller- Hinton (MH) culture media were previously prepared in the multidisciplinary laboratory of Escola Superior Batista do Amazonas (ESBAM). Asepsis of the practice site was performed with 56% alcohol, then three candles were lit to eliminate air spores. With the help of a colleague, the students' fingers were sanitized as shown in Figure 1 below.

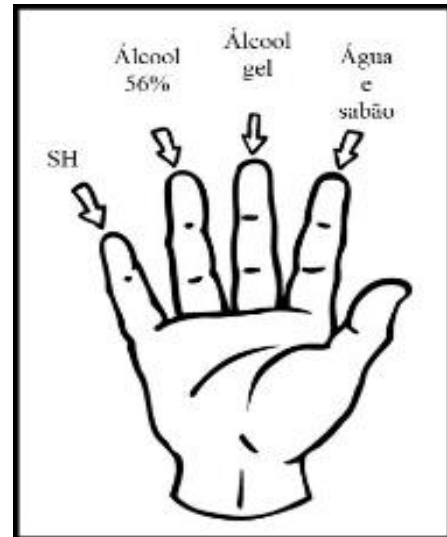


Figure 1. Sanitation scheme. *SH - without cleaning

After cleaning, the fingers were placed in contact with the solid culture medium in their respective quadrants, as shown in Figure 2.

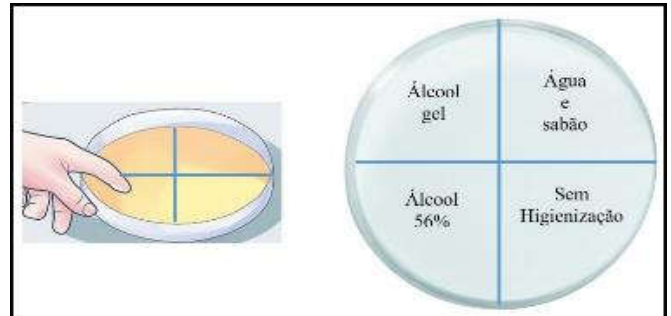


Figure 2. Contact of fingers with solid medium

On the same day, a second practical class was held, with the aid of a swab, biological samples were collected from the mouth, foot and from a school chair. After collection, the samples were inoculated into separate petri dishes containing the appropriate medium as shown in Figure 3.

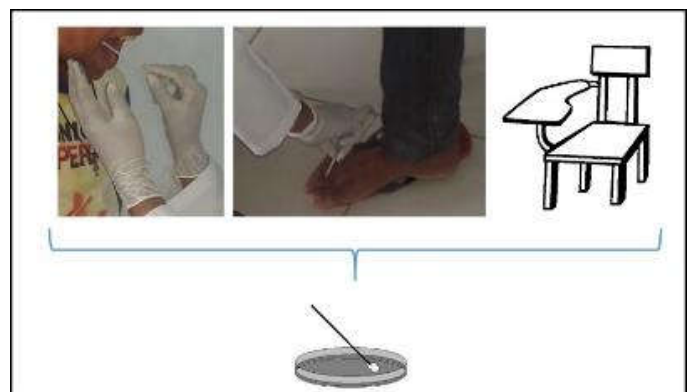


Figure 3. Collection and inoculation of biological material

At the end of both experiments, the plates were sealed and incubated at 28 °C and observed after eight days. Figure 4 shows the plates used in this stage of the experiment.

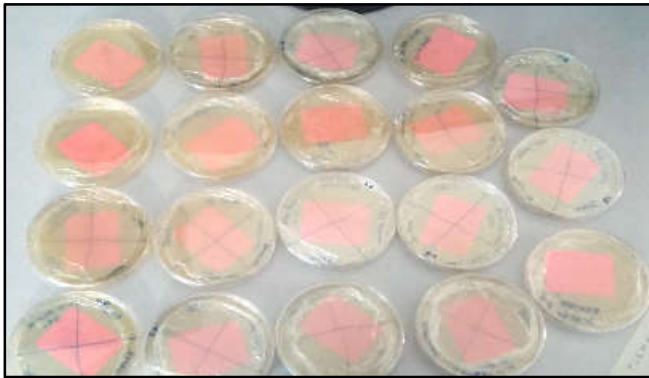


Figure 4. Plates sealed and incubated at 28°C

RESULTS AND DISCUSSION

Analysis obtained through the questionnaire before the practical class: Eleven questionnaires were applied to the class to measure the students' level of knowledge on the topic exposed in the classroom. The first question aimed for students to describe in their own words "What are microorganisms?", the answers were diverse, such as: "Microorganisms are microscopic beings, tiny beings, viruses, bacteria, fungi". The answers were satisfactory, since the contents taught were understood correctly. The second question evaluated the students' knowledge of "Where could they find microorganisms". Most of the answers were: "they can be found in water, dirt, on the body and on the ground". As for question three, asked if "Most microorganisms can cause disease?", of the eleven questionnaires, ten answered yes and one no.

Because in the theoretical class some diseases caused by microorganisms were mentioned. In relation to question four "What for the students whenever they ingest food with microorganisms, they can feel sick or get sick?", eight answered yes and three answered no. According to Cassantiet al (2007), only a small part of the microorganisms causes some type of pathology to the human being. When asked about question five "Does the habit of washing hands prevent diseases?", ten answered yes and one answered no. In the theoretical class, content on personal hygiene was taught to students, such as the habit of washing hands, bathing and brushing teeth.

On question six "Do microorganisms bring benefits to humans?", nine answered yes and two answered no. The content exposed to the class, on the benefits and harms of microorganisms, was stressed that several microorganisms are part of our microbiota, without causing harm to the individual.

As can be seen after analyzing the questionnaires applied before the practical class, most students managed to assimilate the content, and the minority had some doubts about some questions.

Analysis of Experiments: The practical classes were held in the classroom, as the school does not have a science laboratory. For Sodr -Neto and Vasconcelos (2017), experiments are not limited exclusively to a laboratory, they can be developed in a common environment, with alternative materials, as long as students are encouraged to reason about the contents. After the growth time, it was possible to observe microbial growth, mainly on the BDA (Figure 5) and SB (Figure 6) plates, where the fingers washed with alcohol gel, 56% alcohol, water and soap and without hygiene were analyzed. The results were made with the naked eye by the students, making it possible to identify fungi and bacterial colonies.



Figure 5. Microorganisms obtained from the process of hand hygiene in PDA medium.

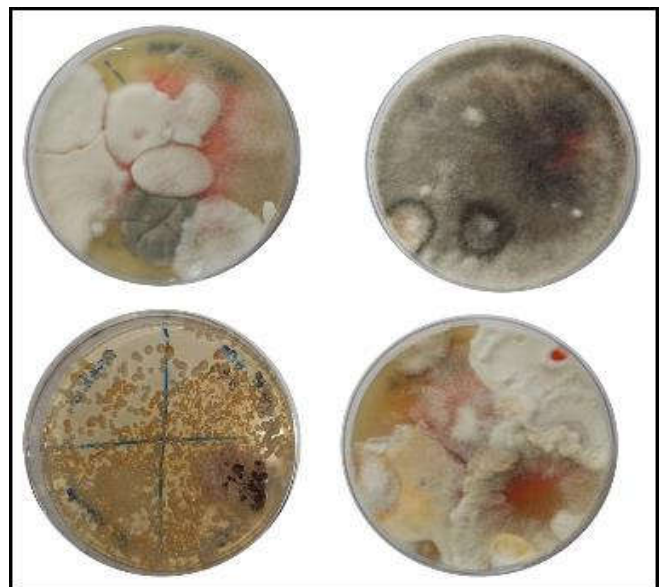


Figure 6. Microorganisms obtained from the process of hand hygiene in PDA medium

Several microorganisms were also isolated from the feet in MH medium. The microorganisms obtained can be seen in figure 7.



Figure 7. Microorganisms obtained from the collection of a student's foot in MH medium

When the students' saliva was inoculated in MH medium, the following microorganisms were obtained (Figure 8).



Figure 8. Microorganisms from saliva in MH medium

With the completion of the practical activity, it was possible to explain to the class the importance of personal hygiene. In this way, they were able to understand that microorganisms are present in various everyday situations (FERREIRA, 2010). In addition to the biological material from the hand, foot and saliva, it was also collected from the school chair in PDA medium, as the result can be seen in Figure 9.



Figure 9. School chair microorganisms in PDA medium

Each student was able to observe their plate with microorganisms, they were surprised and curious about the results of the experiments. According to Barbosa and Oliveira (2015), when something new is brought to the classroom that comes out of the students' routine, their attention increases. of students for scientific research (PALHETA; SAMPAIO, 2016).

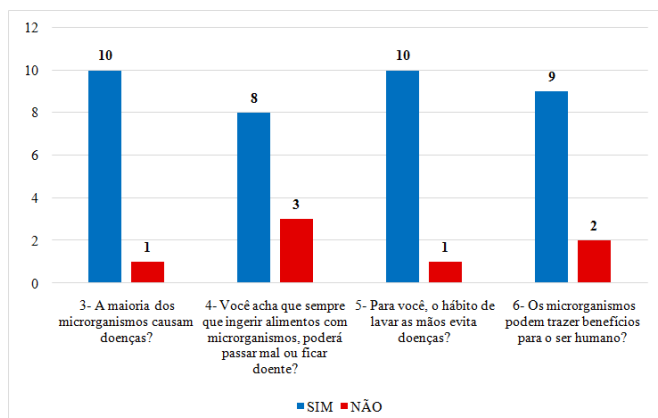


Figure 10. Questionnaire before the practical class

Analysis obtained by comparing the questionnaires before and after the practical class: Comparing the questionnaire before (Figure 10) and after (Figure 11) of the practical class, it was possible to observe that the students had doubts regarding some questions before the experiment and continued after it was carried out. This is due to the eight-day period of growth of the microorganisms, they may have forgotten the content and continued with the same response. Others confirmed what still remained doubt and all marked the same answer, after seeing the results of the practice.

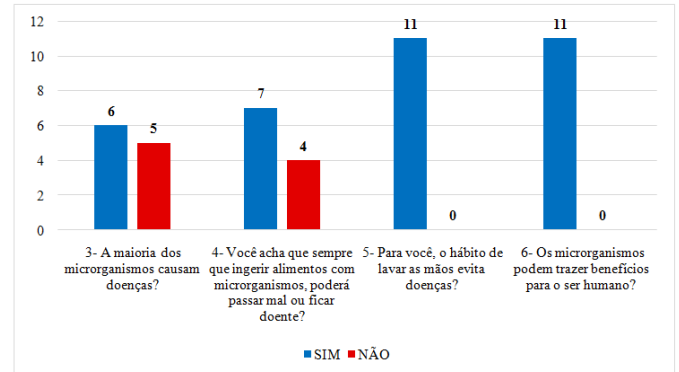


Figure 11. Questionnaire after the practical class

CONCLUSION

With the accomplishment of this research, the students were able to verify that there are microscopic beings in everything, we live in everyday life, we just can't see them with the naked eye. Most students miss practical classes in the discipline of Science, this occurs mainly in rural schools, as they do not have the necessary equipment. The teacher should look for attractive strategies to arouse students' interest in the teaching of Microbiology, relating theory and practice to the contents taught.

Thanks: We thank ESBAM for the equipment and structure necessary to carry out the stages of the work. This work is part of Angélica Levi Ferreira's specialization monograph in microbiology.

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