



## Thoughts on pedagogical techniques and environmental issues developed in a soap-making workshop targeting the teacher's continuous formation

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**Abstract:** The present publication describes activities developed at a public school of primary and secondary education. Initially, soap-making workshops were held including moments of reflection about pedagogical practice, and a questionnaire was applied to evaluate the teacher's perceptions about the activity. Teachers' responses were assessed using quantitative and qualitative analysis. The results were expressed as a percentage and measures of central tendency or position. Based on the issues that came up during the debates, we notice the need for continuous formation, because this gives teachers the possibility to improve their performance in the classroom and therefore enriching their knowledge. After the evaluation of the questionnaires, one can observe the enrichment of the teacher's perceptions regarding environmental issues and how much this type of activity with students contributes to broadening their knowledge concerning social content and environmental values. These activities with high school teachers had a positive impact because they contributed to transformative teaching around environmental education.

**Keywords:** Soap-making workshop; Continuous formation of teachers; Pedagogical practice; Reflection.

**Adherence to the BJEDIS' scope:** This work is closely related to the scope of BJEDIS as it presents an analysis quantitative and qualitative of data referents to the application of a questionnaire, containing open and closed questions, with the objective of availed answers and perceptions de teachers regarding the application of a soap-making workshop and its relationship with environmental issues.

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## 1. INTRODUCTION

The main objective of the Institutional Program of Teaching Initiation (PIBID) is to provide undergraduate students with a possibility to link theory and practice during graduation in basic education schools [1]. The undergraduate student is involved in projects and pedagogical internships, whose objective is to provide work experience in a scholarly environment [2]. A central part of this internship is the support offered to the future teacher by an experienced professional or a university professor [2].

In the subproject Chemistry at the Federal University of Pampa - UNIPAMPA, Campus Bagé, which serves the public schools located in the city of Bagé, are planned and developed various activities with the coordinator, supervisor, and scholarship holders [3]. Thus, an activity was developed that sought integration between teachers from all fields, to meet the need of the community served about the continued training of teachers. This training took place at the State High School Dr. Luis Mércio Teixeira, located in the city of Bagé/RS. The teacher who does not prioritize his continuous formation, who does not study, who is not prepared for his task does not have the moral to coordinate the activities of his class [4].

The continuous formation is a permanent process that has great social relevance, which should be further explored and used as a strategy that facilitates the exchange of information between teachers [5]. Several authors highlight the importance of this type of training for several areas, both in primary and higher education [6–9]. Also, continuous formation provides the construction of theoretical knowledge and its relation with the development of aspects focused on professional practice and reflexive training [10]. Teaching should be a space of inquiry that allows the teacher to become a researcher or specialist, a fact that should guide students to improve their learning [11]. However, there are challenges in professional development between communicating your ideas and understanding them for a wider community [12]. To contribute to the need for continuous formation, soap-making workshops and moments of reflection were proposed and held [13], lasting approximately four hours with the presence of teachers from various areas (Chemistry, Physics, Mathematics, Biology, Portuguese) among others. In our workshops the raw material was used cooking oil, knowing the environmental importance of its improper disposal: sink drains, sewage box, wasteland, and backyards, directly affecting the environment, as it can contaminate groundwater, springs, and streams, reaching rivers and dams [13]. Since it has a lower density than water the oil creates a layer on the surface of water that covers the aquatic fauna and flora, making it impossible for light and oxygen to enter, bringing negative effects to the environment [13].

Starting from the premise that the school is a social space where teachers and students will continue their socialization process, it is understood that environmentally correct attitudes should be stimulated in the school routine. This practice contributes to the formation of citizens with responsibility when dealing with situations that involve not only themselves but the entire society [14]. It is also emphasized that continuous formation of teachers, as well as discussion and reflections about pedagogical practices, are essential elements of social policies, thus being directly intertwined to the construction of education [15].

In the educational context, methodologies are used to evaluate the results obtained by works related to these areas. Among them, qualitative and quantitative analysis stand out. Qualitative analysis has accompanied research in several fields, and from a methodological point of view, it is the best way to capture reality, as it allows the researcher to "put himself in the role of the other", seeing the world through the view of the respondents [16]. Quantitative analysis, in turn, is less used in educational research. However, there are problems with educational activities that, for their contextualization and understanding need to be qualified through quantitative data [17]. To collect data about teachers' perceptions, a questionnaire was used, one of the preferred measurement instruments [17]. Thus, the objectives of this work were: i) Raise educators' awareness of the inappropriate disposal of substances harmful to the environment; ii) Promote a space for dialogue and debates among educators; iii) Through the application of a postal questionnaire, evaluate the teacher's perceptions in the organization of workshops and knowledge or ideas learned about environmental issues.



## 2. METHODOLOGY

The methodology of realization of soap-making workshops and information collections was divided into four distinct stages.

### 2.1. Conducting soap-making workshops

Initially, participants (teachers) and school students were asked to reserve used cooking oil in their homes for approximately two weeks. After receiving the residues, the students of PIBID-Química filtered impurities from fried foods to obtain a better final product.

The making of the soaps took place on July 26, 2017, for approximately two hours. Being taught by three students of PIBID-Química and by the supervising professor. About 21 teachers participated in the workshops. The teachers were divided into three groups of five people and a group of six, the materials manufactured during the workshops were offered to teachers to take home.

The methodology to produce soap-making from cooking oil is described by Filho., *et al.*, (2013) [18]. The following materials were used for the workshops: residual vegetable oil, sodium hydroxide (NaOH), and hot water. In addition to natural lemon and orange juice to flavor the soaps made.

### 2.2. Initial survey

An initial survey was carried out about the inappropriate disposal of vegetable cooking oil. This survey took place through informal, unstructured dialogues. Subsequently, a slide show was held, where some questions about the environmental damage caused by the inadequate disposal of vegetable oil used in fried foods were listed, such as: decreased BOD (biochemical oxygen demand), negative effects on the local fauna, due to the lack of light entering water bodies, negative impacts caused to the soil, among others [13; 14; 18]. This stage took place on July 27, 2017, and lasted approximately three hours. The slide presentation of the environmental problems caused by the inadequate disposal of vegetable oil was given by two students from PIBID-Química and was attended by 15 teachers, lasting one hour. Still in this stage, moments of debates between teachers from different areas of knowledge were provided, lasting approximately two hours, to promote reflective moments on the pedagogical practice and discussion of classroom reports. As a form of support for teachers and school principals, at the heart of continuous professional development, these moments of debates and discussions generate a better understanding of their practices and how they can improve them to contribute to an effective education [15]. During this stage, teachers were asked about the creation of soap-making workshops in their classes. The same guests were invited to provide suggestions for activities within the environmental theme to be carried out with the school's students.

### 2.3. Application of the questionnaire

To acquire data about the activity carried out, a questionnaire was elaborated, which is a method frequently used in the humanities through the application of it [19]. Besides, a questionnaire is just a set of questions, designed to generate the necessary data to verify whether the objectives of a project have been achieved [20]. Thus, a questionnaire containing five questions with open and closed questions was applied. Being them: 1) It is possible to develop the soap-making workshop with high school students and EJA (Educação de Jovens e Adultos = Youth and Adult Education)? 2) Considering your area of expertise, do you agree with this type of activity in your classes? 3) What chemical, physical, biological, mathematical, or social concepts could be explored within the soap-making workshop? 4) Do you consider it possible to hold this workshop with the community where the school is located? 5) What arguments do you consider most important to be listed in the realization of the soap-making workshop, considering the improper disposal of cooking oil and the negative effects caused to the environment? These questions were sent to the participants through google forms in October of 2020, due to the SARS-CoV-2 pandemic, with about 20 days available for teachers to respond. With the application of this questionnaire, it will be possible to observe if there were changes or ideas different from those mentioned in the previous step. This type of analysis is a qualitative research approach. This is used when there is no concern with a numerical representation, but with the understanding of a social group [21]. Qualitative research, therefore, deals with the dynamics of social relations, without the intention of quantifying it.

### 2.4. Analysis of questionnaire

After the application of the questionnaire, the perceptions of 9 teachers who participated in the workshops and answered the questionnaire, were analyzed.

#### 2.4.1. Analysis of questionnaire contains closed questions

As the questionnaire applied contained closed questions. The answers were separated into affirmative (Yes), non-affirmative (No), and affirmative with justification (Y/J) for questions (1, 2, and 4). Descriptive statistics were used [22–24], and the results were expressed as a percentage, average, mode, median, and standard deviation [23].

The percentage is calculated based on the 9 teachers who participated in the workshop and answered the questionnaire. For average, mode, median, and standard deviation calculations, grade values were applied to the responses that ranged from 0 to 2, with a score of 0 for answers no, grade 1 for answers yes, and grade 2 for answers, yes with justification.

#### **2.4.2. Analysis of questionnaire contains open questions**

From questions 3 and 5, some answers will be transcribed since these questions aboard a deeper knowledge on the part of teachers. Qualitative research answers very specific questions. It is concerned, in the social sciences, with a level of reality that cannot be quantified. In other words, it works with the universe of meanings, motives, aspirations, beliefs, values, and attitudes, which corresponds to a deeper space of relationships, processes, and phenomena that cannot be reduced to the operationalization of variables [25]. In other words, qualitative research seeks to study what people think or feel [23], that is, their experiences about themes or facts. In this way, a discursive textual analysis of the data will be carried out. That it is a data analysis approach that transits between two established forms of analysis in qualitative research, which are content analysis and discourse analysis [24]. In this process, the answers to the questions will be evaluated according to the three phases of content analysis proposed by Bardin, (2011). The answers to questions 3 and 5 were tabulated and categorized into three groups, with corresponding numbers: individuals who achieved what was expected, grade 3; individuals who partially reached it, grade 2 and individuals who did not reach it, grade 1. In general, categorizing refers to a concept that encompasses elements or aspects with common characteristics or that are related to each other, that is, categorization is one of the operations mathematical logic that we have built since our first years of life [25]. Descriptive statistics were used [22–24], and the results were expressed as a percentage, average, mode, median, and standard deviation [23]. The percentage is calculated based on the 9 teachers who participated in the workshop and answered the questionnaire. For average, mode, median, and standard deviation calculations, the values of grades categorized above, ranging from 1 to 3, were used.

### **3. RESULTS AND DISCUSSION**

#### **3.1. Results and discussion of the initial survey**

There was great difficulty on the part of educators in suggesting activities in the field of environmental education envisioning integration of several areas of teaching. Verifying the reason for this difficulty in literature we find authors who report a deficit in formation in environmental issues [26]. The solution to this problem could be to provide teachers with training in environmental education [27].

Teachers did not have many ideas for activities and suggested new meetings to discuss, which was very important at first, as it showed their interest in developing activities to promote interdisciplinary learning that would lead students to expand the meanings of the contents studied, mainly regarding the use of school knowledge in situations outside of school and about environmental issues.

Subsequently, a theater that encompassed social and environmental issues was suggested by an Artistic Education teacher, the theater was presented at the school's Science Fair, with the participation of regular school students and EJA (Youth and Adult Education).

After carrying out the activities, the teachers commented that they enjoyed the training. The majority related that continuous formation is somehow forced, bureaucratic and that they do not feel comfortable in participating. However, teachers need to be constantly qualified, so that they can rethink teaching practice and do not see this need as something bureaucratic to fulfill, charged by the maintainers who manage the educational institutions in which they teach [27]. Despite the need for integration between different areas, the reality of teaching and its organization in Brazil is rather fragmented and disconnected, thus lacking integration of areas of knowledge. The curriculum at high schools is composed of isolated parts that do not interact and therefore produce a professional and human training of teachers and also students insufficient to face social realities more consciously and critically [28]. Thus, educators, must reflect on their pedagogical practices to contribute to the quality of public education, later offering students subsidies and efficient learning alternatives, aiming for wider knowledge in various areas of teaching. The teacher has to control the contents of the study program and the corresponding activities to have a significant learning process, during which students can carry out research projects with the help of their teachers [11]. Thus, both students and teachers will have wider transdisciplinary knowledge, being able to actively participate in their day-to-day context, because they will have critical sense in decision making, whether about political, social, and environmental issues. The need for a more present continuing education in the school environment was perceived because it allows teachers mean of updating themselves, improving their professional performance, and thus enriching their knowledge, contributing to less fragmented teaching, focused on a more integrated approach. The realization of soap-making workshops has provided greater interactivity between teachers from all areas. This

is of great importance for individual and team growth because it leaves the teachers more comfortable at school. Thus, the experience added perception on the topics explained, more autonomy, and confidence in the act of teaching.

### 3.2. Results and discussion about the application of the questionnaire

#### 3.2.1. Results and discussion about the questionnaire contain closed questions

After the application of the questionnaire, the perceptions of 9 teachers who participated in the workshops were analyzed. As the questionnaire applied contained closed questions the answers were separated (Table 1) into affirmative (Yes) = Grade 1, no-affirmative (No) = Grade 0, and affirmative with justification (Y/J) = Grade 2, for questions 1, 2, and 4. Descriptive statistical measures are shown in the same table. After the application of the questionnaire, it was noticed that in general about questions 1 and 2 that all teachers who answered the questionnaire found it possible to hold the workshops with high school and EJA students, as well as agree with their development in their classes, corresponding to 88.9%. It should also be noted that the remaining 11.1% think it is possible and justified the possibility of developing the workshop. To question 4, the teachers understand that it is possible to do it with the school community in general.

**Table 1.** Answers to the questionnaire closed.

Questions	Yes grade 1 (%)	No grade 0 (%)	Y/J grade 2 (%)	$\bar{x}$ (grade) $\pm$ sd	Mode (grade)	Median (grade)
1	88.9	0	11.1	1.11 $\pm$ 0.33	1	1
2	88.9	0	11.1	1.11 $\pm$ 0.33	1	1
4	100.0	0	0	1.0 $\pm$ 0.0	1	1

With:  $\bar{x} \pm sd$  = average  $\pm$  standard deviation.

The justification cited by one of the subjects evaluated to question 1 is that: - The workshops provide the student with new ideas, concepts, and values. In question 2, a teacher explained that the workshops: - Contribute to the development of student's abilities, as well as to the motivation for their cognitive development. It is observed that all the teachers surveyed understand the relevance of the use of this type of activity (soap-making workshop) both in their classes and with the community in general. They mentioned that this activity contributes to their training and the formation of their students, whether regarding empirical knowledge related to their disciplines and also of a social character, focused on the reality of the students.

#### 3.2.2. Results and discussion about the questionnaire contain open questions

As the questionnaire applied contained open questions the answers were separated (Table 2). Questions 3 and 5 were separated according to the categorization mentioned in section 2.4.2. The perceptions of 9 teachers who participated in the workshops were analyzed. Descriptive statistics were used and the results were expressed as a percentage. The conceptions about questions 3 and 5 were more elaborated by the teachers, an answer to each question was chosen to be transcribed in this study, due to the extent of them. Regarding the answers given to the question, it was noticed that some teachers still had some difficulties in citing concepts that could be related to their area, with 33.3% of them not answering correctly or even partially. However, 44.4% received a score of 3 for the concepts that could be addressed in their area. In question 5, this index fell by half (22.2%), that is, most teachers continued to have difficulties in describing the environmental damage caused by the inappropriate disposal of cooking oil.

**Table 2.** Answers to the questionnaire open.

Questions	Grade 1 (%)	Grade 2 (%)	Grade 3 (%)	$\bar{x}$ (grade) $\pm$ sd	Mode (grade)	Median (grade)
3	33.3	22.2	44.4	2.11 $\pm$ 0.93	3	2
5	33.3	44.4	22.2	1.88 $\pm$ 0.78	2	2

With:  $\bar{x} \pm sd$  = average  $\pm$  standard deviation.

Below are described an answer to each of the open questions (3 and 5), which show the understanding of some teachers to the content that can be addressed in their classes, as well as the harm caused by the inappropriate disposal of cooking oil.

In question 3, a teacher cited some concepts that can be worked during application of the activity: "In the acquisition of basic concepts of chemistry and biology (important to highlight the ecological benefits) in mathematics the need to know the concepts of measures and proportions and in social inclusion be a means of acquiring income, helping in the support of families. In all aspects cited it is also interesting to bring to the student practical meaning of how can and should be applied the knowledge acquired in the classroom in daily life. This provides the student with a possibility of (re)signifying the study beyond the acquisition of only one certificate of completion of studies. In question 5, about the improper disposal of cooking oil, a professor cited that the development of the activity contributes in such a way as to: "To raise awareness among the school community of the importance of proper oil disposal, to preserve the environment, which is our home, demonstrating with statistical data, informative folders, the problems caused by inadequacy."

It also shows that in addition to preserving the environment, with actions such as the workshop, there will be a change in attitudes, that will be experienced by the social surroundings. It is gradeworthy that this questionnaire was applied about three years after the teacher training activity, which in a way shows how important this activity was for the teachers and how the values are still clear in their statements, evidencing that the activity and reflection on pedagogical practice has an important role within the continuous formation of teachers, as well as concerning the role of education as a potential transforming instrument of society, thus consisting of a tool capable of ensuring environmental safety for future generations, promoting the behavioral change of individuals and, consequently, modifying the way the human being interacts with the environment. The workshop also enabled instruction, motivating teachers to rethink their daily actions to the consumption and destination of cooking oil. However, it is understood that this activity alone is not sufficient to solve environmental problems, but it is a substantial condition for this.

#### **4. CONCLUSION**

It is concluded through the quantitative and qualitative analysis of the teachers' responses that they are aware of the inappropriate disposal of substances harmful to the environment. About the debates which arose during the activity, it was possible to grade the relevance of activities that promote reflections about pedagogical practices, where teachers visualize the need to search for transformative teaching around environmental education since these allow articulation, contextualization, reconnection, and globalization of contents to be developed in the classroom, so that both parts, teacher, and students, can build their skills, their knowledge about the subjects dealt with in the activities, relating them to various areas of knowledge. However, it should be noted that these are preliminary results, requiring even more studies, presentations, and repetition of this activity with teachers and students to arrive at more positive results that effectively contribute to the training of teachers. It is also highlighted the importance of using quantitative analysis in the educational context, to measure the data obtained with the application of questionnaires, generating a better visualization of them.

#### **5. FUTURE PERSPECTIVES**

It is expected to develop these activities with other schools in the municipality and for the community in general, envisioning to raise environmental awareness of students, parents, and teachers, as well as to show the inadequate disposal of cooking oil, as well as to look into other aspects related to environmental questions.

#### **CONFLICT OF INTEREST**

There are no conflicts of interest.

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