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# Investigative Environmental Education: an Interdisciplinary Proposal

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**Abstract.** The environmental education is responsible for forming critical and active individuals in their communities. The investigative teaching becomes an attractive alternative because the student is set off as the leading figure of the teaching-learning process generating a comprehension that the school contents are not disconnected from daily situations. To fulfil the proposed activities, experimental analyses will be performed with surface waters brought by the students from their communities objecting to verify the presence of hydric pollution. If any kind of pollutant is found, interdisciplinary and collaborative activities will be applied to find a solution to that problem.

## 1 Introduction

The preservation of aquatic environments, as all environments, has been the main subject of many debates in Brazil. To preserve aquatic systems are fundamental to maintain life as we know it. In that context, the spectroscopic techniques are among the most used for water quality analysis. On that, Arduino gains momentum, since it makes possible to create high efficiency equipment with low cost and their programming and handling procedures are quite simple.

In teaching, environmental education needs to be acknowledged due to its importance in making citizens participative in everyday environmental issues [1]. This proposal aims to cultivate abilities and competencies to analyse and solve relevant questions through a problem situation and a development of an intervention scheme.

In this project three specific methodologies are proposed: Reversed classroom; Investigative methodology; Transdisciplinarity [2]. With the assistance of other teachers, this proposal seeks to bring a plural knowledge around the theme through an approach of scientific aspects about water and its implications on modern society.

The main objective of this proposal is to create an educational ambience for the students to develop monitoring skills and decision-making abilities to solve environmental problems. According to Brazilian government guidelines it is supposed to discuss, at the classroom, the importance of preserving and conserving biodiversity, evaluating the effects of human interference and environmental policies to guarantee the sustainability of the planet [3].

## 2 Methods

The Arduino prototype will be the starting point to the interdisciplinary activities with Physics, Chemistry, Biology and Geography throughout the school year. The physics teacher will construct the Arduino photometer. At Chemistry, the questions surrounding coloured compounds water pollution will explicate. The geography teacher will expose the geopolitical and economic problems brought by water pollution. At Biology, the importance of hydric resources for physiological, fauna and flora issues within the context of population growth will be enlighten.

The photometer was calibrated using substances with well established colour levels in the literature, being copper sulphate and potassium dichromate. After calibration, the process of construction of a standard curve with the platinum-cobalt colour standard to analyse random surface water samples.

The students are supposed to collect effluent water samples from their communities and, escorted by the results and with teacher's assistance, they shall develop, in groups, intervention schemes to be applied at the location they identify pollution.

## 3 Results and Discussion

The prototype presented satisfying results on the tests and random water samples analyses. To compare the photometer results, the analyses were also done by a spectrophotometer from DIDALAB brand, POF 010-

361 model. The comparison was above the expectations, since the quality and precision of the photometer's analyses were superior to DIDALAB's spectrophotometer analyses. It was revealed that some locations on Petrópolis, in the state of Rio de Janeiro, there is dumps of coloured substances that modify the natural colour of water rivers, conferring a colour level above the limit established by Brazilian government.

#### 4 Conclusion

This application shows the potential of the proposed activity, because the experimental method gives the student the possibility to develop skills, abilities and competencies, related to the identification of pollutants on their communities through the collected sample waters analysis and the group activities aid to growth social skills. By that, beyond learning, the student appears with useful tools to effectively make moves in their community environmental issues. The teaching project was not implemented yet, because the suspension of in-person activities in Brazil since March 2020 due to the pandemics.

#### 5 References

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