



USEDAT: USA-Europe Data Analysis Training School

MOL2NET, International Conference Series on Multidisciplinary Sciences



Application and Evaluation of Low Cost Biology Practical Lessons for Students of a Certain State School in the Municipality of Jaciara, Mato Grosso, Brazil

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Abstract.

Among the greatest difficulties of Biology teachers who teach in high school is the adequacy of alternative teaching resources to the teaching process, in order to facilitate mediation and understanding of the content covered. The absence of didactic resources and difficulties in developing low-cost strategies, which integrate the contents covered and contextualize them within problems in which the student must seek to solve, leaves the teaching and learning process deficient. Within this context, this study aimed to apply and evaluate two practical classes in a public school in the municipality of Jaciara-MT. The evaluation was carried out using questionnaires about the contents involved in the classes, applied before and after the practical classes. It was observed that most of the students involved in the study showed greater mastery over the contents, after the practical classes.

Keywords: practices, biology, teaching-learning.

Introduction

Among the greatest needs of Biology teachers when teaching in high school, is the adequacy of alternative teaching resources to the teaching process, in order to facilitate mediation and understanding of the content covered. The absence of didactic resources and difficulties in developing low-cost strategies to improve teaching in Biology is a problem to be thought about and solved (Lima, 2017).

One of the most widespread discussions when it comes to the teaching of Biology is related to the choice of methods used by the teacher to address the subjects that involve the discipline. Among the possible methodologies to be used, the theoretical expository class appears among the most used methodologies during the teaching and learning process in Biology. Its choice is justified by the ease of application, since for practical classes and other alternative methods resources and time are required (Silva et al., 2011). Within this context, there is a great need to develop new teaching strategies in low-cost biology, since the traditional teaching method, lectured, is outdated (Carvalho, 2018).

Educational institutions are going through a time when there is a real need to plan new pedagogical methods, at a more accessible cost and in order to improve teaching and learning, motivating teachers and participants to seek efficiency in their studies (Miter, 2008).

In view of the discussions about the teaching model practiced by several institutions, other issues related to this theme were also taken into consideration, such as the teaching strategies employed, an extremely relevant part in the teaching-learning process, because, for this to occur, effectively, teaching methodologies must be very well adjusted (Giovanella, 2007).

It is the responsibility of teachers to provide their students with effective learning experiences, combating the most common difficulties and updating, as much as possible, the pedagogical instruments they use (Fiolhais & Trindade, 2003). The teacher's role is to provide students with the construction of meaningful learning. The way teaching and learning situations are proposed is decisive for meaningful learning to materialize (Giovanella, 2007).

The changes and transformations of the agents make the transmission of knowledge a very dynamic process, which requires permanent monitoring and the permanent search for new practices, aimed at breaking paradigms (Barbosa & Moura, 2013).

In addition to obtaining effective teaching tools for successful learning, there is still a need to educate within the scientific basis, since new knowledge has been surprisingly generated, thus emerging a reality that directly influences traditional education putting it in a situation dramatic. For a country to develop harmoniously, sustainably and be within a globalized world, its population must have a level of scientific literacy, considerably good (Rocha & Soares, 2005).

An alternative pedagogical practice to traditional teaching that has gained prominence in the educational environment is the active methodology. Instead of teaching based on the transmission of information, where the teacher acts as a protagonist, in the active methodology, the participant adopts a more active, participatory posture, in which he elaborates solutions to problems, creates and develops projects and, with that, forms the possibility of creation and not just the reproduction of knowledge (Valente, 2017; Schneider, 2013). Within the active methodology, it is not up to the teacher, the transmission of ready and conceptual speeches, but the organization and mediation of previously organized and sequenced activities that start from problems that students must solve, individually or in groups (Suhr, 2016; Santiago & Carvalho, 2018).

Another relevant factor that can contribute effectively to the development of teaching strategies is the advancement of information and communication technologies (ICT), which have transformed some teaching and learning methodologies. The ICT gives teachers and students the opportunity to establish contact with different media, improving the understanding of information, thus allowing the development of a new teaching-learning methodology (Assis, 2015).

Another way to improve the quality of teaching, sometimes with lower costs, is the demonstration experiment, where the truths already proven scientifically are demonstrated, improving the mediation of knowledge (Possobom; Okada & Diniz, 2003; Lima & Garcia, 2011). Practical classes are fundamental and essential to demonstrate these aspects, because in addition to drawing the attention of the participants, the subjects become more visible and palpable.

The relevance of this project is in the development of tools that will contribute to the efficiency of the teaching and learning process, through low cost strategies.

Thus, the objective of this work was to evaluate two practical biology classes applied to high school students from a specific public school in the municipality of Jaciara, state of Mato Grosso, Brazil.

Materials and Methods

This study aimed at the application and evaluation of practical biology classes for high school in a public school located in the municipality of Jaciara, Mato Grosso, Brazil. The practical classes were evaluated based on a study directed to each practice, applied to students before and after the development of the classes, so that the results could be compared.

The participants were responsible for the execution of the scripts of the practical classes, proposed by the teacher responsible for the discipline. The teacher was the mediator of the teaching-learning process. It was allowing them to develop autonomy, teamwork, leadership and problem solving. To carry out the practices, the participants had to perform tasks, overcome challenges and propose solutions to problems, so they acted as protagonists of their learning and will need to articulate different knowledge.

The practices were chosen through positive results found in the literature, experiences of professionals already inserted in teaching, through the adaptation of scientific methodologies for teaching, as well as the observation of the interest and difficulties encountered by students about some Biology content.

For the first year of high school, the practical class of “ADN extraction, assembly of the molecule and investigation of its importance for living beings” was applied - the practice aims at the extraction, visualization and confirmation of the existence of ADN from banana or onion, besides the reproduction of the macromolecule as a model.

For the second year of high school, the practical class “vegetable anatomy through the cultivation of vegetables” was applied - the practice aims to bring students closer to different plants, observing different anatomical aspects of the plants.

The present study was carried out in a specific public school in the municipality of Jaciara-MT. The project included 25 participants from the first year and 25 participants from the second year of high school.

For each selected practice, the participants had a previous theoretical / expository class with an approach focused on the subject involving the practical class. After the lecture, the participants answered a multiple choice questionnaire on the subject addressed during the lecture. Then, the practical class corresponding to the theoretical class taught was carried out. After the practical class, the same questionnaire was applied. In this way, it was possible to analyze the performance and efficiency of practical classes in the learning of students.

To conduct the study, the Terms of Free and Informed Consent were obtained from participants over 18 years old and / or those legally responsible for minors of that age. Together with participants under 18 years of age, in addition to a Term of Assent, with the school management.

Results

Practice Extracting ADN from bananas

To assess the students' knowledge, five questions were applied before and after the application of the practical class:

1) What is the function of the ADN molecule for living beings?

- a) Related to the genetic code of a species.
- b) Related to all external characteristics of a species.

2) Is it possible to isolate the ADN?

- a) Yes
- b) No

3) Where is the ADN located in the cells?

- a) Depends on cellular organization
- b) Restricted to the core

4) It is an importance in the possibility of manipulating ADN

- a) Production of GMos.
- b) Map the genes within the chromosomes.
- c) Facilitate food digestion
- d) Cure hereditary diseases

5) What can alter the ADN of a living being?

- a) Cloning
- b) Spicy foods
- c) Healthy eating.
- d) Random mutations.

When asked about ADN function, it was observed that after the practical lesson application, it increased considerably to correct answers, as shown in Figure 1.

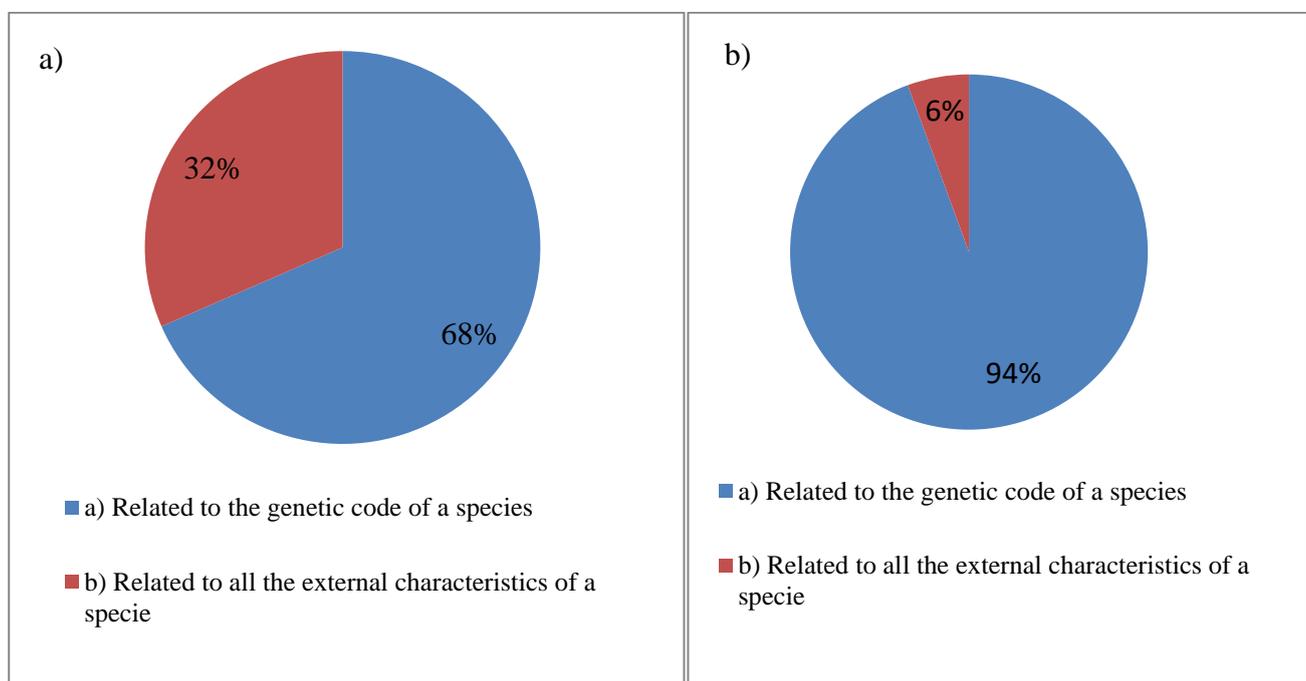


Figure 1. Proportion in relation to the responses of the participating students. a) pre-test; b) post-test.

When asked if it was possible to isolate the ADN, it was observed that after the application of practical class all students answered yes, correctly, as shown in Figure 2.

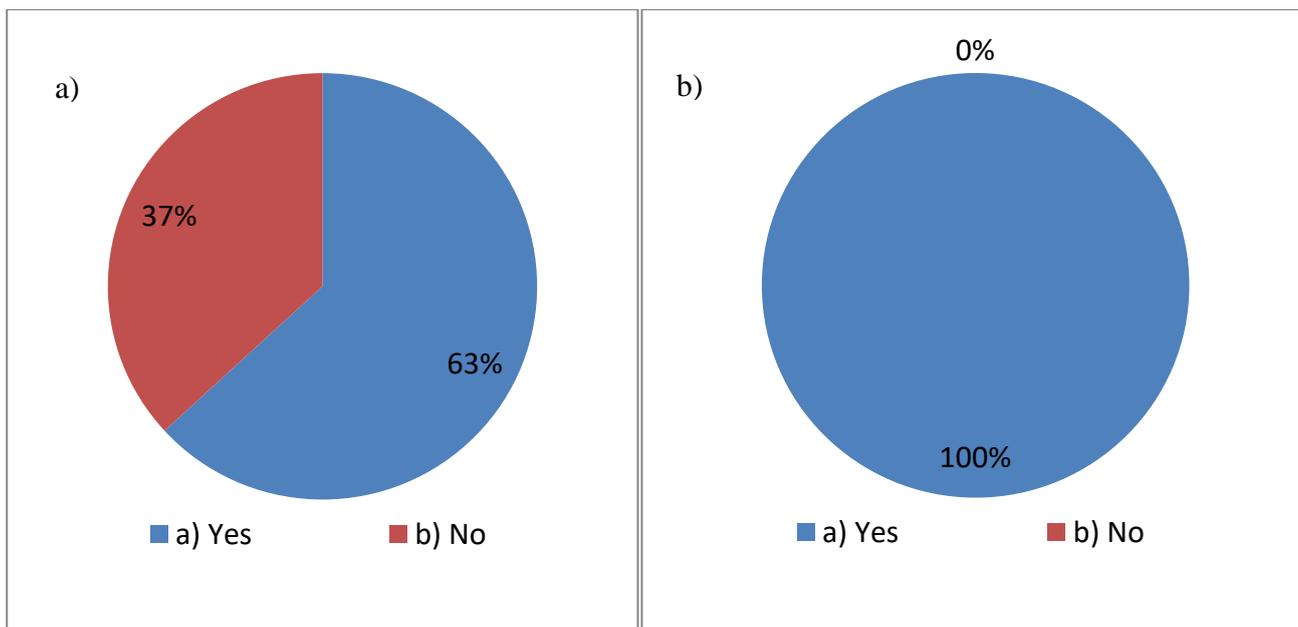


Figure 2. Proportion in relation to the responses of the participating students. a) pre-test; b) post-test.

When asked where the ADN is located in the cell, there were no significant differences between the pre-test and post-test, as shown in Figure 3.

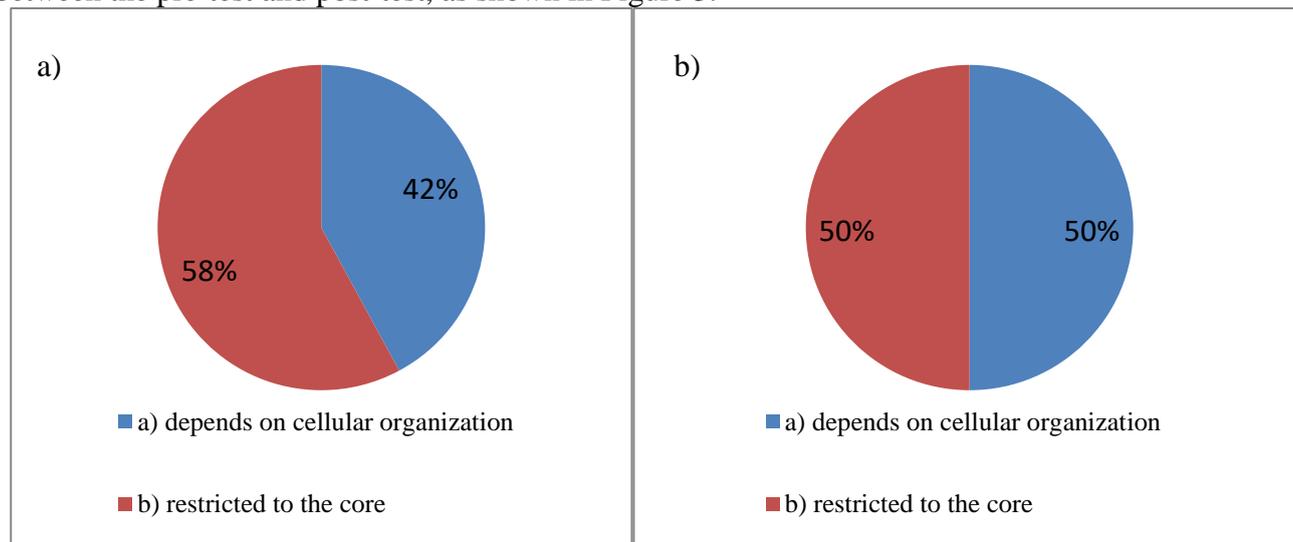


Figure 3. Proportion in relation to the responses of the participating students. a) pre-test; b) post-test.

When asked about the possibilities in ADN manipulation, after the practical class, the answers were more correct, as shown in Figure 4.

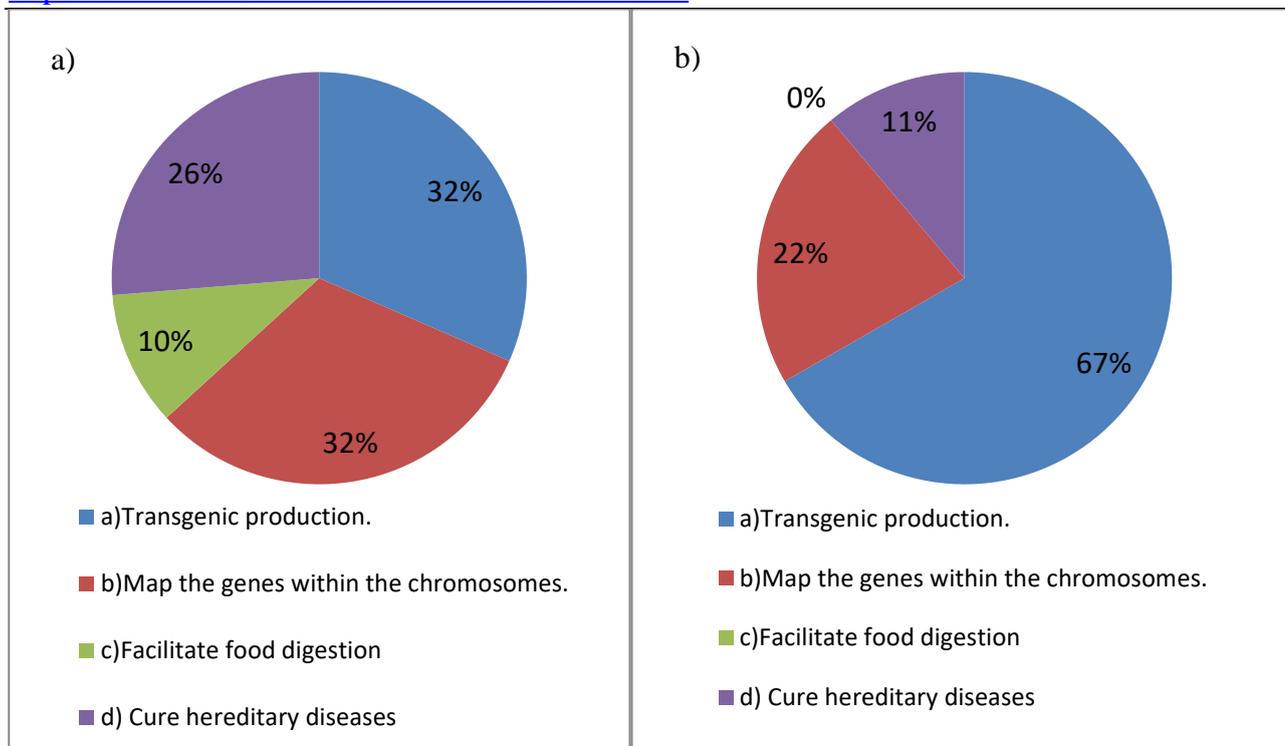


Figure 4. Proportion in relation to the responses of the participating students. a) pre-test; b) post-test.

When asked what can change ADN, most students responded correctly after applying the practical class, as shown in Figure 5.

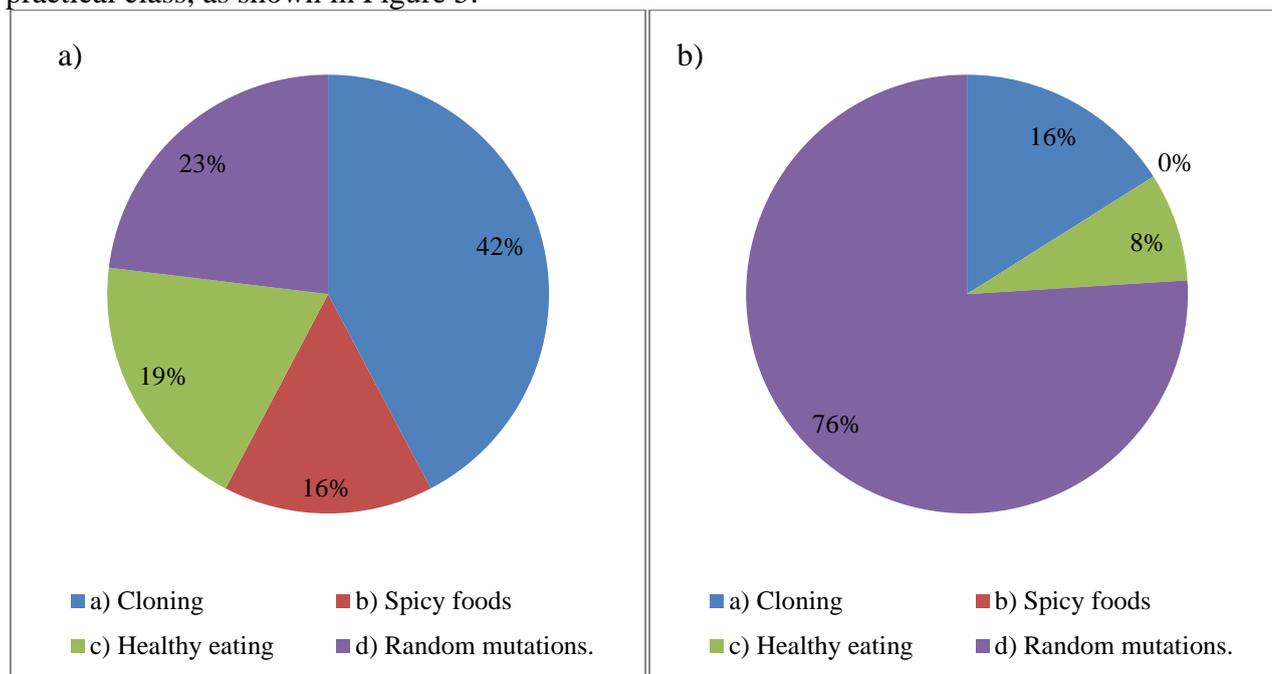


Figure 5. Proportion in relation to the responses of the participating students. a) pre-test; b) post-test.

To assess students' knowledge, the questionnaire below was applied before and after the execution of the practical class of plant anatomy and plant cultivation.

- 1) What are the characteristics of vegetables?
- 2) Introduce plant organs and their basic functions
- 3) What do plants need to perform photosynthesis?
- 4) Do plants photosynthesize and breathe? At what times of the day do these vital processes occur?
- 5) Do you know the plant groups? Which ones are they? Point out its basic characteristics.

When asked about the characteristics of the vegetables, the correct answer after applying the practical class increased considerably, as shown in Figure 6.

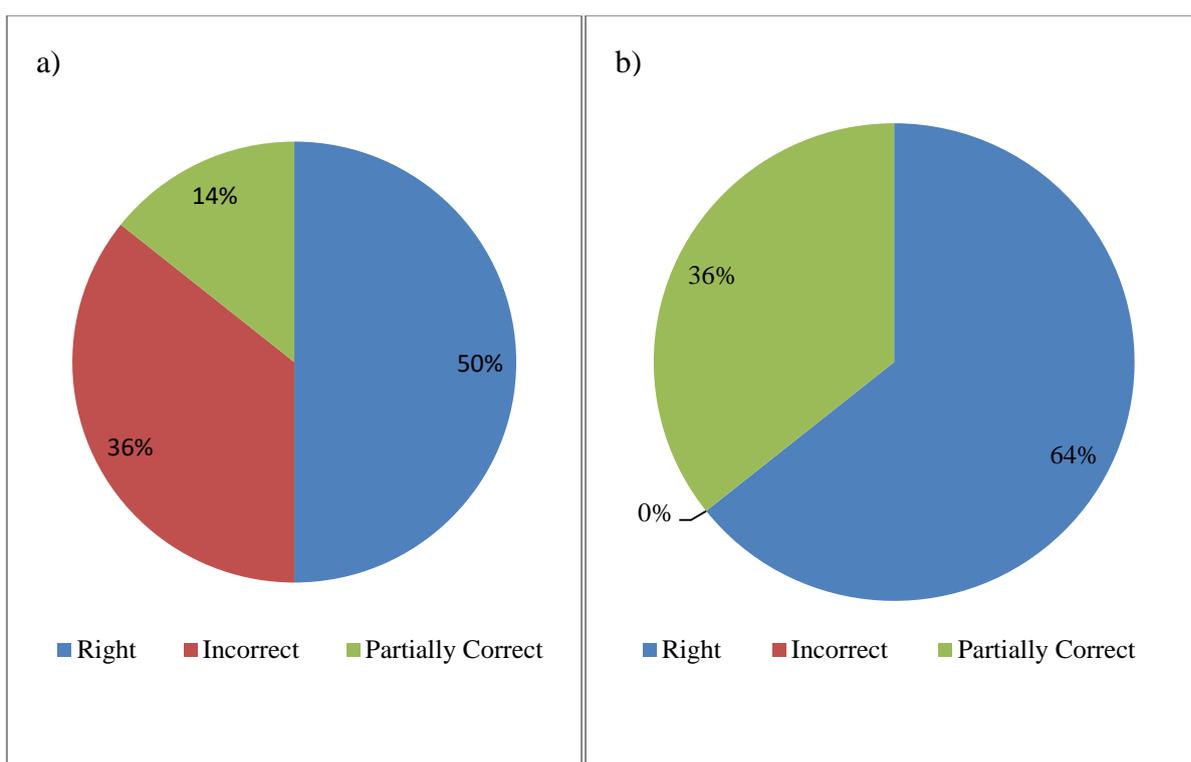


Figure 6. Proportion in relation to the responses of the participating students. a) pre-test; b) post-test.

When asked about plant organs and their functions, the number of correct answers increased considerably, as shown in Figure 7.

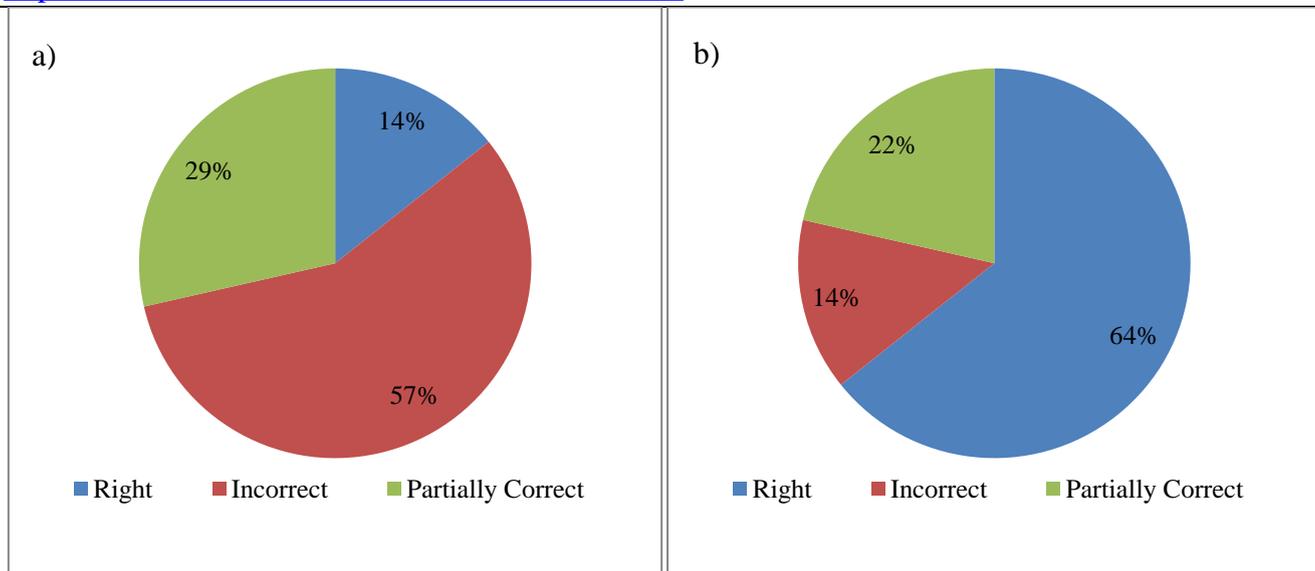


Figure 7. Proportion in relation to the responses of the participating students. a) pre-test; b) post-test.

When asked what plants need to promote photosynthesis, the number of correct answers increased considerably, as shown in Figure 8.

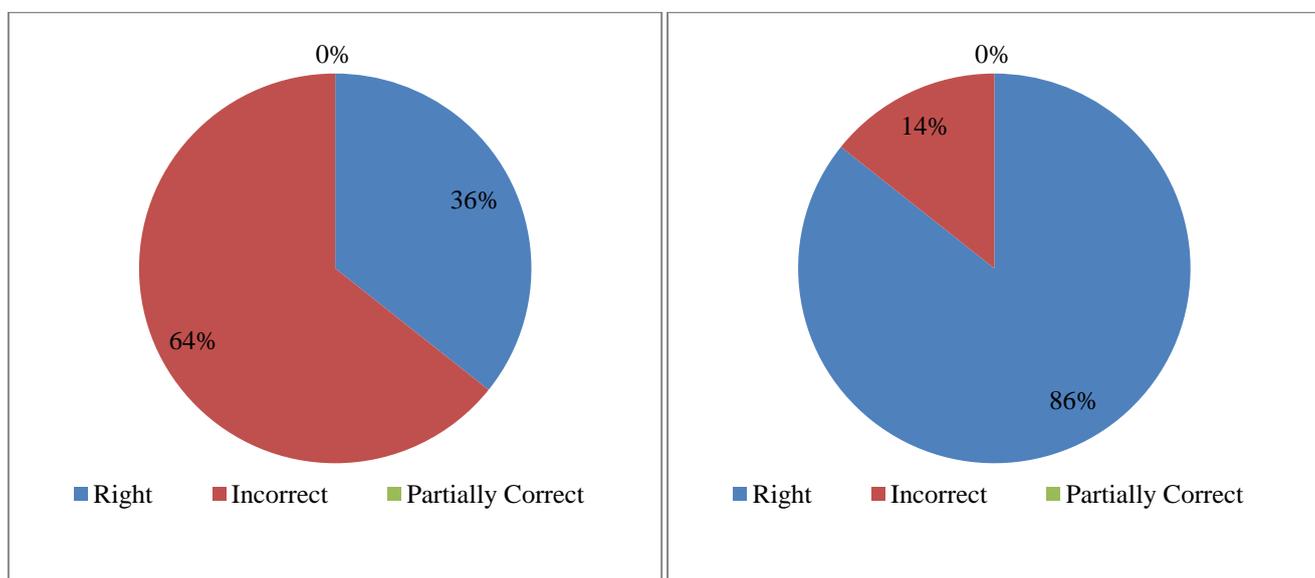


Figure 8. Proportion in relation to the responses of the participating students. a) pre-test; b) post-test.

When asked whether plants photosynthesize and breathe and at what times of the day these vital processes occur, the number of correct responses increased considerably, as shown in Figure 9.

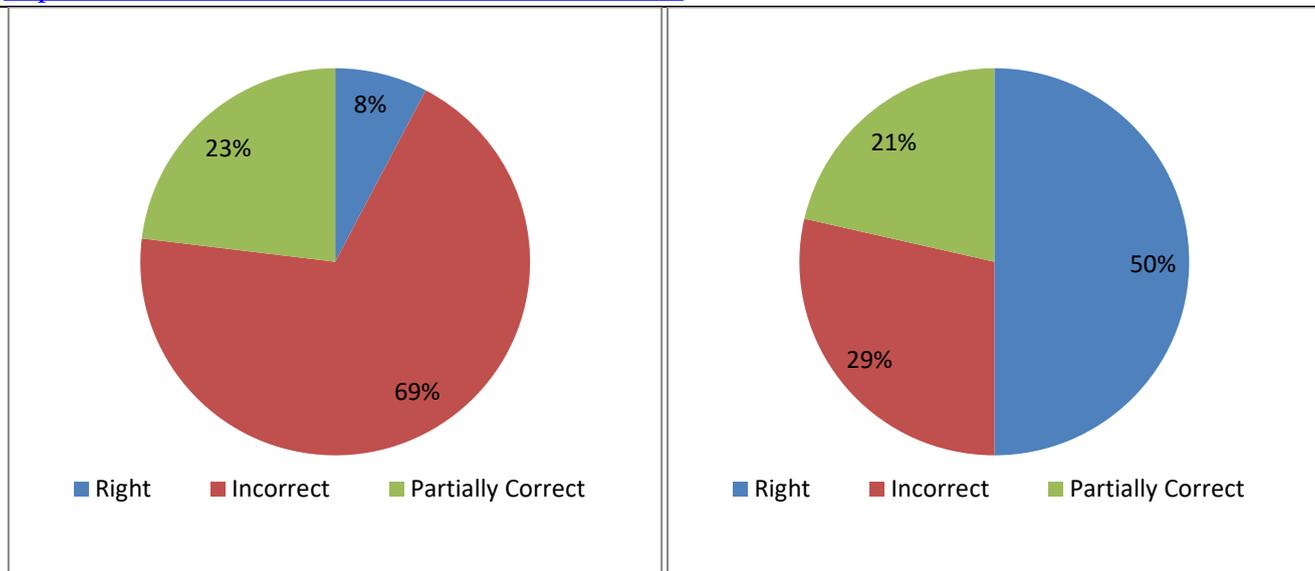


Figure 9. Proportion in relation to the responses of the participating students. a) pre-test; b) post-test.

When asked about plant groups and their basic characteristics, the number of correct answers, although still low, increased considerably, as shown in Figure 10.

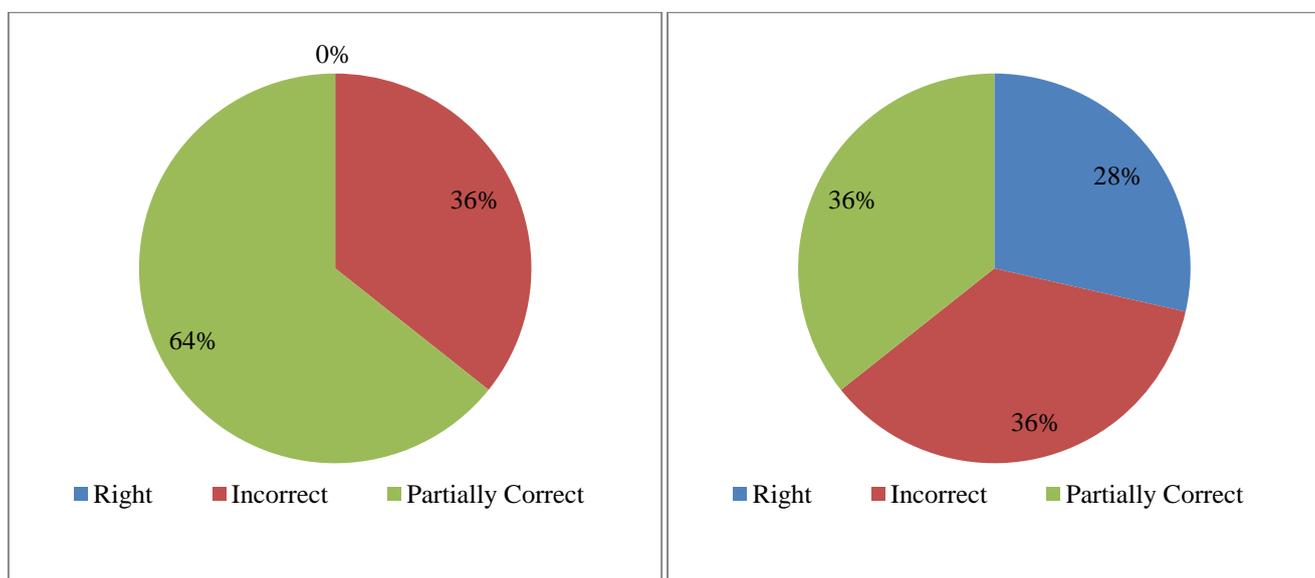


Figure 10. Proportion in relation to the responses of the participating students. a) pre-test; b) post-test.

Conclusions

The results, still partial, showed that the practical classes were essential for the students to better understand about the subjects covered, both with ADN, and with the class of plant anatomy and cultivation of medicinal plants. Thus, it is concluded that a script with practical classes of low cost and easy application is essential to assist public school teachers.

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