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THE TEACHING OF SCIENCE IN BASIC SCHOOL THROUGH EXPERIMENTATION

Simone Lazzarotto[1] and Viviane Lobo[2]

ABSTRACT
Experimentation in science classes is essential to connect theory with reality, making learning more meaningful. However, practical classes are often limited to demonstrations and closed experiments, far from the modern teaching proposal, which seeks greater active participation of students. The research proposes to overcome these limitations, promoting the student's role as a protagonist in simple experiments that can be done in various spaces, such as kitchens or classrooms. The objective is to evaluate how practical classes can improve students' understanding of the content and learning, considering their perceptions and performance.

Keywords: Practical classes. Science Teaching.

INTRODUCTION

The importance of experimentation during classes, not only to arouse interest in Science in students, but also to stimulate the active participation of students during classes.

In the teaching of Science, it is possible to highlight the student's difficulty in relating the theory developed in the classroom with the reality around him. Considering that theory is made up of concepts that are abstractions of reality According to Freire (1997), to understand theory it is necessary to experience it.

Conducting experiments in Science represents an excellent tool for the student to experiment with the content and to establish the dynamic and inseparable relationship between theory and practice. The importance of experimentation in the learning process can be as follows: in theoretical classes, students can receive information that has a purely abstract character and that, perhaps for this reason, does not seem to be useful to explain the reality of some phenomenon, much less to act or interfere in it. Practical classes, on the other hand, allow students to make the relationship of these abstract ideas and concepts with reality themselves.

> Contrary to what is desirable, practical classes are strongly associated with a traditional teaching approach, restricted to closed demonstrations and laboratories for verification and confirmation of the previously defined theory, which is undoubtedly very distant from current teaching proposals. (ARAÚJO, M. S. T.; ABIB, M. L. V. 2003).

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[1]UTFPR – Federal Technological University of Paraná – Paraná
[2]UTFPR – Federal Technological University of Paraná – Paraná

When talking about practical classes, it is common to think of something very elaborate, which requires state-of-the-art equipment, a specific environment for this, however, we know that we can carry out simple and very important experiments, using a kitchen or even the classroom as a space. Many experiments can be adapted to the reality that the school offers at that moment, all it takes is knowledge to adapt what is necessary.

> The relationship between theory and practice can enhance students' learning by connecting content with everyday life, with the visualization of what happens in reality. In this way, the complement of teaching with experimental activities to resume what was studied in the classroom gives meaning to the learning of the contents by the students. (TAMIOSSO Raquel Tusi, et. al, 2019).

Nowadays, practical classes have been seen as something that can contribute to the understanding of the contents covered in traditional classrooms, during these classes the student can develop a better and more comprehensive understanding of the subject worked. However, this is possible when the student has the opportunity to seek, reflect and reformulate their previous knowledge.

The student needs to overcome the barrier in which he expects tasks or activities previously prepared by the teachers, following these steps as if it were a "manual" where it is described in detail how things should be done.

This research is intended to open space for the student to act as a protagonist during the development of experimental classes, thus overcoming the barrier of demonstration.

OBJECTIVE

Evaluate the efficiency of science teaching when applied to the content using practical classes during its presentation.

METHODOLOGY

In line with the assumptions presented so far, the methodological procedure is proceeding in two moments:

At first, the research will take place with experiments carried out with elementary school students in the discipline of science in an elementary school in a municipality in Paraná. Science and chemistry practices will be carried out, guided by the university's extension and research group.

In a second moment, experiments will be carried out with high school students, directed to the area of biology and chemistry.

Afterwards, the data obtained from the semi-structured interviews with the students will be analyzed and we will also analyze the performance of the students throughout the classes, as well as their perspectives in relation to the practical classes.

Thus, it was possible to elaborate an explanation for the importance of practical classes in the students' view in relation to the experimental classes they had the opportunity to participate in. Articulating with the in-depth analysis of theoretical references that address this theme in the area of education/science teaching, thus contributing to the conclusion and necessary notes obtained through the research.

However, it is important to emphasize that the theme presented is not static, but passive to changes, as it is under construction, and is subject to changes and alterations, according to the need and possibility of carrying it out.

DEVELOPMENT

It is expected with this research, to stimulate students to effectively participate in practical science classes, as protagonists and not only as observers.

The objective is to know the conception of students of different levels in the area of science, chemistry and biology, in relation to practical classes, as well as the relevance and its relationship with the construction of scientific knowledge. Thus, check why most students hesitate to participate in practical classes during the presentation of the contents.

Analyze whether practical classes are an important complement in the teaching-learning process, even so that a greater number of students can achieve their goals in relation to assimilation of contents.

Identify the difficulties or limitations that students face when taking practical classes. Check with this, if you need to bring something that draws the attention and arouses the curiosity of young people in elementary and high school, such as practical classes, observation or simple experiments, basic investigations that can be carried out by the students themselves.

Below are some scripts of classes carried out for the writing of this research.

PRACTICE NO. 01 - VEGETABLES: OBTAINING PLANT EXTRACTS

INTRODUCTION

Vegetables belong to a broad group of cultivated plants from vegetable growing. Through the cultivation of these plants, they are popularly known as vegetables and legumes. Almost all vegetables differ by the period and climate for cultivation. The choice of the ideal cultivar for each region is important for its development. Vegetables are classified into three groups:

- Tuberous vegetables: Their edible parts develop inside the soil. This group includes tubers (potatoes), rhizomes (yams), bulbs (onion and garlic) and tuberous roots (carrots, beets and sweet potatoes).
- Herbaceous vegetables: Their usable parts are located above the ground. Examples are: Leaves (lettuce, cabbage, spinach), stalks (asparagus, fennel, celery) and inflorescences (cauliflower, broccoli, artichoke)
- Fruit vegetables: Part or all of the fruit is used, whether it is green or ripe. This group includes: peppers, okra, tomatoes.

What are its nutritional values?

They are rich in sources of vitamins and minerals such as pro-vitamin A, vitamin B2, vitamin B5, vitamin B9, vitamin C, vitamin K, calcium, iron, magnesium and potassium, providing great benefits to the body. Vegetables also help the immune system, have anticancer properties, prevent premature skin aging, and help improve vision. In addition, they are separated by groups, whose colors are related to their nutritional properties.

What are plant pigments?

These are molecules present in plants that are responsible for the color presented. These pigments have a great chemical and color diversity that can be applied in various industrial sectors, such as: Food Industry, Cosmetics Industry, Textile Industry and Pharmaceutical Industry. Each group of vegetables has its pigment, for example:

- White vegetables: they have flavonoids (flavones and flavonols).
- Green vegetables: contains the pigment chlorophyll.
- Yellow and orange vegetables: contains the pigments carotene and xanthophylls.
- Red vegetables: they have the pigment lycopene.
- Purple vegetables: contains anthocyanin.

The chlorophyll pigment is located in chloroplasts, has green pigmentation and has a photosynthetic function. Flavones, yellowish flavonols and anthocyanin (violet/blue) are located in the vacuoles of plant cells. Finally, carotenes, xanthophylls, and lycopene are present in chromoplasts that contain pigments of the carotenoid group that are yellow, orange, or red in color.

OBJECTIVES

- Understand what vegetables are from their classification to their composition;
- Understand what pigments of plant origin are and their applications in industrial sectors;
- Obtaining plant extracts.

METHODOLOGY

Materials needed:

- Green Leaves
- Solvent
- Test tube
- Mortar and Pistil
- Beaker
- Scissors
- Paper Filter
- Funnel

Experimental procedure:

1. With the help of scissors, cut the leaves into small pieces;
2. Add 20 mL of solvent and then macerate the leaves with the mortar and pistil;
3. Once this is done, wait approximately 15 minutes for the pigment to be released;
4. Filter the extract using a pleated paper filter;
5. Store in a clean, suitable container.

In this practice, the script was made available and the students were helped during its development, at first they were a little afraid, perhaps afraid of the new, throughout the development they loosened up, until in the end they were already able to manipulate the laboratory materials and plants.

PRACTICE NO. 02 - VEGETABLES: PHYTOCHEMICAL ANALYSIS AND CHROMATOGRAPHY ON PAPER

INTRODUCTION

Phytochemical analysis

Natural products have several applicabilities for the treatment of diseases. According to Viegas et al (2006), treatment is based on the ingestion of herbs, leaves or teas. Knowledge of plant properties is key to understanding certain functions. Phytochemical analysis is used to identify the classes of organic compounds that can be applied in different types of extracts. The main classes of compounds are alkaloids, flavonoids, tannins and saponins and among others. In plant cells, metabolism is divided into primary and secondary. They are able to differentiate between plant species. The classification of secondary metabolites occurs according to their biosynthetic route. They are divided into three groups: terpenes, phenolic compounds and nitrogen.

- Terpenes: Known as natural hydrocarbons produced by a variety of plants. It aims to serve as the basis for numerous structures with various functions in primary and secondary metabolism, from small molecules (sesquiterpenes), hormones (brassinosteroids, abscisic acid, gibberellins) and carotenoids. (KORTBEEK et al., 2019).
- Phenolic compounds: According to De La Rosa et al. (2019), several metabolites are produced possessing a functional hydroxyl group in an aromatic ring. Some compounds are soluble in organic solvents and insoluble in water, others are soluble in water (carboxylic acids and glycosides). Tannins, lignin, flavonoids and others, perform several functions in plants.
- Nitrogenous compounds: Nitrogenous compounds have cyanogenic glycoside alkaloids and non-protein amino acids. They have great pharmacological properties in mammals, an example of which would be morphine.

The production of secondary metabolites in plants is related to its class and can occur in two different ways, and can be derived from the tricarboxylic acid cycle, forming aliphatic amino acids, originating from nitrogenous secondary products, and from shikimic acid, forming aromatic amino acids. (BORGES AND AMORIM, 2020).

Many of these substances are used as insecticides, production of medicines, essential oils, etc. Therefore, it is important to study this area, as it has great potential for industrial purposes.

Paper chromatography

Chromatography is one of the most widely used methods in the separation of mixtures. The process is divided into two parts, the mobile phase and the stationary phase. In this case, the components interact with these phases so that separation occurs. The paper chromatography technique is based on the use of filter paper as the stationary phase. The mobile phase (organic solvent) moves by capillary action. The components are separated according to their solubility. The less soluble components in the stationary phase move quickly along the paper. The most soluble ones, on the other hand, are retained, causing a slower movement. (SKOOG, 2002).

OBJECTIVES

- Understand the importance of plants in medicinal products.
- Understand the concepts of phytochemical analysis and paper chromatography.

METHODOLOGY

Materials required (phytochemical test):

- Test tubes
- Extract
- Pasteur's pipette
- Graduated pipettes
- Reagents

Experimental procedure:

Tannins and phenols:

1. Identify the test tube according to the extract samples;
2. Add 4 mL of extract and add 3 drops of 3% ferric chloride alcohol solution.
3. Let it rest. The presence of these compounds will change the color;
4. Write down the result;

Anthocyanins, anthocyanidins and flavonoids:

1. Identify the test tubes according to the test;
2. Add 4 mL of extract and undergo the following procedures: acidify at pH 3.0; the second alkalize the pH at 8.5 and the last at pH 11.

3. There will be a change in color;
4. Write down the result;

Leukoanthocyanidins, catechins and flavones:

1. Identify the test tubes according to the test;
2. Add 3 mL and undergo the following procedures: acidify with HCL up to pH 1-3; the second alkalize with NaOH up to pH 11.
3. Warm up to observe the change in color;
4. Write down the result.

Saponins:

1. Identify the test tube according to the extract sample;
2. Dissolve the extract in methanol and distilled water in continuous stirring, forming two soluble and insoluble fractions. Remove the soluble part and use the non-soluble part.
3. Add distilled water again to remove any watery substance;
4. Shake vigorously to observe the formation of foam;
5. Write down the result.

Reaction with Ferric Chloride:

1. Identify the test tube according to the extract samples;
2. Add 1.0 mL of the extract and then add 5.0 mL of distilled water and a drop of 2% ferric chloride (by draining it down the tube wall;
3. The formation of precipitate or appearance of colorations will appear: black, green, or blue.
4. Write down the result.

Reaction with Sodium Hydroxide:

1. Identify the test tube according to the extract samples;
2. Dilute the extract in a 1:5 ratio, then place 5 mL of the extract in a test tube and add 1 or two drops of 5% NaOH;
3. The reaction will develop a yellow color, which varies in intensity;
4. Write down the result.

Mayer's Reagent

1. Identify the test tube according to the extract sample;
2. Add 4 mL of extract and a few drops on the sample and observe the development of a white flocculous precipitate;
3. Write down the result.

Dragendorff Reagent

1. Identify the test tube according to the extract samples;
2. Add 4 mL of extract and a few drops on the sample and observe the development of a brick yellow stain;
3. Write down the result.

Materials required (paper chromatography):

- Beakers
- Capillaries
- Scissors
- Graphite pencil
- Ruler
- Solvent
- Bond paper
- Watch glass

Experimental procedure:

1. Cut the bond paper into strips;
2. Using a ruler, draw a straight line with a pencil 1.0 cm from the ends

1. of the stationary phases and also in the mobile phase;
2. Mark a small dot with the extract on the line with the help of a capillary and wait for it to dry;
3. In a beaker, add a certain amount of solvent and then place the paper so that the paper comes into contact with the solvent but does not come into contact with the sample;
4. Cover the beaker with the watch glass so that the solvent does not evaporate and wait for the sample to travel to the line marked on the top.

FINAL CONSIDERATIONS

At the beginning of the project, during the first classes, the students exposed the content, using slides and other strategies to guide the students of the schools on how they should proceed during the class and how to do the experiments, at this point the entire class script is detailed, from the materials used to the scientific explanation of plants, such as its classification and other biological materials used in that particular class, soon after this presentation, the students, supervised by me and Prof. Viviane Lobo, help the students to carry out the experiments, from the handling of the materials to the development and completion of the proposed experiment.

Observing the performance of the students in the first classes, who were a little afraid, somewhat insecure, in view of this in the next class, it was done differently, so that they could really do the experiments with supervision, but with autonomy to handle the laboratory materials as well as the biological materials, in this case the vegetables. During the course of this class, it is noticeable how much more attentive, concentrated and motivated they became to carry out the experiment and reach the result proposed in the script presented before the experimental part. In this way, it can be said that the student values the moments in which he is the protagonist of his own learning.

It is hoped that this document can facilitate the preparation of the article by the authors, as well as the review of the reviewers. (Demonstrate whether the proposed objectives have been achieved, and the final considerations of your research).

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