

THE USE OF GEOTECHNOLOGY, AS A PROPOSAL FOR THE DISSEMINATION, INTERACTIVITY, AND KNOWLEDGE ABOUT THE PANTANAL BIOME, IN ELEMENTARY SCHOOL

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Abstract

The search for an integrated school to an increasingly dynamic reality has been perhaps the greatest challenge faced by education professionals nowadays. In this context; technological innovations have played an important role to obtain more effective results in the process of understanding and possible spreading of knowledge. That demand has made possible in recent decades, the development of several work proposals using new technologies, such as Remote Sensing. In this sense, this work is characterized as a development of the project on Psychomotor activities and Animation Remote Sensing for the 5th and 6th grades of elementary school - the Case Study was carried out at the Municipal School Rondon (VIEIRA, 2011), in which foundations and Remote Sensing activities were combined with a playful and interactive approach. This new step aimed at identifying the major biomes of Brazil, with emphasis on the Pantanal. The use of computer animation was maintained with the same characters from previous work, at this stage, focusing on the interpretation of satellite images in the presentation and identification of the biome with its diversities and changes, covering the impacts generated by human activities. It is hoped that this work generates educational material that serves as support to educators in the use of new technologies for the study of this and other Brazilian environments.

Key-words: Geotechnology. Education. Pantanal biome.

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Resumo

Estudo do bioma Pantanal no ensino fundamental utilizando recursos de sensoriamento remoto e animação gráfica

A busca de uma escola integrada a uma realidade cada vez mais dinâmica tem sido, talvez, o maior desafio encontrado pelos profissionais da educação atualmente. Neste contexto, as inovações tecnológicas têm assumido papel relevante para a obtenção de resultados mais eficazes no processo de apreensão e difusão do conhecimento. Essa demanda possibilitou nas últimas décadas, o desenvolvimento de várias propostas de trabalho utilizando novas tecnologias como, por exemplo, o Sensoriamento Remoto. Seguindo nessa direção, o presente trabalho se caracteriza como desdobramento do projeto Atividades Psicomotoras utilizando a animação de personagens por computação gráfica bi dimensional, e imagens de satélite, para as classes do 5º e 6º anos do Ensino fundamental – Estudo de caso da Escola Municipal Rondon (VIEIRA, 2011), no qual, fundamentos e atividades de Sensoriamento Remoto foram combinados a uma abordagem lúdica e interativa. No desenvolvimento desta nova etapa, apresentada neste artigo, o objetivo foi desenvolver uma metodologia de estudo dos principais biomas do território brasileiro, com ênfase no bioma Pantanal, adequada para alunos do ensino fundamental, utilizando recursos de Sensoriamento Remoto e animação gráfica. Nesta animação gráfica foram mantidos os mesmos personagens do trabalho anterior, priorizando nesta fase a interpretação das imagens de satélite na apresentação e identificação da diversidade e dinâmica do bioma Pantanal, bem como da sua transformação e dos impactos, decorrentes das atividades humanas. Os resultados obtidos indicaram a viabilidade da metodologia utilizada. Espera-se que a metodologia apresentada neste trabalho sirva como suporte aos educadores, no uso de novas tecnologias, para o estudo deste e de outros ambientes brasileiros.

Palavras-chave: Ensino fundamental. Bioma Pantanal. Imagens de satélite. Animação gráfica.

INTRODUCTION

According to data from the Brazilian Institute of Geography and Statistics (IBGE) the Pantanal biome covers an area of approximately 150,355 km², corresponding to 1.76% of the national territory, extending even to small parts of Bolivia and Paraguay. Considered a national treasure by the Constitution of 1988 and, more recently, entitled Mankind Heritage and Biosphere Reserve by the United Nations, this biome occupies the largest continuous flooded area of the planet. It is ruled by the same laws of other Brazilian regions and has been explored according to old concepts and traditions. Its integrity, however, has been threatened by human activities conducted in the highlands of Alto Paraguai watershed for the last three decades (VIEIRA, 2001). Thus, the constant monitoring of these areas contributes to enforcement actions and more effective management in that region.

We have been living in recent years, a new threshold regarding social and technological access to information. In this context, geotechnology dissemination has become increasingly common in different types of media. Technological innovations have played an important role in achieving more effective results in teaching, learning, and knowledge building. However, the huge amount and speed in which information has been reaching an increasingly significant portion of students, still makes it difficult to select, systematize, and turn it into knowledge. Therefore, in order to contribute to the improvement of teaching and learning as well as to increase students' participation in the process, many education professionals have been inserting the use of technology, such as remote sensing, in the development of projects and activities.

The interpretation and analysis of satellite imagery, in this context, are justified, not only by its multidisciplinary characteristics, contributing to the expansion of cartographic understanding in teaching different areas of knowledge, but also mainly because, according to Carvalho (2012), they may greatly contribute to the cognitive development of students, to the extent that several cognitive functions are required to carry out the process of image interpretation. Using this feature can also serve as a "motivational tool" for the teaching and learning process, allowing the teacher to check the students' prior knowledge of the content to be worked (CARVALHO,2012). Remote sensing has become an important tool for understanding the intervention process and the impact of social relationships in a balanced/ imbalanced environment and it also allows overcoming the current approach, still restricted to **Natural** Sciences ,common when dealing with this issue, and advancing towards Social Sciences and Pedagogy communication, Santos says (2002).

It is also essential to highlight the importance of environmental education today, a theme which has been in all relevant meetings to discuss issues of both scientific research and planning and environmental management. (ABDON et al,2007). Therefore, stimulating it in the environment of elementary school, using new technological resources, becomes urgent in the face of major social and environmental challenges of this new century, becoming a basis for building a just and sustainable society.

Although many of the Public School Units of the municipality of Rio de Janeiro already rely on various multimedia devices, it has been observed that this fact alone has not contributed to the generation of a real interface with its users. It is also important to note that many professionals who now work in teaching have not been trained in this reality, staying on the sidelines of the mentioned process.

The change in this scenario is possible through investments in teachers' training and development of teaching materials freely accessible, which would support these professionals. That could contribute to the use of available resources and improve the quality of education, because they would not only be limited to presenting and discussing the specific contents of the subjects in each grade. Furthermore, the use of new methods that add technology can indeed function as a motivational factor not only for students but also for teachers. Xavier da Silva (2011) points out that the process of education and retraining of teachers is a key factor to fulfill the requirements and potentials of this new form of communication. In this context, the aim of this research has been to develop a methodology for the study of biomes, taking the example of Pantanal, for elementary students, using resources of Remote Sensing and Graphic Animation. Through the use of these resources, we tried to identify the elements that form the geographical landscape of the wetland biome, to understand its dynamics and impacts produced by human actions to promote socio-spatial transformations.

This work was undertaken with a group of 7th graders from the Elementary Municipal School called Visconde de Porto Seguro in Sulacap, in Rio de Janeiro, where we used satellite images of the region and applied a methodology that enabled the active participation of the students as effective constructors of their knowledge.

It is noteworthy that, this work is a Project offshoot of Psychomotor Activities and Animation in Remote Sensing for classes of the 5th and 6th years of Elementary School - Case Study of the Rondon Municipal School (VIEIRA, 2011), in which, foundations and activities of Remote Sensing were combined with a funny and interactive approach.

In developing the teaching material offered, besides the use of satellite images, we chose to include graphic animation features, in accordance with the guidelines of the National Curriculum Parameters (NCP), pointing to the use of different sources of information and technological resources. The action of animation allowed using characters in the presentation of historical and natural features of the Pantanal biome, as well as addressing adequate questions and observations considerin the seventh graders' age with simple and current language, providing an identification between themselves and the characters, therefore, awakening greater interest. According to Gurgel (2009), "audiovisual production in school

spaces reminds us of the emotional dimension, the imaginary and the mythologies of our time, introducing disturbing elements to classical disciplines. One must consider that "turbulence" may generate a renewal.

MATERIALS AND METHODS

In developing the work we employed the following materials:

- TM and Modis Images from the study area, obtained from LANDSAT 5 and EARTH, respectively, available for free on GOOGLE EARTH;
- 1 computer;
- Multimedia Projector;
- Wetland photos freely obtained on travel blogs;
- Whiteboard;
- Marker pens.

The procedures developed in this project were divided into five stages, as shown in figure 1. The first three steps are dedicated to research and development of material and activity by the teacher. The two later stages refer to students' activities.

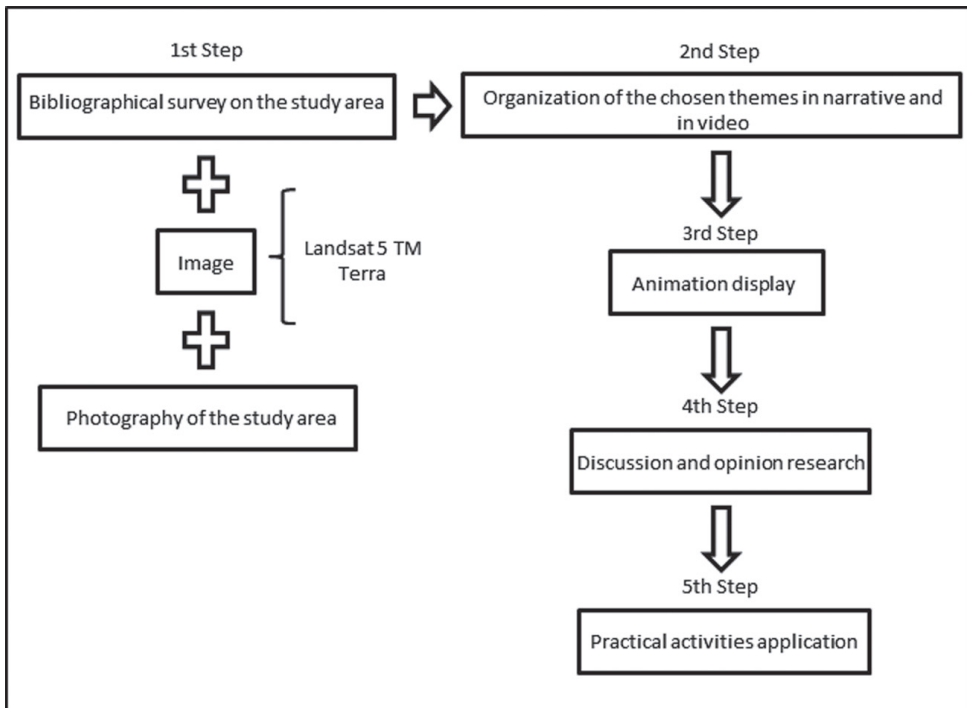


Figure 1 - Flowchart of the methodological procedures

1stStep - Data Collection

This first stage was conducted with the selection of themes and a bibliographical survey on wetland biome was made. Furthermore, we selected and acquired the remote sensing data of the study area. This stage was the longest of all as the work, lasted almost two months. In the survey of the themes dealt within this work, the suggestions contained in the NCP (1998) were taken into account for the area of Geography in Elementary School. Also a survey was conducted on concepts related to the Pantanal region. The following topics were then selected:

- Location of the study area (using GPS / Geographic coordinates);
- Characterization of the major morphoclimatic elements;
- Identification of the main aspects of biodiversity;
- Establishing relationship between the Paraguay river watershed and the dynamic flow presented by the river;
- Establishing relationship between the environmental and human activities, especially in the area for cattle and commercial agriculture.

At this stage, images and photographs that could better illustrate the region were also didactically chosen from the pre-selected themes. A selection of photographic material used in the project was made through research on blogs of people who traveled to the Pantanal region and provided the photos for free. The satellite images were also obtained for free on the website of the National Institute for Space Research (INPE) and NASA (National Aeronautics and Space Administration). The combination of these two forms of representation of the landscape, as shown in figure 2, served as support for the work of identifying the different elements that make up the landscape of wetland and to encourage the establishment of relations in the environment.

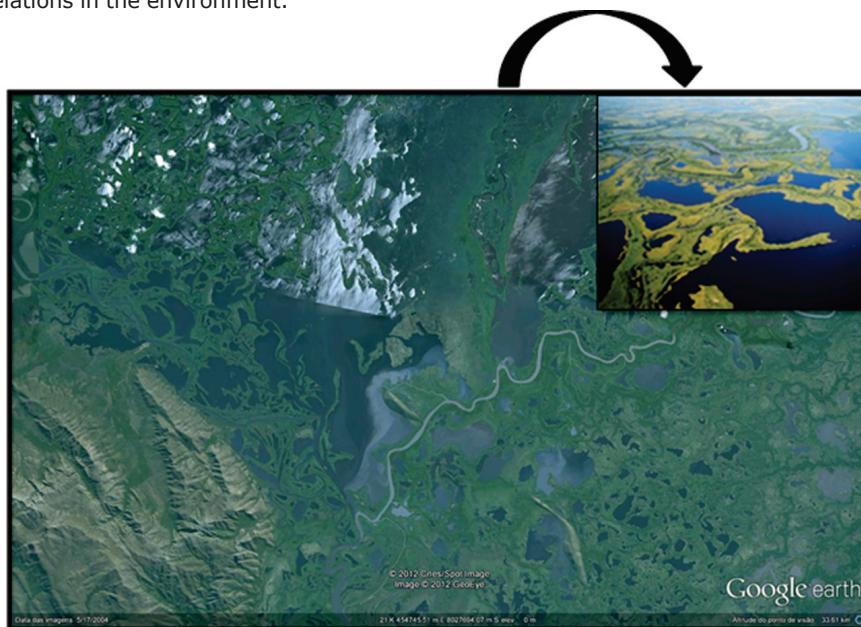


Figure 2 - Example of satellite imagery and aerial photo used in the recognition and location of the study area

(Source: Google Earth and www.blogsport.com.br/2010/12/parque-nacional-do-pantanal.html)

2ndStep -Building the narrative

The elaboration of the video text was careful not to be based only on the approach of the concepts previously selected, which could become boring for students. Relying on simple current language, which is adequate for the target age of this work, ranging from 11 to 13 year- old students, the narrative prioritized the playful aspect of the learning process, acting as a stimulus for greater interaction among students and the topics discussed. Thus, we used the graphic animation of two characters: Estela (represented by the figure of a star) and Zoião (an artificial satellite representation) which had been created in previous work (VIEIRA et. Al. 2011). Their usage aimed to approach the information and questions about the wetland biome to students'reality as it is illustrated in figure 3.

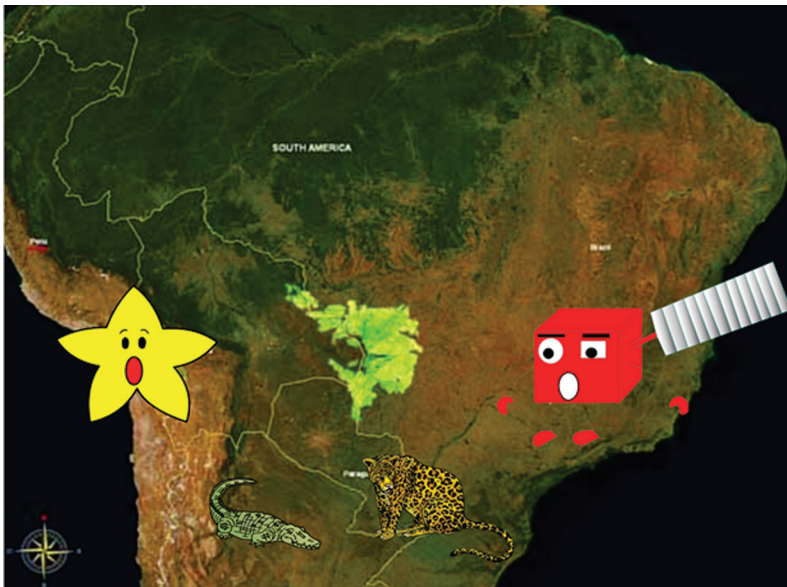


Figure 3 - Image and animation used to identifying the study area threatened with extinction

(Source: Wikipedia)

In the approach adopted, we tried to emphasize the aspects on which the teacher wanted the students to take a stand, making them ask questions about it. To finalize the text, there was an audio recording in a studio provided by private collaborators where the authors of this work dubbed the voices of the characters Estela and Zoião.

3rdStep - Audiovisual material production

Adobe Flash Professional CS5 was used in the elaboration of animation materials. For the treatment of images, we resorted to the Adobe Illustrator CS5 and Adobe Photoshop CS5 for pixel images. For almost two months, from studio recordings and appropriateness of text and images to the movements of the characters in the scenes, the Project received volunteer technical support from other professionals outside the school unit. Interacting with TM and Modis from Landsat 5 and EARTH satellites, respectively, among others that were available on Google Earth and photographs, the characters presented questions,

and suggested possible solutions regarding the process of socio-spatial transformation in order to encourage the students to observe the various aspects involved in the study area. figure 4 illustrates one of these relationships, overlapping the character Zoião in a satellite image where it is possible to observe several outbreaks of fire occurring simultaneously in different parts of the region.



**Figure 4 - TERRA (satellite image / NASA of fires in the BR 163/2008)
Combined with the character Zoião from the graphic animation**

4thStep -Application of practical activities

At this stage, students' participation becomes effective. The resulting material produced a 6-minute video. It is presented in multimedia projector in the classroom to seventh graders, Class 1701, formed by 38 students at Visconde de Porto Seguro Municipal School. After the presentation, students were divided into small groups consisting of 4 or 5 members and were engaged in the discussion of the main issues addressed in the video. Then the groups were asked to prepare a collective text with suggestions and alternatives for land use in the Pantanal region. During this time, the teacher served as a mediator who encouraged students' participation, so that everyone's opinion was respected in the groups. This step was performed during a 1hour and 40-minute class (twice the regular class time).

5th Step-Debate and opinion research

In this final step, which lasted a regular class time, each group was asked to choose a student representative for the reading of the material produced by the group. This moment of the socialization is essential to encourage the students to respect each other's opinions. Afterwards, there was a debate on the best suggestions highlighted by all groups and the students were then asked to try to extrapolate what was learned there to other areas where similar problems may occur. As a conclusion of the activities, all participants completed a survey (Figure 5) previously prepared by the teacher, considering the questions posed by

the students during the presentation / discussion groups in the previous step by numbering, in order of priority, the main alternatives to minimize the environmental degradation of the study area.

QUESTIONNAIRE

School: _____
Student: _____
Year: _____ **Class:** _____ **Number:** _____ **Group:** _____

Number the options below from 1 to 3 according to the importance of this action to reduce the environmental impacts in the region of the Brazilian Pantanal.

- Larger investments in education and research. ()
- Encourage sustainability programs and generating employment and income for the local populations. ()
- Make stricter environmental laws and increase oversight. ()

Figure 5 -Questionnaire prepared for the survey

RESULTS AND DISCUSSION

The results showed a greater interest of students in class participation and in the discussion of the issues highlighted by the video and a greater for debating them. The use of satellite imagery in this work, and not simply of maps identifying the main landscape elements, functioned as an important tool to acquire more information about the study area, since various types of information can be obtained from the image interpretation: raised signage, drainage, vegetation cover and land use were in the spotlight, as it was also observed by Lima et al (2011). Moreover, the data as textures, colors and forms mainly observed in the satellite images can be used as facilitating aspects to identify different types of targets on the earth's surface.

Another important point observed and also pointed out by Zocoler (2005) is that, after carrying out the activities with satellite images, students said they felt the need for more specific teaching materials, which could facilitate the understanding of concepts related to remote sensing, especially in the case of those who have had contact with this type of activity for the first time. Regarding the results of students' critical positioning about the issues discussed, it can be observed in the chart of figure 6, more than 50% of interviewees indicated that support for education and research is the main road in attempting to reduce impacts of human activities in the region. Students are also greatly concerned about new environmental legislation, still quite unknown to the general population, because they know

the need for effective oversight to ensure compliance with those laws. With regard to the item of encouraging sustainability programs and employment generation, probably because they are still very young and distant from the labor market, students gave that alternative less importance than they did to the others. This shows the need to extend the debate about this issue that seemed to have little significance to most students.

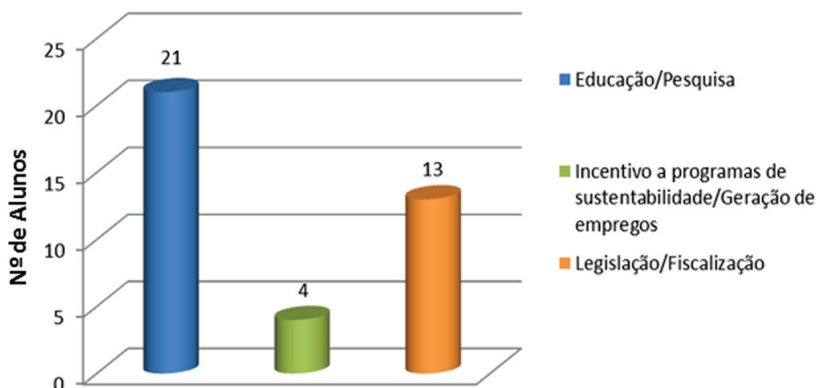


Figure 6 - Results of the questionnaire on possible solutions to the environmental problems facing the study area

Regarding the students' participation in the proposed activities, it was found that the methodology used and the duration for completion (three regular classes, a total of 2 hours and 30min), were suitable to the age group of the target audience which made the development stage design more dynamic. It is also worth noting that for most students, the wetland area was virtually unknown. Therefore, there were many doubts and questions about this biome. The students were mostly curious about the preservation of flora and fauna, unique to that environment. Questions like: "Is it in Africa?" And "Where do the fish go when the wetland dries?" reveal how the Pantanal biome is unknown to most students.

Moreover, it was found during the collective debate that for many students the use of remote sensing was something new in the school universe as exemplified in the following sentences taken from that debate: "How can we see a place so far?" "This satellite business is cool!" "The classes could always be like that!" They were able to observe that the interpretation of satellite images is an important tool in the recognition and interaction of landscape elements, as well as the transformation which results from various human activities in the Pantanal region.

CONCLUSIONS

The results of this study confirmed the importance of using resources of remote sensing and motion graphics in elementary education, as it was evidenced in previous studies. These features contributed to the construction of a new perspective on the study of such an important national biome. Students in the seventh grade of Visconde de Porto Seguro Municipal School, who live in a highly urbanized area of the country as the city of Rio

de Janeiro, had only restricted information about their immediate environment. This factor worked as an inhibitor in the early debates, requiring greater intervention by the teacher who asked questions about the issues presented in the video and used games with the class so that everyone would feel safe to speak. The use of the teaching materials and methodology proposed in this paper contributed to the process of learning about other environments, far from their reality, and it happened in a more playful way generating greater participation and interest.

It is noteworthy that, during the course of this work, School Unit teachers tried to learn about the use of these new teaching tools and how they might incorporate them in their disciplines. Some of them even reported that the students began to suggest the use of remote sensing after they realized that the technique could be used as a tool to make their classes more attractive.

It is expected that this research promote the generation and dissemination of new educational material that can serve as support to educators in the use of new technologies for the study of this and other Brazilian environments.

REFERENCES

ABDON, M. de M; SILVA, J. S. V; SALES; G. M. M. Geotecnologiana educação ambiental: a Diversidade da Vegetação do Pantanal Brasileiro. In: VI JORNADAS DE EDUCACIÓN EM PERCEPCIÓN REMOTA EM EL ÁMBITO DEL MERCOSUR Y URUGUAYAS DE EDUCACIÓN EM PERCEPCIÓN REMOTA - Montevideo, 22 a 24 de novembro de 2007. SELPER capítulo Uruguay, 2007. Não paginado.

CARVALHO, V.S.G. **O sensoriamento remoto no ensino básico da geografia** – Definindo novas estratégias. Rio de Janeiro, APED, 2012.

GURGEL, E. P. A Experiência Audiovisual nos espaços educativos: possíveis interseções entre educação e comunicação. Disponível em: <www.mnemocine.com.br>. Acesso em: 04 de abril de 2012.

INSTITUTIONAL DE PESQUISAS ESPACIAIS (INPE). Disponível em <http://www.dgi.inpe.br/CDSR/>. Acesso em 10 de Março de 2012.

LIMA, S. F. S; FLORENZANO, T. G; MORAES, E. C.; COSTA, D. F. M. Uso Escolar do Sensoriamento Remoto no Estudo da Dengue. **Geonordeste**, v. 1, p. 93-110, 2011.

Parâmetros Curriculares Nacionais: Geografia (5a a 8a séries). Brasília, Brasil: MEC/ Secretaria da Educação Fundamental SEF, 1998. In: SANTOS, V.M.N. dos. **Escola, cidadania e novas tecnologias: o sensoriamento remoto no ensino**. São Paulo: Paulinas, 2002.

VIEIRA, D. M; ZANI, M.V. Atividades psicomotora se de animação em sensoriamento remoto para as classes do 5º ano do ensino fundamental – Estudo de caso da Escola Municipal Rondon, In VIII JORNADAS DE EDUCACIÓN EM PERCEPCIÓN REMOTA EM EL ÁMBITO DEL MERCOSUR, 2011. Córdoba –Argentina. Não paginado.