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Barbosa

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Landscape and Environmental Education in Brazil: Impressions of students at the “Professora Didi Andrade” Municipal College–Itabira / Brazil

Diogo Jorge da Silva Oliveira¹, Helder de Moraes Pinto², and Renata Pires Barbosa³

¹ Geography Teacher for the Final Series of Basic Education at the Itabira Municipal Education Network. Graduate from the Degree Course in Geography at the UFMG and holder of a post-graduate degree in People Management and Social Projects from UNIFEI.

² History Teacher for the Final Series of Basic Education at the Itabira Municipal Education Network. Graduate in History at UEMG and Master in Education from PUC-MG.

³ Geography Teacher and Coordinator for the Final Series of Basic Education at the Itabira Municipal Education Network. Graduate from the Degree Course in Geography at FUNCESI-Itabira.

Abstract. This work is the result of the “Landscape Observation” Environmental Education project carried out with students from Brazilian Basic Education. Part of this project was an urban study aimed at analyzing landscape alterations through visits to two strategic points in the city of Itabira: the “Pico do Amor” and the “Morro da Pousada”. At these points it is possible to observe numerous details of the consequences of mineral exploration in the areas surrounding the city. By placing an emphasis on the critical gaze as a means for students to interpret the current situation, this work discusses the environmental relationships that individuals have with nature.

Keywords. Environmental Education, Alteration, Landscape, Observation, Exploration.

1 Introduction

Socio-environmental matters are some of the main present day issues that awaken concern and interest among education workers. According to Lima (1999), this issue is defined as:

(...) a set of contradictions arising from internal interactions in the social system, and interactions between this system and the environment. They are situations marked by conflict, exhaustion and destructiveness that are expressed at the material limits of exponential economic growth; in urban and demographic expansion; in the tendency to exhaust non-renewable natural resources and energy; (...) in the loss of biodiversity and in the increased contamination of terrestrial ecosystems, among other aspects. These are all situations that compromise the quality of human life in particular, and threaten the continuation of life on the planet in general.

Environmental education is one of the ways of working on this set of contradictions in the school environment, as it

can promote a critical understanding of reality, encourage changes in habits and attitudes, and create coherent positions in relation to the environment.

It has been accepted that it is necessary to mainstream Environmental Education in the school curriculum. As part of this, the Geography, History and Science teachers, along with 22 student researchers from the 9th grade (known as “Group 91”) from the “Professora Didi Andrade” Municipal College designed and carried out the “Landscape Observation” project. Located close to the central area of the municipality of Itabira, the school takes in students from both urban and rural areas of the district. Most of those in Group 91 come from rural areas. This school is known in the city for several reasons: it is located in a central region, it is undergoing an organizational restructuring process coordinated by the headmistress Kele Frossard, and it has an educational management philosophy in which projects and quality teaching are prioritized and encouraged.

The objective of this article is to present details of how this project was carried out, along with its partial results, development and methodology. *Landscape* was the chosen geographical study category, as it is the best way to expressly illustrate the ecology of a place. In a landscape, an emphasis is placed on the relationship between humans and nature, as stated by Maximiano (2004): “the notion of

landscape has been part of human existence since the dawn of time, as the survival of human beings always depends on their relationship with the environment”. This quote can be supplemented by stating that a landscape is determined by the combination of its cultural/humanized and/or natural elements. When these natural elements are subject to human observation and intervention, their available resources are put to practical use by humans to meet their basic needs of survival and development, thereby leading to the construction of a geographical space. It is worth stressing that the predominance of certain natural or human/cultural elements will end up shaping the various landscape types defined by the field of geographical studies.

In Itabira—a city that can trace its mineral exploration origins back to 1720, during the Minas Gerais gold rush—the geographical space was constructed from the complex consolidation of the local economy, based on the mineral resources extraction activity. In the case of Itabira, landscape formation dates back to pre-colonial times. Local tradition has it that the word “Itabira” is derived from the native Tupi language: *Ita = stone + bira = that shines*. The original geomorphology of the municipality included a rich mineral deposit in the northern region of the main urban centre, called *Pico do Cauê*¹. During the first two decades of the 20th century, an enormous block of iron ore, the “Pico”, was discovered, attracting English and North American interest in exploring it. After the English came out on top, what was noticed thereafter was the gradual disappearance of the “Pico”². With the setting up of a mining company in the city (currently the second largest mining company in the world), its relief became completely altered when compared to the original, until it acquired its current appearance, known as “cava do Cauê”.

2 Methodology

Starting from the assumption that environmental education promotes socio-environmental awareness among students, to the extent that it provides instruments and possibilities to allow them to perceive the nature of the environment and their responsibility towards it (Silva, Bhering and Muggler, 2009), the initial aim of the “Landscape Observation” project was to use the landscape problem as an approach to working on the environmental issue of the city of Itabira, as this problem provides clear evidence of the relationship between exploration, humans and the environment.

The project subsequently came about in geography classes when student interest was aroused in making *in situ* observations of Itabira landscapes from sites that afford a good view. The following theme was worked on by students and teachers alike: “*discussing socio-environmental issues based on landscape observations*”. The big question was: how could students think about socially and ecologically sustainable actions based on observations of Itabira landscapes? More than just a school project, this theme increasingly became a concern that went beyond the teaching practice of most of the city’s teachers. It seems that awareness of sustainable social relations remains a rhetorical figure. In practice, neither society nor the education system has assimilated the matter as a constant problem in daily life. In the case of Itabira, the environmental degradation caused by economic development seems to be an unsolvable drama.

The main objective of “Landscape Observations” was to work with the students to develop skills aimed at seeking environmentally critical answers, using concern for the landscape as a starting point. Other objectives were to stimulate observation and perception, to facilitate the understanding of concepts related to the environment, to research written and photographic records and the acquisition of sustainable points of view.

The project was designed to be implemented in four phases. Each phase represents a specific space-time and theory-school moment, and each has its specific and particular aspects. The first phase was planned to include work by students and dialogue between them about the concepts. The second phase was designed for the preparation of fieldwork. The third phase would be the field work itself. Finally, the fourth phase would conclude the project and transform it into material to be used for writing this article.

In practice, the project phases were implemented as follows:

- 1st phase: initial debate with students and work on the concepts:
During this initial phase, the demands of the project were defined by dialogue between students and teachers. Following this, a class plan was drawn up to include work on basic landscape concepts and on the socio-environmental context in Itabira. The most difficult task of this phase was to encourage understanding (inconclusive work) of the fact that the impression given by a certain place of being natural is a “false truth”. Therefore, landscape needed to be understood as a long-term human construction; the issue of natural/cultural dichotomy had to be posed.
- 2nd phase: preparation of the data collection method to be used, the performance of surveys and the sourcing of technical and recording equipment (binoculars, compass, cameras, etc.) for field work at strategic points with views over city landscapes:
During the second phase the teachers prepared an “Environmental Form” (Figure 1), a data collection instrument to be filled in by students for the collection of survey data on site. This form reflects the materialization of the work previously done in the classroom and,

¹ The “cava” is an enormous crater (Figure 3) in the ground, from inside which the ‘Cauê’ ore is still extracted.

² During the 1970s a type of movement occurred to feature the Cauê as one of the city’s symbolic-cultural aspects. In 1978, Professor José Luiz Gonsalvez created the musical lyrics “Saudade do Cauê” (Cauê Health): *‘Nunca mais vou rever [...] meu Cauê se foi [...] mãos hostis te levaram pouco a pouco até o fim’* [...] (I’ll never see it again [...] my Cauê has gone [...] hostile hands took you away, bit by bit until the end” [...]) (Iron Museum Archives). Now, this evidence points to an intense dynamic in the city’s landscape that mixes the euphoria of urbanization with nostalgia caused by the degradation of landscape memories.

FORMULÁRIO AMBIENTAL – OBSERVAÇÕES E IMPRESSÕES SOBRE AS PISAGENS

NOME DO PESQUISADOR: _____

DATA DA OBSERVAÇÃO: ____/____/____



1. Classifique os elementos da paisagem do Pico do Amor de acordo com a tabela abaixo:

ELEMENTO	0. não alterada	1. pouco alterada	2. muito alterada	RESPOSTA
Vegetação				
Construções	0. nenhuma	1. poucas	2. muitas	
Relevo	0. não alterado	1. pouco alterado	2. muito alterado	
Água	0. em curso natural	1. poluída	2. ausente	
Indústrias	0. ausentes	1. pouco presente	2. muito presente	
Fauna	0. presente	—	2. ausente	
Vias asfaltadas	0. ausente	1. pouco presente	2. muito presente	
Poluição visual	0. ausente	1. mediana	2. muito presente	
SOMA TOTAL				

2. Qual aspecto observado do Pico do Amor indica um conflito ambiental?

() vegetação () água
 () poluição visual () lagoa
 () mina () estrada
 () construções () indústria
 () relevo () fauna

3. Digite em uma palavra o que a paisagem representa para você: _____

4. Classifique os elementos da paisagem do morro do Pousada de acordo com a tabela abaixo:

ELEMENTO	1. não alterada	2. pouco alterada	3. muito alterada	RESPOSTA
Vegetação				
Construções	1. nenhuma	2. poucas	3. muitas	
Relevo	1. não alterado	2. pouco alterado	3. muito alterado	
Água	1. em curso natural	2. poluída	3. ausente	
Indústrias	1. ausentes	2. pouco presente	3. muito presente	
Fauna	1. presente	—	3. ausente	
Vias asfaltadas	1. ausente	2. pouco presente	3. muito presente	
Poluição visual	1. ausente	2. mediana	3. muito presente	
SOMA TOTAL				

5. Qual aspecto observado do morro do Pousada indica um conflito ambiental?

() vegetação () água
 () clima () lagoa
 () mina () estrada
 () construções () indústria
 () relevo () fauna

6. Digite em uma palavra o que essa paisagem representa para você: _____

Figure 1. Example of the “Environmental Form”.

as a result, reflects the expectations, the demands and the ecological problems of the situation in Itabira³. This phase also included investigation work on the matter, distributed among the students. The fieldwork organisation team also worked on obtaining the equipment necessary to make observations of the landscape and to record the activity, such as compasses, binoculars, digital cameras, etc.

It was the responsibility of the organization team, comprising the teachers, to plan the itinerary for a visit to two viewpoints inside Itabira’s urban perimeter: Pico do Amor and Morro da Pousada. These two points were chosen due to two basic characteristics. First, due to the fact that they are defined as city “viewpoints”, and offer a panoramic view of more than half of the urban complex. Secondly, as they are just a few metres away from the ore industry and the ‘Cava do Cauê’. The reason behind choosing these aspects was to make it possible to compare urban and natural landscapes, allowing it to be seen how, to a certain extent, the two categories become confused.

- 3rd phase: fieldwork, with the on-site observation, description and explanation of landscape (trans)formation processes:

During the third phase, teachers and students visited the two city viewpoints, which afford a privileged view over the surroundings of Itabira, including both the area used by the mining company and rural and urban areas. Before starting the observations from the viewpoints, the students were allowed to take photos of the landscapes that they liked the most. They were then given explanations about “landscape alterations and environmental problems in Itabira”. Lastly, they were asked to take photographs to report the most significant landscapes, or the aspects of the landscapes that were most significant to them.

- 4th phase: analysis of the data, debate with the students and writing the article:

The last phase included the analysis of the data and a conversation with the students about their impressions and accounts of the trip. The results, analyses and accounts of this trip, as well as the results of the project, were transformed into the raw material for this article. Efforts were made during all of its phases to not lose sight of the students’ real and specific learning process. Taking inspiration from *vygotskian* constructivist thinking, the project prioritized interactions between the knowledge recipients and between them and their socio-environmental and cultural environment.

During the entire teaching-learning process, the teachers:

- Created problem-situations to encourage the students to observe the landscape and question their observations;
- Created an environment that provided solutions and knowledge based on questions and observations, on dialogue with peers, with the teacher, with themselves, with knowledge found in books (and other resources of information) and with the environment.
- Placed value on student knowledge, both when planning the survey, during the observation and analysis phases and when summarising the information and data.

3 Presentation of results and their discoveries

The visit was made in June 2011, during a season that is suitable for open air observations due to the cold, dry winter typical of the region’s “tropical altitude” climate. Below can be seen the landscapes viewed from the two viewpoints located within the urban perimeter of Itabira: Pico do Amor (Figure 2) and Morro da Pousada (Figure 3). For illustrative purposes, Figure 4 shows the *Pico do Cauê* when there was still no aggressive iron ore exploration in the area.

Photographic and written records were made of these points by the students/researchers. They looked for indications of environmental tensions and conflicts caused by the human occupation of the two landscapes, they recorded high levels of alteration of landscape elements, and identified aspects indicative of environmental conflicts. Following this, in answer to the question: “*In one word, what does the landscape mean to you*”, each student wrote down one random

³The teachers emphasized the fact that the work is specific to the city’s local situation and therefore would not be completely suitable for other situations, should any teacher or researcher decide to apply it.



Figure 2. Photograph of the Pico do Amor landscape. Note the urban constructions, the reforestation with eucalyptus trees of part of the Pico and the iron ore extraction in the background.



Figure 3. Photograph of the Morro da Pousada landscape. Note the old Pico do Cauê excavation and the ore industry in operation.

word to describe the landscape observed at each viewpoint. The words were:

- Industrialization,
- Revolution,
- Evolution*,
- Destruction*,
- Devastation*,
- Deforestation,
- Beautiful*,
- Nice,
- Nature*,
- Humanized,
- Culture,
- Change*,
- Altered,
- Reconstruction
- Hope,
- Harmony,
- Inspiration,
- Cool*,
- Tranquillity,
- Surprising,
- Sadness*

**these words were repeated by several students*

These words qualitatively expressed the students' impressions of the observed landscapes. It should be emphasized that the most quoted categories of "industrialization", "revolution" and "evolution" express, among other aspects, a

certain positive value judgement by students when faced with reality. In this case, the action by industry on the space entailed a revolution, or a qualitative leap understood as evolution. In summary, the students have a teleological impression of the course of history, such that rural = backwards, city = development. However, in the eyes of other students this evolution does not happen for free and without "destruction" and "devastation". It is important to talk about these impressions, as more than 90% of the students believed (based on the answers given on the form, presented below) that the landscapes have suffered "*a relevant level of alteration*" or a "*high/very high level of alteration*".

4 Landscape alteration

As regards the levels of landscape alteration, the observations made by students and recorded on the "Environmental Form" could lead to significant assessments relating to the environmental perception of students. Part of this instrument is made up of the table shown below (Table 1), which allows the observer to grade their subjective gaze based on pre-established levels. The project acknowledges the limitations posed by this qualitative-quantitative transposition, but the teachers

Table 1. Table showing landscape alteration levels

ELEMENT				ANSWER
vegetation	0. not altered	1. somewhat altered	2. very altered	
buildings	0. none	1. few	2. many	
relief	0. not altered	1. somewhat altered	2. very altered	
water	0. in natural channels	1. polluted	2. absent	
industry	0. absent	1. minor presence	2. major presence	
fauna	0. present	—	2. absent	
asphalted roads	0. absent	1. minor presence	2. major presence	
visible pollution	0. absent	1. medium	2. major presence	
TOTAL SUM				



Figure 4. Old photograph of the Pico do Cauê in 1932, before mineral extraction.

place an emphasis on the practical and statistical gains that the task contributes to the research.

The table comprises five columns and ten lines, eight of which refer to elements of the landscape that could suffer, or that have already suffered, human intervention, or that are the result of human work. The three central columns refer to the levels of alteration that it is possible to perceive, whereas the final column is related to the quantitative option chosen by the student that most closely matches the qualitative observation made by them. The cell formed where the last line crosses the last column contains the sum of the values posted by the students in the other lines of the last column. Therefore, each student generated a Sum Total for each viewpoint visited, a quantitative value related to the landscape observed by them. Project participants were able to start a richer and more in-depth debate about landscape

alteration in Itabira, using the correlations of these sum totals as a starting point.

During the studies that were carried out, it was found to be necessary to create a scale for landscape alteration levels, in order to bring greater validity to the intended correlations. Therefore, the project’s teachers proposed the “Drummond Landscape Alteration Scale”⁴ as a tool for analyzing the data obtained from the form. However, this scale only makes sense if data from the “Environmental Form” tables presented in this work is used, and if the data is understood and interpreted in the manner explained herein. Having observed

⁴Note that the term “landscape” is used in the sense of “related to landscape”. At no time does the term refer to the field of studies and activities usually known as “landscaping”.



Figure 5. Site photographs.

this, it can be seen that the scale is very useful for quantitatively highlighting subjective and qualitative observations. The name of the scale is a homage by one of the participants in the project to the poet Carlos Drummond de Andrade, who lived through and suffered alterations to the landscape of a city that experienced the devastating power of mining companies⁵. It is worth highlighting that the largest scale landscape alteration perceived by the illustrious poet and by the oldest inhabitant was the complete destruction of the Pico do Cauê, nowadays called the Cauê mine—which is a large opening in the ground with a width and depth of several metres, and which can be easily seen from the “Morro da Pousada” viewpoint that was visited.

In order to better display the levels of alteration, a color gradient was also defined for certain systems of signs: Level “0” or “Green”, Level “1” or “Blue”, Level “2” or “Yellow”, Level “3” or “Amber”, Level “4” or “Red”, and Level “5” or “Grey”. Levels “0” and “1” are defined as *safe*, Levels “2” and “3” are for an *alert*, and levels “4” and “5” are *emergencies*.

Below can be seen the proposed scale:

Drummond Landscape Alteration Scale

- **Level Green**—0 points—landscape not altered.
- **Level Blue**—1 to 3 points—landscape with very little alteration or a minor level of alteration.
- **Level Yellow**—4 to 6 points—landscape with some alteration of a low level of alteration.
- **Level Amber**—7 to 9 points—landscape with significant alteration or a medium level of alteration.
- **Level Red**—10 to 12 points—very altered landscape or a high level of alteration.
- **Level Grey**—13 to 16 points—completely altered landscape or a very high level of alteration.

The team used the “scale” tool to analyze the data. The following results were obtained from the responses of the students to observations made of the southern part of the Pico do Amor landscape:

- No student rated the landscape in the GREEN and BLUE levels—0%
- One student thought that the landscape could be rated as YELLOW—6%
- Seven students thought that the landscape could be rated as ORANGE—41%
- Five students thought that the landscape could be rated as RED—29%
- Four students thought that the landscape met the requirements for the last level: GREY—24%.

The following results were obtained from the responses of the students to observations made of the northern part of the Morro da Pousada landscape:

- No students rated the landscape in the GREEN and BLUE levels—0%
- No students rated the landscape in the YELLOW level—0%
- Twelve students thought that the landscape could be rated as ORANGE—71%
- Four students thought that the landscape could be rated as RED—23%
- One student thought that the landscape met the requirements for the last level: GREY—6%.

5 Correlations

By comparing the qualitative and quantitative data, the teachers were able to perceive the different reactions provoked among students by the landscapes. It is worth remembering that the concepts and notions of *landscape*, *landscape alteration*, *natural and human elements*, *ecology*, *environmental awareness and sustainability* were worked on with the students on several occasions, even during the observation. When the students quantified their observations into alteration levels, they were doing so based on the previous

⁵ For Drummond, the Pico do Cauê was impressive: “The town of Utopia is a curious place, perched on the slopes of the venerable mountain, numbed by the fascination with its one billion, five hundred million tons of ore, with an average iron content of more than 65%, enough to supply five hundred worlds for five hundred centuries, as guaranteed by the Viscount of Serro Frio.” (ANDRADE, apud Minayo, 2004).



Figure 6. Site photographs.



Figure 7. Professor Renata Pires (right) with collaborators.



Figure 8. Site photographs—The History, Science and Geography teachers and students.

guidelines referring to environmental degradation and changes to the city's ecology and landscapes. Based on the landscape aspects available on the form, students were given the task of noting which aspects had suffered alterations and to what level.

It is worth noting that the students are accustomed to a rural landscape, in which the population lives on land dominated by vegetation and animals. This means that they are conditioned by looking at “natural landscapes”, rather than the robust agglomerates of urban buildings. Some teachers were able to see a certain enchantment of the students due to the crammed-in houses on the Itabira landscape, which are quickly growing away in the opposite direction from the headquarters of the ore industry.

When asked to write a word to express the feeling (or meaning) transmitted by the observed landscapes, the students noted no less than 23 words—52% of the total—with a “positive” emphasis, such as “harmony”, “beautiful” and “cool”. This information becomes both curious and challenging when compared to the information provided by the data obtained from the tables filled in by the students themselves. Based on the figure 9 shown below, created from the forms, almost 95% of students believe that aspects of the landscape to the south of Pico do Amor have suffered high and medium levels of alteration, with 53% of students stating that the landscape is extremely altered and degraded. The results are similar to those shown on figure 10, on which all the students believed that the aspects of the observed landscape have suffered a medium to high level of alteration.

The discrepancy between the qualitative information and the quantitative data suggests that the words chosen by the students are not strictly directly related to objective and critical opinions regarding the ecological alteration or degradation of the landscape. Therefore, it can be considered that a student with a “critical environmental gaze in development” is able to *perceive environmental alterations to the landscape* (and their causes and consequences). As a result, it can be thought that the students participating in this project *are developing critical thought*, even though many of them have used “positive” nouns and adjectives to classify the landscape.

By quantifying information about the city's bio-geographical and sociocultural space, students carried out an intellectual activity different from the exercise of randomly noting down words that represent the landscape. Often when a teacher asked a student for their opinion about an altered or degraded landscape, the student would be reproached by the teacher for expressing a positive opinion. However, it can be proved that even though a student may consider a landscape to be harmonious or beautiful, they can identify altered or degraded elements and aspects.

6 Final considerations

Rather than drawing conclusions, the aim of this article is to record this significant initiative taken by teachers and students at the “Professora Didi Andrade Municipal College, entitled the “Landscape Observation” Project. This project is currently being continued at the school, with other discoveries and possibilities, meaning that it will be possible to address or reformulate some issues encountered in the field, with the data analysis or with the article itself. By using a rich educational and research activity—fieldwork—this initiative offered students the chance to compare urban landscapes with the rural ones in which they live, and to perceive the evolution of urbanization and its consequences in terms of the alteration of original environmental forms.

In this sense, it is extremely important to comprehend the various formats of geographical space and the landscape configurations that arise with urban and demographic expansion, to allow each student to view themselves as being responsible for the environment in which they live. This was only possible because they were able to observe and interact with the extreme points within the urban perimeter; altered

Observations made of the southern part of the 'Pico do Amor' landscape

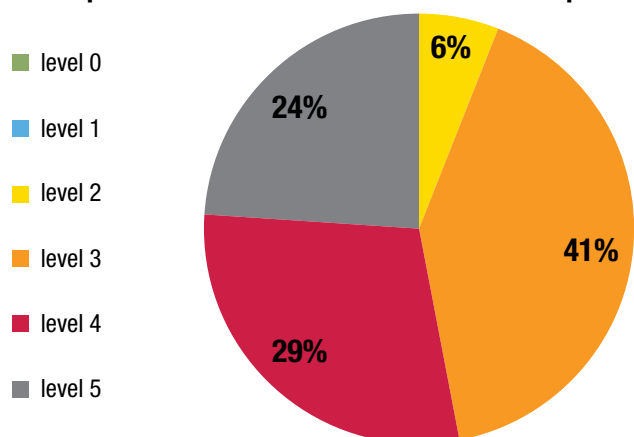


Figure 9. Levels of Alteration–Pico do Amor.

Observations made of the northern part of the Morro da Pousada landscape

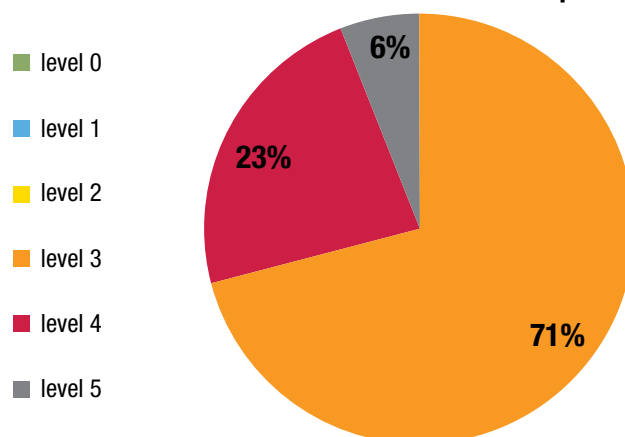


Figure 10. Levels of Alteration–M. Pousada.

by extraction by the local mining company and the consequential expansion of the city. The essence of the project is a *criticality* aimed at getting the student to look at the environment in a certain way. The most important thing is for the student to gain a minimum notion of landscape/urbanization/alteration and the visible environmental problems embodied in the landscape.

In the first instance, one of the objectives of the project was achieved when the landscape caused the expected impact on people who have little interaction with the urban environment. The shock, the attentive gaze on reality, the modelled landscape, made up of different colours to the natural landscape to which they are accustomed, in conflict with mineral exploration. Furthermore, this initiative encouraged thought on *civilization and the preservation of finite natural resources*, which served as a basis for reaching deeper subjective analyses about human practices, as a result of this fact.

Based on the considerations and work presented in this article, the teachers involved in the project believe that the “Landscape Observation” achieved its objectives. They are now ready for new ecological and educational challenges and issues in the area of environmental education.

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