ART PIXEL PANELS: ENVIRONMENTAL EDUCATION AND ART IN TEACHER TRAINING

PAINÉIS ARTE-PIXEL: EDUCAÇÃO AMBIENTAL E ARTE NA FORMAÇÃO DOCENTE

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Abstract: Solid waste improperly disposed causes several environmental problems and affects public health. Especially plastic, produced on a large scale and incorrectly discarded, can negatively affect terrestrial and aquatic ecosystems. In this sense, this study aimed to sensitize the academic community of the Federal Institute of Paraná Campus Umuarama in relation to the inadequate disposal of waste through the reuse of plastic lids in artistic productions, activities here called "art pixel panels". To this end, undergraduate students in Biological Sciences promoted awareness and collection of plastic caps in potential generators of this waste. At the institution, based on figures researched on the internet and others of their own creation, the panels were constituted with tying schemes for these covers. To carry out the tying, internal wiring extracted from network cables was used, which were already in disuse, in view of their resistance and convenience in handling. Thus, 20 panels were made using more than 30,000 plastic caps. The art pixel panels were displayed in the lobby causing the academic community to reflect on the generation and final destination of plastic, in addition to serving as a source of artistic inspiration. It is believed that, through environmental education and art, it is possible to promote the formation of more aware and responsible people regarding current environmental problems.

Keywords: Teacher Training. Solid Waste Management. Plastic Lids. Visual Arts. Creativity.

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Revista Mundi Engenharia, Tecnologia e Gestão. Paranaguá, PR, v.5, n.7, p. 279-01, 279-18, 2020
DOI: 10.21575/25254782rmetg2020vol5n71102
Resumo: Os resíduos sólidos dispostos de forma inadequada provocam diversos problemas ambientais e afetam a saúde pública. Em especial o plástico, produzido em grande escala e descartado de maneira incorreta, pode afetar negativamente ecossistemas terrestres e aquáticos. Nesse sentido, este estudo teve como objetivo sensibilizar a comunidade acadêmica do Instituto Federal do Paraná Campus Umuarama em relação à disposição inadequada de resíduos por meio da reutilização de tampas plásticas em produções artísticas, atividades aqui denominadas “painéis arte-pixel”. Para tanto, acadêmicos da Licenciatura em Ciências Biológicas promoveram sensibilização e coleta de tampas plásticas em potenciais geradores desse resíduo. Na instituição, a partir de figuras pesquisadas na internet e outras de criação própria, os painéis foram constituídos com esquemas de amarrações dessas tampas. Para realizar as amarrações, utilizou-se fiação interna extraída de cabos de rede que já se encontravam em desuso, em vista de sua resistência e comodidade no manuseio. Assim, foram confeccionados 20 painéis, utilizando mais de 30.000 tampas plásticas. Os painéis arte-pixel ficaram expostos no saguão provocando reflexão da comunidade acadêmica acerca da geração e destinação final do plástico, além de servir como fonte de inspiração artística. Acredita-se que, por meio da educação ambiental e da arte, é possível promover a formação de sujeitos mais conscientes e responsáveis com relação aos problemas ambientais atuais.

Palavras-chave: Formação docente. Gerenciamento de Resíduos Sólidos. Tampas Plásticas. Artes Visuais. Criatividade.

1 INTRODUCTION

The constant process of industrialization, the expansion of technological resources, especially from the second half of the twentieth century, combined with socioeconomic growth added benefits and changed the living habits of man and his organization within social groups. However, the new consumption behaviors strengthened by technological innovation and purchase desire cause problems for society, especially in the environmental issue (NUNES; BASTOS, 2018).

In this context, Gouveia (2012) reports that in Brazil, between 180 and 250 thousand tons of solid urban waste are collected daily. However, a large part of this waste is still not directed to sanitary and environmentally adequate disposal. Initiatives to reduce the amount of material discarded in landfills do not occur in a wide-reaching manner.

Among such waste, plastic stands out as a great villain when improperly discarded in the environment. This disorderly disposal poses great risks to
terrestrial and aquatic ecosystems, including human health, since it has toxins that can be passed through the food chain (SILVA, 2018).

According to the Plastics Europe report (2017), world plastic production increased from 1.7 million tonnes in 1950 to 2.7 trillion tonnes in 2016, with a continuous growth rate for over 50 years. Global production in 2016 grew 39% over previous studies.

In view of the facts, it is necessary to intensify this discussion. To this end, it is necessary to promote awareness directed at the population in order to "consolidate environmental education based on new educational paradigms that are formulated to ensure the transformation of attitudes in this society" (VARGEM; SILVA; SOUTO, 2015 p. 92).

In this direction, the reuse of materials presents itself as an effective measure to explore environmental education, as well as to encourage practices of these actions in daily life. Law No. 9,795, of April 27, 1999, provides for environmental education and institutes the National Policy on Environmental Education, placing as fundamental objectives of environmental education:

I - the development of an integrated understanding of the environment in its multiple and complex relationships, involving ecological, psychological, legal, political, social, economic, scientific, cultural and ethical aspects;
II - the guarantee of democratization of environmental information;
III - stimulating and strengthening a critical awareness of environmental and social issues;
IV - encouraging individual and collective participation, permanent and responsible, in the preservation of the balance of the environment, understanding the defense of environmental quality as an inseparable value of the exercise of citizenship (BRAZIL, 1999).

This discussion has gained space in political, academic and business affairs (GOMIDE et al., 2018). And, in order for environmental education practices to really achieve these objectives, it is necessary to use diversified didactic methodologies and resources, besides teacher training.

Starting from this assumption, this study deals with environmental education practices carried out in the Licentiate in Biological Sciences,
associated with an artistic bias, which in addition to raising awareness and discussing environmental issues provided a space to awaken creativity. This appreciation of art is justified by the fact that it can express the experiences of the time. This has been happening since prehistoric times, through records on cave walls sketches and schemes of everyday events (TOCHETTO; FELISBERTO, 2017).

In view of the above, the main objective of this work was to sensitize the academic community of the Federal Institute of Paraná (IFPR) Campus Umuarama regarding the inadequate disposal of waste through the reuse of plastic lids in artistic productions, activities here called "art pixel panels".

## 2 MATERIAL AND METHODS

The IFPR Umuarama Campus, founded in 2010, is a referential in extension projects in the areas of art, culture, environment, recycling, agribusiness and educational support, in addition to several research projects in development, consolidating the link between teaching, research and extension. The institution operates in basic, technical and technological education with high school, undergraduate and graduate courses.

This study was developed from the optional curricular component Visual Arts in Environmental Education, of the Degree in Biological Sciences. After the theoretical classes on art, environmental education and solid waste management, the academics selected drawings to reproduce art-pixel panels made of plastic lids. In this activity, it was possible to choose by images available on the internet or by copyright drawings.

Then, using Microsoft Paint® software, the selected images went through the creation and composition process, making it possible to better visualize the characteristics for later organization of the plastic lids with their respective colors on the panels.
For the collection of the material, a survey was made of the places where
the plastic caps were made available in the largest quantity possible, such as
bars, schools, event centers, among others. The establishments were visited to
explain the relevance of the project and request the separation of this waste for
periodic collection. After the collection, the team performed the hygienization of
the lids, classification by colors and brands, besides the simulation of the
drawings with them.

After that, to start the panels assembly, the covers were marked (Figure
1), perforating them with the electric drill bench.

**Figure 1:** Scheme of marking and perforation of the covers.

![Scheme for marking and drilling the covers.](image)

The arrows indicate the locations of marking and drilling on the covers.

**Source:** Authors, 2020.

To join the plastic covers, the tying was done (Figure 2) following the
format of the chosen figures, assembling the art-pixel panels. To make the tying,
we used internal wiring extracted from network cables that were already in disuse,
in view of their resistance and convenience in handling. It is worth mentioning
that there is no use of glue to assemble the panels, which allows them to be
discarded for recycling in the future, when desired.
Figure 2: Tying scheme with short-wire.

Source: Authors, 2020.

The tying of the covers for the assembly of the art-pixel panels, was also performed by another scheme developed, as shown in Figure 3.

Figure 3: Long wiring tying scheme.

Source: Authors, 2020.
After the assembly work was completed, the panels were displayed in the lobby of the Federal Institute of Paraná Campus Umuarama, in order to raise awareness in the community about the amount of plastic waste that is often improperly placed and the importance of reuse of materials.

In short, the production of the art-pixel panels was a six-step sequence, as shown in Figure 4.

**Figure 4**: Production stages of the art-pixel panels.

- **Stage 1**: Selection or production of the drawing to be reproduced on the art-pixel panel.
- **Stage 2**: Creation, composition and characterization of the image using Microsoft Paint® software or squared paper.
- **Stage 3**: Collection of the material. At this stage it was important to conduct a survey analyzing places where the lids are found in larger quantities.
- **Stage 4**: Hygienization of the covers, classification by colors and brands and simulation of the designs with the covers to adapt the original colors of the design to the pigmentations of the covers found.
- **Stage 5**: Drilling and tying the covers according to the format of the chosen figures.
- **Stage 6**: Exhibition of the panels, aiming to raise community awareness about the importance of reuse of materials in order to make environmental education effective.

**Source**: Authors, 2020.

### 3 RESULTS AND DISCUSSION

During the search for plastic caps, it was found that many establishments were not separating the waste properly, carrying out its final destination inadequately. In this sense, Gonçalves, Tanaka and Amedomar (2013) report...
that the capacity of traditional disposal systems is reaching its limit, needing alternatives for the final destination of goods after consumption, in order to minimize their environmental impact.

Still in this aspect, Nunes and Bastos (2018) highlight that population and consumption growth, together with the form of appropriation of new technologies, has a direct impact on the amount of plastic generation by today's society. In addition, there are changes in the characteristics of solid waste associated with the growth of products with synthetic materials, hindering their biodegradability (ANDRADE; FERREIRA, 2011).

From this proposal, with the orientation for the separation of the plastic caps, the reflection of the students and the merchants generating this waste was provoked. The purpose of the caps for the project was to prevent a large amount of them from being deposited in the environment. This first action of environmental education can contribute to reinforce concepts that, in fact, promote sustainability.

In this direction, Silva (2018) states that there is inefficiency in plastic waste management and collection programs, and the awareness of society can be a measure to reduce the impacts caused by this factor.

Furthermore, Reis, Souza e Dias (2016) discuss that environmental education can act in the renewal of the educational process, through the insertion of content into the local reality and the involvement of the conscious citizen in concrete actions to transform reality. In proposing a vision of what really understands the environment, this study aroused reflection on the sense of belonging, corroborating the preservation of natural resources (VARGEM; SILVA; SOUTO, 2015).

In addition to the awareness-raising carried out in the establishments, students were able to transform formal environmental education (guidelines for activities received at the IFPR) into non-formal education (by passing on the information acquired on the disposal of waste to friends and relatives). As described by Gohn (2006), formal environmental education is developed in
educational institutions, with planned contents and the non-formal one is that in which the individual learns in the "world of life", by sharing experiences in different spaces.

At this threshold, these interventions motivate the educational practice that can remove the student from the field of invisibility, building an affective and applaudable space in the formation of knowledge (MIRANDA; MOREIRA; SILVA, 2019). Furthermore, these dynamics during the classes encouraged the practice of sustainable actions, seeking to stimulate the academic community to take these measures beyond the school environment. Thus, formal environmental education can succeed non-formal education, forming agents that multiply good ideas.

Regarding the drawings used for the construction of the panels, some students chose to make the creation and composition in an alternative way, making their production on squared paper (Figure 5).

**Figure 5:** Drawing produced in software and manually on squared paper.

Source: Authors, 2020.
This method was quite useful when access to the computer was compromised. Moreover, with the freedom of creation and organization of the panels by future teachers, the awakening of creativity with this artistic bias was prioritized. Perhaps, as Rodrigues, Souza and Treviso (2017) emphasize, immediacy and practicality are common in daily actions and it is observed that art does not occupy the necessary space in social life and school and is not treated with its due importance.

In the sequence, the original colors of the drawings were adapted according to the chromatic pigmentation of the collected caps. This process is pertinent due to the divergence of colors between the brands and because the colors of the design are not compatible with the pigmentation of the covers available, requiring adjustments for reproduction on the panel. In order to facilitate and enhance the assembly of the panels, the tying process was divided into smaller parts. Several students assisted in the assembly of a single panel. Once the smaller parts had been assembled, they were ordered and assembled by the tying system, Figure 6 illustrates the tying process.

**Figure 6:** Tying Process.

![Figure 6: Tying Process](image)

**Source:** Authors, 2020.
At the end of the manufacture of the panels, it was found that about two thousand plastic caps were used per unit, representing, approximately, more than four kg of waste reused in each panel manufactured. In all, twenty panels were made, using more than thirty thousand caps, corresponding to approximately sixty-three kg of waste reused.

Data from the Brazilian Association of Public Cleaning Companies and Special Waste (ABRELPE, 2017) show that the generation of urban solid waste per capita reaches 1.035 kg/inhab./day and reveal an annual total of 78.4 million tons in the country. Of this total, more than 40% has inadequate final disposal with high potential for environmental pollution and negative impacts on health. Thus, this work has contributed minimally considering the great problem, however, it has provoked the reflection of the community in search of behavior change.

Figure 7 illustrates the result of the process with some of the panels assembled.

**Figure 7:** Art-pixel panels produced from the reuse of plastic lids.
As Siqueira and Arrial (2018, p. 928) emphasize, "solid waste, in general, can be reused or recycled, if treated appropriately, contributing to reduce the demand for waste spread throughout the environment. In this study, plastic caps could be reused by linking art that, like any area of human knowledge, in the school context, has its own objectives, contents and knowledge. It is part of a set of symbolic manifestations of a particular culture, is creation and innovation (AMÉRICO et al., 2017).

The art-pixel panels were displayed in the lobby of IFPR Campus Umuarama for two months, and were attended by the entire academic community (high school students, undergraduate and graduate academics, staff, contractors and visitors). During the exhibition, it was possible to observe many people contemplating the works, praising and commenting on the impact of the amount of plastic caps that are produced in all environments and that need a correct destination.

Source: Authors, 2020.
The production of art-pixel panels, in addition to its educational character, enabled the awakening of social and cognitive abilities instigating creativity, facts already reported by Siqueira and Arrial (2018) with the construction of toys reusing materials. This can be a path to an environmental education with criticality and art, promoting the local culture.

It is worth mentioning here that critical environmental education has grown remarkably in the academic sphere and is moving towards occupying a central place in the field in place of the pragmatic macro trend (LAYRARGUES; LIMA, 2014). According to the authors, the latter, together with the conservationist macrotendency, invested in children in schools in individual and behavioural actions in an ahistorical, apolitical, conteudistic and normative way, without any social cut-off. The critical macrotendency, on the other hand, groups popular, transformative, emancipatory environmental education currents belonging to the environmental management process.

It is worth emphasizing that in this study, this criticality was closely linked to the artistic view. This art, understood as part of the ontological and historical essence of man, externalizes the subjective and happens in a practical way through human creations, passing through the history of man in the delegation of information from the daily life and values (MEIRA; FORMIGA, 2018).

In face of this, the incorporation of reusable objects in the activities of a teacher training course, reinforced artistic and aesthetic values, bringing closer forms of knowledge and experience for a more comprehensive and satisfactory learning and subsequent teaching activity. According to Layrargues e Lima (2014, p. 33) “in the educational experience learning and change are inseparable: it is not possible to learn something new without changing one's point of view or, conversely, changing a reality without discovering something new with and about it.

Thus, this work, besides contributing to the reduction of a small part of plastics that could have been improperly discarded, the art-pixel panels exhibited at IFPR Campus Umuarama, served as a source of inspiration to the entire
academic community, highlighting artistic creativity and awakening a sense of responsibility regarding the reuse of materials.

4 FINAL CONSIDERATIONS

The reuse of plastic covers for the production of art-pixel panels intended to consolidate environmental education for the formation of conscious and responsible individuals regarding current environmental problems and the impacts that each individual's actions have on the environment.

From this study, it is confirmed that the practice of environmental education should be a space to stimulate formal education, promote creativity and innovation, in addition to awareness linked to an artistic and aesthetic bias with the one who produces it.

In addition, it is important to emphasize that it does not make sense to promote the reuse of waste for the production of something that may later be improperly discarded. Therefore, it is insisted that the object produced from the reuse of materials must have an artistic and aesthetic value, so that the student has an interest in looking after it.

It is hoped that this initiative in the degree course in Biological Sciences will be a way to awaken new actions related to the problems caused by the bad management of solid waste, especially plastic, in teacher training. In this way, the student, as a protagonist in this process, can create alternatives that minimize environmental impacts by strengthening democratic participation and ethical behavior in the construction of a more just society.

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Edição Especial: I SISU – Simpósio Interdisciplinar de Sustentabilidade

Enviado em: 07/02/2020
Aceito em: 10/11/2020

Editores Responsáveis: Otávio Akira Sakai e Diane Belusso